

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ІМЕНІ В.Н. КАРАЗІНА
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КАФЕДРА АНГЛІЙСЬКОЇ МОВИ



«ACADEMIC AND SCIENTIFIC CHALLENGES OF DIVERSE FIELDS
OF KNOWLEDGE IN THE 21ST CENTURY» /

«АКАДЕМІЧНІ ТА НАУКОВІ ВИКЛИКИ РІЗНОМАНІТНИХ ГАЛУЗЕЙ ЗНАНЬ
У 21-МУ СТОЛІТТІ»

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Частина I. HUMANITIES

Частина II. NATURAL SCIENCES

Частина III. TECHNICAL SCIENCES



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DIE ETHISCHEN PROBLEMEN DER STERBEHILFE

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Zusammensetzung: In dem Artikel sind die ethischen Probleme der Sterbehilfe, die Argumenten für und gegen die Verwendung von Sterbehilfe analysiert. Das Wesen der Sterbehilfe, ihre wichtigsten Arten und Formen wurden definiert. Der Beitrag verfügt über die Daten zur Nutzung der legalisierten Sterbehilfe in verschiedenen Ländern.

Stichworte: ethische Problemen, das Leben, der Tod, Sterbehilfe.

Анотація: Стаття присвячена аналізу етичних проблем евтаназії, розглядаються аргументи як за, так і проти застосування евтаназії. Визначено сутність евтаназії, її основні види та форми. У статті наводяться данні про легалізоване використання евтаназії у різних країнах світу.

Ключові слова: евтаназія, етичні проблеми, життя, смерть.

Аннотация: Статья посвящена анализу этических проблем эвтаназии, рассматриваются аргументы как за, так и против использования эвтаназии. Раскрыта сущность эвтаназии, ее основные виды и формы. В статье приводятся данные о легализованном использовании эвтаназии в разных странах мира.

Ключевые слова: жизнь, смерть, эвтаназия, этические проблемы.

Der Wert des menschlichen Lebens stellt sich die Frage der Sterbehilfe in einer Reihe von globalen Problemen. Seit den alten Zeiten, verursacht sie viele Streite Ärzten, Juristen, Soziologen u.a. Heute ist Sterbehilfe unter bestimmten Bedingungen in einigen Ländern zulässig, in Vielen wird ihre Legalisierung diskutiert. Aber die ethische Seite des Problems der Verwendung von Sterbehilfe löst noch Diskussionen aus.

Der Frage der Sterbehilfe ist ausreichende Anzahl von Werken aus verschiedenen Perspektiven gewidmet. Politische und rechtliche Aspekte offenbaren in ihren Arbeiten mehrere Gelehrte wie O. Kapinus, A. Kony, F. Akvinskyi, L. Seneca und andere. Aus der ethisch-sozialen Sicht betrachteten sie A. Huseynov, L. Konovalova, A. Naletova, B. Judin und andere. Aus den medizinisch-biologischen – V. Akopov, A. Bilibin, A. Bova, A. Orlov, I. Pokrowski und andere. Berühmte ausländische Werke: M. Janice, S. Grof, R. Kay, J. Sudo, F. Foot und andere.

Trotz der großen Zahl von wissenschaftlichen Arbeiten zu diesem Thema, hat Konsens noch nicht aufgetaucht.

Der Zweck dieses Artikels ist das Wesen des ethischen Problems der Sterbehilfe zu offenbaren.

Das Konzept der "Sterbehilfe" wurde von Francis Bacon im XVI Jahrhundert eingegeben und bedeutet im Griechischen einfach, gut, glücklich Tod eingeführt. Die Definition des Begriffs "Sterbehilfe" ist in der Erklärung zur Sterbehilfe WHO im Jahr 1987 vorgestellt: " Sterbehilfe ist ein Akt der vorsätzlichen Tötung des Patienten, auch auf Wunsch des Patienten oder durch Behandlung mit einem ähnlichen Antrag von seinen Verwandten, ist unethisch. Dies schließt nicht aus der Notwendigkeit, den Arzt, um den Wunsch des Patienten nicht, um den Verlauf des natürlichen Prozesses des Sterbens in der Endphase der Krankheit verhindern zu respektieren" [6].

Es gibt zwei Haupttypen von Sterbehilfe: aktiv und passiv. Das Sinn der aktiven Sterbehilfe ist es, alle Maßnahmen, die zu einen schnellen und schmerzlosen Tod führen, zu ergreifen. Passive Sterbehilfe ist die absichtliche Beendigung der Behandlung [2].

Man unterscheidet auch freiwillige und unfreiwillige oder erzwungene, direkte und indirekte Sterbehilfe. Die freiwillige wird auf Antrag sofort durchgeführt, unfreiwillige – ohne die Zustimmung eines Patienten, der in der Regel, bewusstlos ist. Die direkte wird durchgeführt, um die Lebensdauer der Arzt des Patienten zu verkürzen, indirekte tritt als Nebenwirkung von Aktionen des Arztes, die für andere Zwecke gerichtet wurden [6].

Darüber hinaus versuchen die Wissenschaftler in den letzten Jahren eine Reihe von border concepts zu identifizieren – Distanaziya, Ortonaziya und Yatronaziya [6].

Ins Konzept der "Distanaziya" wird maximale Umsetzung von Maßnahmen, um den Patienten in einem Terminal-Zustand zu speichern investiert.

Ortonaziya ist der passiven Sterbehilfe ähnlich. Der Arzt ergreift keine besonderen Maßnahmen, um den Patienten zu retten und seine Lebensdauer zu verlängern, sondern nur seinen Zustand zu erleichtern.

Der Unterschied zwischen der Yatronaziya und der aktiven Sterbehilfe ist es, dass die ungeschickte Handhabung des kranken Arztes die Möglichkeit einer Behandlung aufgrund von inoperablen Patienten bestreitet.

Die ganze Zeit hat das Problem der Sterbehilfe Argumente seine Unterstützung für und gegen gefunden. Zuerst ziehen wir in Betracht die negative Seite des Problems.

Der erste Faktor gegen die Verwendung der Sterbehilfe wurde Religion. Das menschliche Leben ist als das höchste Gut erkannt und die Eingriffe der in ist nicht akzeptabel. Aktive Sterbehilfe wird von den meisten Philosophien verboten, Ausnahmen nur Theologen reformistische Tradition (die Niederlande) sind, in Indien gibt es eine Tradition von Selbstmord, aber in streng definierten Umständen als eine spirituelle Reinigung. Verweigerung der Behandlung, die unterstützen und das Leben verlängern, ist für die Katholiken, Protestanten, Juden, Buddhisten, Hindus und Sikhs, die meisten Anhänger des Taoismus zulässig. In der Orthodoxie und Konfuzianismus, ist das inakzeptabel [8].

Code of Ethics der Arzt, der immer noch relevant ist, wurde in der Antike formuliert. Die Verwendung von Sterbehilfe explizit zu verbieten, sehen wir in der hippokratischen Eid: "Ich gebe keine tödliche Droge und zeige keine Möglichkeiten, um einen solchen Plan zu umsetzen" [5].

Das Hauptargument zugunsten der Sterbehilfe ist ein Menschenrecht auf Autonomie. Man hat das Recht, sein Leben zu verfügen. Zwingt den Patienten, der für den Tod fragt und unerträgliche Schmerzen erlebt, ist unmenschlich und unmoralisch.

Außerdem kann dieser Zustand des Patienten dazu führen, dass der Patient, der die ihre Leiden beenden will, kann er mehr grausame Art und Weise führen, um sein Leben zu beenden [2].

Ein weiteres Argument ist, dass für das menschliche Leben - nur wenn die Freude über den Leiden herrscht, das Positive über dem Negativen. Das Leben kann ein Segen sein, bevor es verliert der menschliche Form und besteht nicht mehr auf dem Gebiet der Kultur und moralischen Beziehungen. Zustand im Koma beseitigt Anzeichen von persönlichen Leben.

In ihrem Vortrag konzentriert sich A. Sonkina auf die Tatsache, dass Sterbehilfe der Akt der Barmherzigkeit ist. Menschen, die Sterbehilfe zu begünstigen, sind keine Mörder.

Ein weiterer Grund liegt in den hohen Kosten der Behandlung in den meisten Fällen. Funds geht um das Leben von unheilbar kranken Patienten zu erhalten, könnte eine große Anzahl von Patienten speichern, deren Krankheit behandelbar ist [7].

Aus genetischer Sicht gibt es eine Notwendigkeit für die Beseitigung der Anhäufung von Krankheitssymptome. Infolge der Anhäufung von einer großen Anzahl von negativen Mutationen, steigt die Gefahr einer Degeneration der Menschheit [1, S. 392].

Während seines Bestehens hat Sterbehilfe Anerkennung gefunden.

Laut Francis Bacon, Pflicht des Arztes ist nicht nur die Wiederherstellung der Gesundheit, sondern auch, um das Leiden zu lindern, wenn der Patient hat keine Chance auf Heilung selbst, Sterbehilfe ist ein unbezahlbares Geschenk [2].

Russischer Rechtsanwalt A. Koni unterstützt ebenfalls Sterbehilfe. Er hielt es zulässig in der bewußten und ausdrücklichen Wunsch des Patienten, und unbestrittene Unfähigkeit, vorherige Mitteilung an die Staatsanwaltschaft zu heilen [6].

Seit den Tagen der primitiven Gesellschaft gibt es Praxis der Sterbehilfe.

Im Jahr 1930 wurde eine massive Sterbehilfe in Deutschland durchgeführt. Sterbehilfe exponierten Menschen, die die Last der Gesellschaft werden. Im Jahr 1939 erließ Hitler ein Dekret über die Registrierung von Kindern mit Mongoloid, Hydrocephalus, Lähmungen und Missbildungen, von denen einige getötet wurden. Später gab er eine weitere Verordnung über Menschen mit geistiger Behinderung [3].

Danach war aktive Sterbehilfe seit langem verboten. Seit 2002 wird die Niederlande das erste Land, in dem aktive Sterbehilfe legalisierte. Dies ist jedoch beschränkt auf die strengen Auflagen: Der Patient muss unheilbar krank sein, Schmerz und keine Chance auf Heilung haben. Als mit gesundem Verstand, sollte er/sie den Wunsch zum Ausdruck bringen, um zu sterben und auch weiterhin auf sie für eine gewisse Zeit zu bestehen.

Das nächste Land, das Sterbehilfe legalisiert hatte, wurde Belgien. Dieses Recht wird nur für belgische Staatsangehörige, die dauerhaft in dem Land wohnen. Ebenfalls seit 2012 ist Belgien das erste Land, das die Sterbehilfe an Kindern legalisiert hat.

Dazu gehören auch weitere Länder wie Schweiz, Vereinigte Staaten von Amerika (Oregon, Washington, Vermont und Montana), Luxemburg, Kolumbien, Kanada (Quebec) [4].

Seit November 2015 hat Deutschland, für das dieses Thema sehr empfindlich ist, ein Gesetz verabschiedet, unter denen die Sterbehilfe durchgeführt werden kann "im Einzelfall auf der Grundlage altruistischen Motiven" [3].

Die Ukraine ist nicht bereit für die Legalisierung der Sterbehilfe. Es gibt die Gefahr von Missbrauch, wie Organhandel, Tötung mit egoistischen Motiven.

Nach der Analyse aller Argumente kamen wir zu dem Schluss, dass die Sterbehilfe nicht eindeutig als negatives oder ein positives Phänomen bestimmt werden. Für alle seine negativen ethischen Aspekte, ist Sterbehilfe ein Mittel, um von nicht-menschlichen Schmerzen und das Leiden für viele Menschen zu befreien. Allerdings ist die Frage der Regelung der Nutzung der Sterbehilfe legal bleibt offen. Vielleicht ist die Gesellschaft noch nicht bereit für die vollständige Legalisierung der Sterbehilfe und braucht der Vorbereitung und der überarbeiteten Haltung zur Frage von Leben und Tod.

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THE DOCTRINE OF BISTAMI AS A REFLECTION OF HELLENISTIC PHILOSOPHY IN THE EARLY ISLAMIC MYSTICISM

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Summary: The article studies the influence of Hellenistic teachings upon religious-philosophical conception of Abu Yazid Bistami. Neoplatonism and Gnosticism, interacting with orthodox Islam, formed the basis of ontology and epistemology of early Islamic mysticism, and formed an original model of relationship between the individual and the Absolute. In the article the author analyzed terminology that was used first is Bistami's conception, but later has been widely spread in orthodox Islam and Sufism. The author reconstructs this doctrine that underlies the most of the religious and philosophical doctrines of the Middle East.

Key words: fanah, gnosticism, mysticism, neoplatonism, sufism, zuhd.

Анотація: Стаття присвячена впливу еліністичних вчень на релігійно-філософську концепцію Абу Йазіда Бістамі. Неоплатонізм та гностицизм при взаємодії з ортодоксальним ісламом склали основу онтології,гносеології ранньоісламського містицизму, а також сформували своєрідну модель взаємовідносин особистості та Абсолюту. У статті проаналізована термінологія, яка вперше була використана Бістамі, однак у подальшому широко використовувалась як у ортодоксальному ісламі, так і у суфізмі. Автор реконструює дане вчення, що лежить в основі більшості релігійно-філософських доктрин Близького Сходу

Ключові слова: гностицизм, зухд, містицизм суфізм, неоплатонізм, фана.

Аннотация: Статья посвящена влиянию эллинистических учений на религиозно-философскую концепцию Абу Йазид Бистами. Неоплатонизм и гностицизм, взаимодействуя с ортодоксальным исламом, легли в основу онтологии и гносеологии раннеисламского мистицизма, а также сформировали своеобразную модель взаимоотношения личности и Абсолюта. В статье проанализирована терминология, которая впервые была использована Бистами, но в дальнейшем широко применялась как в ортодоксальном исламе, так и в суфизме. Автор реконструирует данное учение, лежащее в основе большинства религиозно-философских доктрин Ближнего Востока.

Ключевые слова: гностицизм, зухд, мистицизм, неоплатонизм, суфизм, фана.

Islamic civilization owes its existence to the frontier cultural situation. Resulting from the meeting of different traditions syncretism formed the basis for further processes of formation of Islamic culture. A striking example of this syncretism is Islamic mysticism as a set of different teachings and doctrines.

Synthetic character of mystical teachings is reflected not only in its multicultural roots, but also in the fact that it becomes a kind of compromise between religious and philosophical knowledge. Being a branch of Islam, mysticism applied philosophical concepts of East and West to the Muslim ontology, epistemology, as well as to values, personality and identity issues.

The aim of this article is to analyze and classify the models of relations between an individual and the Absolute regarded by early Islamic mysticism and represented by the teachings of Abu Yazid Bistami. Drawing parallels with the concepts of Neoplatonism as well as interpretation of early Sufi terminology contribute to a better understanding of philosophical content of Islamic theological studies. Hence, the objectives of this work may be defined as following: reconstruction of Bistami's conception based on discrete range of texts of his followers and contemporaries; comparison of Bistami's teaching and philosophical ideas of Vedanta and Neoplatonism; analysis of the central notions of Bistami's doctrine (such as "Arsh", "fanah" and "zuhd") and observation of their correlation with terminology of Western and Indian mystical traditions.

The novelty of the work lies in the number of points. Foremost, for domestic scientific tradition, this is the first attempt to reveal the influence of Neoplatonic philosophy upon the emergence of early Islamic mystical teachings, a vivid example of which is the conception of Abu Yazid Bistami. Second, the doctrine of Abu Yazid Bistami has not been studied in detail and there had not been made any attempts of its reconstruction as of philosophical system. So, in this article we undertook such kind of observation. Islamic mysticism originated in the first centuries of the Hijra. Works of early Muslim mystics formed the basis for most of the Sufi teachings. While our awareness of great Sufi thinkers' doctrines (such as ibn'Arabī, al-Suhrawardī, Rumi, etc.) is quite voluminous, the information about early mystics' conceptions is poor. Their original treatises have not survived to our time, but many of their ideas were reflected in the writings of followers, numerous retellings and aphorisms. Reconstruction and analysis of the first teachings allow us to define vectors of early Islamic religious thought.

In the VIII-IX centuries Muslim philosophy was divided into two trends - the orthodox and the mystical ones. At the heart of the mystical tendency there was a thesis that understanding and interpretation of the Qur'an needed new background, different from the official tafsir (Tafsīr) Traditionally, the interpreters of the Qur'an used analytical tafsir method that mysticism, since Zhu-n-Nun, considered to be a great mistake [18, p. 58]. According to early mystical teachings, a human heart is a Mirror of the Divine Intension [12, p. 22]. With the help of his heart a person can understand the Scripture, and analytical work of mind is only a hindrance. As an illustration, there are the words of Persian Sufi Anwar al-Kasymi (Anvar Al-Qasimi): "The heart of a gnostic ('Arif) is in the contemplation of Truth. The heart of a reasonable man is caught by the cycle of speculation and doubt" [18.p 63].

The main position for the sufism is represented by Gnostic mysticism wing, which Ibn-Arabi named Al-wujud vahad (waḥdat al-wujūd), "The Unity of Being". According to this doctrine, the Deity dwells beyond time and space and thus is a single reality. Empirical reality is only a derivation from True Being, similar, in terms of Sufi symbolism, to reflection in a mirror [14, p. 61]. Mystic endowed with enlightenment, is akin to Platonic philosopher, who ought to return to the cave and felt embarrassment transferring experience of True Reality to residents of darkness because there were no categories with which one can express divine essence. This position differs from the Sufi's one, however, many researchers erroneously consider it as such.

The first Islamic thinker, who put forward a mystical thesis of unity of being, was Abu Yazid Bistami, known for his saying "I am God" [18, p. 60]. His doctrine is at the very heart of Islamic mysticism. Understanding the reason of Bistami's conception and analyzing his texts we can reveal heterogeneous borrowing in Islamic mysticism, define the problem field of early Islamic philosophy, observe the evolution and transformation of Middle East philosophy in general.

Noteworthy is the fact that Bistami's statements are represented by his biographers and followers as self-sufficient hermetic symbolic systems, which contained, in addition to the obvious sense, some hidden meanings as well as their mystical "codes". Munavi, who was the one of compilers of Islamic texts, gave the following saying: "If the Throne and what is around it, and what is inside it, would be placed in a corner of the heart of Knower, they would be completely lost in it" [14, p. 240]. Delineated in such a way the fragment appears to be an esoteric text "closed in itself", while historical and philosophical connotations allow us to discover a range of possible interpretations and to enrich the original text with new meanings.

"The Throne" and "what is around it" can be understood as being, that is a double reflection in the "mirror" of human soul. Since human reality is a projection of True Being, then "the Throne", "Kingdom of Heaven" (according to Bistami, the projection of human reality), is the result of double ontological "refraction". This metaphor is, on the one hand, an aftersound of Neoplatonic ideas, and its interpretation is diametrically opposed to the ontological order performed by Plotinus' philosophy, on the other. Plotinus' cosmic mind (nous) generates matter; from Bistami's point of view, on the contrary, matter is the source for nous. The above mentioned "Heart of Knower" is similar to True Reality.

Notions of the trinity of reality is typical for Advaita Vedanta [16, p. 395]. Therefore, the comparison of Advaita Vedanta with Islamic mysticism seems quite appropriate. However, the following phrase of Bistami reveals the difference: "But Love is in the Throne (kursi), Arsh, and it is equal in all its manifestations" [2]. If in Sankara's doctrine we can find the idea of "diminishing" substantiality in the process of descending to the lower levels of reality (the highest level is valid, and the lowest turns to be an illusion), Plotinus takes all three levels as equal: "Imagine a spring that hasn't got any other beginning, but that gives itself to all flows, not being exhausted by these flows, and staying calm within itself. Imagine also, that each of the flows that stream out of it before running in different directions, still stay together, but everyone already knows where its way is" [8]. This thesis practically repeats the idea of ontological identity expressed by Bistami.

In this regard, it is important to underline the terminological subtleties of Bistami's text. So, it is worthy to notice how does Bistami use the Qur'anic term "the Arsh". The Arabic words kursi and arsh are synonymous and refer to "the throne". However, Bistami's concept the "the Arsh" means rather a fine line between Being and Otherness (between the higher and lower reality) than the "place" where the Absolute dwells. The Arsh acts as the image of the finest thing that, being the boundary between realities, in the same time is accessible to the human mind. "The finest boundary" is equal to the "One Reality", which thesis also shows the influence of Neoplatonism upon the conception of Islamic mysticism.

The above mentioned similarity of Bistami's and the Gnostics' ideas, is not single. In Islamic theology the thinker is a well-known thanking to the thesis "I am God", for which he was repeatedly condemned by both the orthodox and Sufi theologian. [14, p. 237]. In the opinion of Abu Yazid Bistami, the amalgamation with the Absolute means rather the totality of divine being, its "omnipresence", than just the unity of the lower and higher realities.

Joining the Absolute leads to the "depersonalization" of a sage. Communion with the Absolute, which is the key idea of Bistami philosophical doctrine, is called "fanah". Later, meditation on this term formed the basis for doctrines of many Sufi orders. And the meaning of the term has been changed essentially. In Bistami's teaching, fanah is a denotation of self-cognition and, as a consequence, the cognition of God. As an example, the text of ibn Mu'az, quoting remarks attributed to Abu Yazid Bistami: "I cognized God through God, and what is other than God, I have cognized with the help of His Light" [6, p. 282]. This thesis expresses ontological conception of Sufism in the most complete way. God appears to be an absolute reality, cognition of which is available only by means of absolute knowledge.

In the process of cognition of God worldly things (zuhd) turn into a serious obstacle. Thus, while in the later Sufi tradition (for example, in Ibn Arabi's doctrine), zuhd is used for the description of worldly attachments, material needs or the abandonment of laws for the sake of pleasure, [1, p. 105] in the early Sufism, we can see a different situation. According to Bistami, zuhd is neither a non-material component of being or thought of it, nor a "trap", prepared for a sage by empirical reality. This is non-identity, "watershed" between the subject and the object of thought founding the "facility of judgment", and as a result, the removal from the Absolute (as the Absolute is outside of categorical thinking).

In the case when the world is regarded in terms of zuhd, the object of knowledge can be God or not-God or, as Bistami defined it, to represent being or non-being. Since nothing but the Divine reality exists, whatever level of being would be focused by consciousness of the knower, the object of comprehension can be only Allah. The only thing that is available to human as knowing subject is self-affirmation through the rejection of individual being, and, paradoxically, the establishment of "quantifier of (individual) existence" in the state of fanah, the Oneness. The following saying of Bistami confirms our findings: "I became Him, and only after that I have exclaimed, "Subahani-ma, I'm great, I exist!" [18, p. 64].

The idea of identity and harmony-in-God enriches human activity with the absolute sense, leads to reconciliation of a thinkable and a thinking, connects descending and ascending beings as well. Dynamic identity of different is able to regularize the primeval chaos, run the complex mechanism of Plotinus' ontology or form the basis for the Christian idea of a Godman. This identity appeared to be the highest ontological ideal for the Neoplatonists, Gnostics and, subsequently, the Sufis.

Regarding the main results of our study, we can make some conclusions. A detailed analysis of the conception demonstrates that the traditional thesis of the Indian origin of Bistami's doctrine appeared to be

unsound. In the religious and philosophical doctrine of Bistami one can find obvious traces of Neoplatonic and Gnostic influence. Our thesis about Gnostic character of Abu Yazid's teachings is supported primarily by the concept of the Unity of Being. In Vedanta, the unity of existence implies the saving of personal qualities of an individual, which is contrary to the principle of fanah, formulated by Bistami.

In addition, it is necessary to emphasize the apartness of Bistami's conception of the later Sufi currents. The philosophical conception of Abu Yazid became a basis for most of the mystical branch of Islam. In the same time, its specific terminology expressed in the terms of zuhd and fanah, peculiarities of ontology as well as interpretation of dialogue between an individual and the Absolute, make Bistami's doctrine a unique example of religious and philosophical thought of the Middle East.

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DESCRIPTION GENERALE ET CONSISTANCE DU RESEAU ROUTIER EN UKRAINE

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Résumé: La classification des routes existantes et la consistance du réseau routier en Ukraine sont présentées. Les causes de la détérioration du réseau routier sont étudiées.

Mots clés: autoroutes, dégradation du réseau routier, réseau routier, revêtement, route, transport international, trafic, revêtement.

Анотація: Розглядаються існуючі класифікації доріг та складові дорожньої мережі. Вивчено причини погіршення дорожньої мережі.

Ключові слова: автомагістралі, вулично-дорожня мережа, дорожня мережа, міжнародні автомобільні перевезення, погіршення дорожньої мережі.

Аннотация: Рассматриваются существующие классификации дорог и составляющие дорожной сети. Изучены причины ухудшения дорожной сети.

Ключевые слова: автомобильные перевозки, автомагистрали, дорожная сеть, улично-дорожная сеть, ухудшение дорожной сети.

Le transport routier joue un rôle capital en matière économique et sociale. La route est en effet le principal moyen de déplacement pour les personnes et les biens en Ukraine et représente plus de 90 % de l'activité du secteur des transports, dans son ensemble. Plus de 68 % du volume total de marchandises du pays sont transités par la route et 89 % du trafic de voyageurs – par bus [3]. Chaque jour 9 millions de passagers et 2,6 millions de tonnes de marchandises sont transportés par autoroute. Le transport routier représente environ 300.000 emplois, généralement informels et reste un élément essentiel pour l'amélioration de l'accès des populations, en particulier en zone rurale, aux services de santé ou d'éducation [3].

La plupart des routes et la totalité des autoroutes visent à la desserte des concentrations urbaines et des pôles d'activité économique, à la desserte des campagnes et des bourgs, pour les routes secondaires, chemins et pistes [2]. Elles sont divisées en routes d'utilisation générale faisant partie du réseau routier de l'Ukraine, routes

privées, routes technologiques et les voies urbaines, lorsque ces voies sont à grande circulation ou assurent des liaisons rapides à l'intérieur d'une ville [3].

En Ukraine les routes sont classées en quatre catégories [4]:

- les routes internationales ou les routes européennes qui assurent le transport routier international et présentent environ 5% de toutes les routes de l'Ukraine. Une route européenne est une route dont la numérotation est sous la responsabilité de la Commission économique pour l'Europe des Nations Unies (UNECE), en vertu d'un accord européen sur les artères internationales principales du trafic (AGR), fait à Genève le 15 novembre 1975. Afin de s'affranchir des numérotations nationales, les routes européennes bénéficient d'une numérotation européenne qui ne varie pas d'un pays à l'autre. Mais pas toutes les routes ukrainiennes internationales pourraient être considérées comme de véritables autoroutes. En 2010, il y avait deux grandes autoroutes: Kiev - Boryspil et Kharkiv – Dnipropetrovsk qui pourraient être classées comme les autoroutes européennes [5].

- les routes nationales, qui sont reliées aux routes internationales et n'appartiennent pas aux autoroutes ainsi que les routes qui assurent des liaisons entre la capitale Kiev et/ou plusieurs centres administratifs et culturels du pays. Les routes nationales sont numérotées par la lettre H cyrillique. Les routes nationales présentent 3 % du total des routes ukrainiennes.

- les routes régionales, qui complètent le réseau de routes nationales et assurent des liaisons entre la capitale Kiev et les centres administratifs des régions, les postes de contrôle de frontière nationale, les aéroports internationaux, les ports maritimes, les centres industriels etc. Les routes nationales sont numérotées par la lettre P cyrillique. Les routes régionales présentent 4 % du total des routes ukrainiennes.

- les routes locales, qui assurent la desserte d'un département et/ou entre deux ou plusieurs départements à l'intérieur d'une même région. Les routes locales qui constituent une part importante du réseau routier (155,6 milliers de km ou de 91,7% de la longueur totale) sont divisées en routes territoriales, départementales et rurales [4].

Tableau 1

Index des routes locales et longueur totale des routes dans les régions

Région	Longueur des voies, km	Région	Longueur des voies, km	Région	Longueur des voies, km
République autonome de Crimée	6605	Région de Kyiv	8490	Région de Ternopil	5063
Région de Vynnytsia	9519	Région de Kirovohrad	6545	Région de Kharkiv	9551
Région de Volyn	6199	Région de Luhansk	3631,7	Région de Kherson	4950
Région de Dnipropetrovsk	9182	Région de Lviv	8334	Région de Khmelnytskyi	7136
Région de Donetsk	8052	Région de Mykolaiv	4831	Région de Cherkasy	6118
Région de Zhytomyr	8513	Région d'Odesa	8232	Région de Chernihiv	7680
Région de Zakarpattié	3330	Région de Poltava	8836	Région de Chernivtsi	2869
Région de Zaporizhzhia	6974	Région de Rivne	5056		
Région d'Ivano-Frankivsk	4160	Région de Sumy	7281		

En Ukraine, dans leur quasi-totalité, les routes sont revêtues d'un mélange de bitume et de gravillons (enrobé bitumineux), d'une ou plusieurs couche(s) de granulats scellés avec un liant bitumineux (enduit superficiel) ou d'une dalle de béton. Le réseau routier est constitué à la fois de routes revêtues et de routes non revêtues. On distingue les routes revêtues des routes en terre. Parmi les routes revêtues, il y a les routes revêtues en enrobés, en enduits superficiels (couche de bitume ou émulsion de bitume et de gravillons) et les routes en béton. 81 % des routes ukrainiennes ont le revêtement en béton bitumineux, 8,7 % — en béton de ciment, 10,2 % — ont le revêtement hydrocarboné. Les routes locales dans la plupart des cas ont le revêtement hydrocarboné (45,1 %) — ce sont des chaussées noirs. 51,1 % des routes territoriales et 23,8 % des routes départementales sont en béton bitumineux. 42,4 % des routes rurales sont des chaussées noirs, 26,6 % — en gravillons ou gravier, 19,8 % — en béton bitumineux [4].

Les raisons de la dégradation prononcée du réseau routier ne tiennent pas uniquement à son âge [2]. Un certain nombre de comportements constituent de véritables agressions perpétrées contre le patrimoine routier. Il s'agit essentiellement du non respect de la réglementation relative aux charges à l'essieu qui occasionnent chaque années des dégâts, ou encore des coupures inappropriées de routes effectuées lors des travaux entrepris par les concessionnaires de services publics sur leurs réseaux souterrains. Généralement non sanctionnés, ces actes perdurent encore [2].

Chaque année, sur les impôts dits routiers, les ukrainiens donnent environ 43 milliards de hryvnia, mais c'est encore très peu. Ce serait assez pour construire 37 mille kilomètres de routes, on a calculé à KP en Ukraine.

Ainsi, lorsque les prix actuels de cotisations dans le budget (TVA, taxe d'accise) avec un litre d'essence représentent environ 3,6 uah, avec un litre de carburant diesel d'environ 2,2 uah. Pour un volume de ventes annuelles sur le marché ukrainien environ 5,85 milliards de litres d'essence et de 5,62 milliards de litres de carburant diesel revenu de l'état est d'environ 33,4 milliards d'uah [1].

En outre, avec les 217 581 autos vendues en Ukraine à leur prix moyen de 17,4 mille euros pour la voiture la TVA payée de 10% à l'impôt sur les véhicules importés sera d'environ 10 milliards d'uah. En conséquence, le total des entrées au budget est d'environ 43 milliards d'uah [1].

Selon la publication, la construction d'un kilomètre d'une route goudronnée à deux voies, adaptée pour le passage des camions par une société privée ukrainienne est de 3,24 millions d'uah. Cependant, l'état paie les sous-traitants à beaucoup plus. L'ancien ministre des transports, Boris Kolesnikov a exprimé ces chiffres: la construction de 1 km de routes à quatre voies en Ukraine coûte au moins 5 millions de dollars, soit 40 millions de hryvnia. Autrement dit, la route à deux voies coûte à l'état 20 millions de hryvnia par kilomètre, soit cinq fois plus cher qu'à n'importe quelle entreprise sur l'asphaltage de rues. Certes, les fonctionnaires disent que les éléments ne sont pas conformes aux normes mondiales, donc ils achètent à l'étranger.

Dans le même temps, le budget "Ukravtodor" pour l'année en cours est estimé à seulement 15 milliards d'uah. En outre, selon les estimations de l'office, 90% des routes de l'Ukraine nécessitent des réparations majeures qui coûteraient 450 milliards d'uah. En fait, pour l'argent des conducteurs on pourrait faire normales toutes les routes de l'Ukraine en 10 ans [3].

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THE STATE AND PERSPECTIVES OF HIGHER EDUCATION DEVELOPMENT IN UKRAINE IN THE CONTEXT OF EUROPEAN INTEGRATION

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Summary: The article considers the system and legislative basis of higher education in Ukraine. As a result of the research a grid of higher educational institutions, and a regulatory base of in Ukraine about higher

education are formed, the system of higher education standards and its educational qualification levels are given, the main stages and objectives of business education in Ukraine are singled out and actual problems of Ukraine's entry into the European educational space are defined.

Key words: higher education, legal foundation, regulatory base, business education, the European educational space, accreditation, postgraduate education.

Анотація: Стаття присвячена розгляду системи і законотворчої основи вищої освіти України. У результаті дослідження створена сітка вищих навчальних закладів, нормативна база України про вищу освіту, приведена система стандартів вищої освіти і її освітньо-кваліфікаційні рівні, виділені основні етапи і завдання розвитку бізнес-освіти України та означені актуальні проблеми входження України в європейський освітній простір.

Ключові слова: вища освіта, законодавчі основи, нормативна база, бізнес-освіта, європейський освітній простір, акредитація, післядипломна освіта.

Аннотация: Статья посвящена рассмотрению системы и законодательной основы высшего образования Украины. В результате исследования создана сетка высших учебных заведений, нормативная база Украины о высшем образовании, приведена система стандартов высшего образования и ее образовательно-квалификационные уровни, выделены основные этапы и задачи развития бизнес-образования Украины и определены актуальные проблемы вхождения Украины в европейское образовательное пространство.

Ключевые слова: высшее образование, законодательные основы, нормативная база, бизнес-образование, европейское образовательное пространство, аккредитация, последипломное образование.

All aspects of life in high school life in Ukraine are regulated by Ukrainian legislation. This also concerns private educational establishments, thus management structure, rules of acceptance and training, types and names of educational establishments, their structure as well as the structure of scientific degrees, teaching staff, names of positions, rules of teachers promotion, rights and obligations of students are the same all over the country. The only difference between governmental and non-governmental educational establishments is in sources of financing and forms of ownership. In 2015 the system of higher education of Ukraine comprised 966 educational establishments of 1-4 levels of accreditation, among them 619 were of 1-2 levels of accreditation, including 531 governmental establishments and 88 of the other forms of ownership with total number of 548,500 students. Relative number of students is 125 per 10 000 people.

In 2014-2015 2000026,7 students, 28412 post-graduate students and 1271 those working for doctor's degree studied in 347 higher educational establishments of 3-4 levels of accreditation, there were 233 governmental and 114 non-governmental ones among them.

Among them there are 141 universities, 63 academies, 135 institutes. 81 universities in Ukraine are of national status of national universities. Such diversification of educational establishments in Ukraine is explained by historical traditions, labour market demands and striving of Ukraine to integrate more dynamically into European educational space.

Order of education, reorganization and liquidation of higher educational establishments (HEE) have been defined by law of Ukraine "On higher education" and respective orders of Cabinet of Ministers and goes through mandatory licensing procedures and accreditation.

State higher educational establishments of 3 and 4 levels of accreditation are created by Cabinet of Ministers of Ukraine as their founder. State higher educational establishments of 1 or 2 levels of accreditation are established by Ministry of Education and Science of Ukraine, other central organ of executive power according to the principle of their branch belonging, and private establishments are founded by local authorities. However, problems of perfect system of HEE formation are still very urgent. This was reflected in the President's Decree dated February 17, 2004 "On measures on improvement of higher education system of Ukraine" which confirms the necessity to preserve state HEE as budgetary organizations.

Legal fundamentals for modernization of higher education of Ukraine are formed by normative documents based on Constitution of Ukraine and comprise the following laws of Ukraine "On Education", "On Higher Education", "On scientific-technical activity"; President's Decrees dated September 12, 1995 / 832 "On main directions of reformation of higher education in Ukraine", dated January 23, 1996 / 77/96, "On measures on reforming the system of specialists' training and employment of HEE graduates" dated June 11, 1998 / 615/98, "On integration strategy of Ukraine into European Union", dated February 17, 2004 / 199/2004, "On measures on improvement of higher education system in Ukraine" in compliance with all this all central executive bodies are to take efficient measures on Ukraine's joining Bologna process; Decrees of Cabinet of Ministers dated November 3, 1993 / 896, "On state national curriculum "Education (Ukraine in XXI century)", dated November 12, 1997 / 1260, "On documents about education and scientific titles", dated May 24, 1997 /

507, “ On directions and specialties according to which HEE train specialists as to education-qualification levels”, “ On acceptance of Order of education-qualification levels (stage education)”, dated July 7, 1998 /1247, “ On development of state standards of higher education”. It should be noted that if international agreements of Ukraine ratified by the Verkhovna Rada differ from acting law on higher education, then laws of international agreements have force.

The system of normative-methodical documents regulating higher school education of Ukraine (with a definite level of state regulation) provides relative autonomy and academic independence of HEE, and, moreover, free students personality development, taking into account their wishes and talents.

According to Article 16 of Law of Ukraine “On higher education” and part 1 of Convention about higher education qualification recognition in European region, a system of higher education is “unity of interactions, consistent educational courses, higher educational establishments and other juridical persons providing education services”.

Major subjects of the system of higher education of Ukraine are fields of labour and social relations. Professional training in HEE is directed towards requirements of primary positions, whose names are established in accordance with Directory of qualification characteristics, branch normative documents and list of the staff members of the enterprise, considering principles of formation of position names as to the State classification of professions.

Professional type of education formed in Ukraine, is reflected in State Standards of higher education. These Standards anticipate normative part of education contents which provide obligatory study of a complex of social arts: history, law, ecology, ethics, philosophy, world and Ukrainian culture, etc. These subjects take about 20% of academic time. State Standards provide for humanitarian direction of fundamental and special subjects. State Standards provide not only European level of education and acquisition of professional skills but also bring up harmoniously developed, socially active, tolerant personality with high spiritual qualities capable for self development and self-improvement. The Standard is an essential element in any national system of education. But its form and structure is defined by political, social-economic conditions of the country, its traditions, etc. According to Article 15 of Law of Ukraine “On education” educational standards have similar requirements to contents, volume and level of educational and special training in Ukraine. They make basis for evaluation of educational and educational-qualification level of citizens independent from the form of education obtained. According to Article 11 of Law of Ukraine “ On education”, the structure of the system of higher education standards is hierarchical unity of interrelated components which make requirements to contents, volume and level of educational and special preparation at three levels: state, sectoral, higher educational establishment.

From the beginning of 1990s in Ukraine training of specialists in the system of higher education goes in stages.

Law of Ukraine “On higher education” specifies a system of educational-qualification levels. Such levels characterize higher education according to knowledge formation, abilities and skills of a person which allow him/her to perform tasks and duties of a definite level of professional activity, i.e. characteristics of professional activity according to features of a definite unity of professional works which a specialist is to perform.

Law of Ukraine “On higher education” specifies the following educational levels to get qualification according to an educational-qualification level of incomplete higher education - young specialist, basic higher education - bachelor, full higher education - specialist, master. Today, in accordance with the Bologne Declaration training of specialists at the level of “Specialist” is canceled and there are curricula only for bachelors and masters in high school. Educational establishments which train young specialists are not longer in the system of higher education.

A bright example of democratization of Ukraine’s higher education system which was put into action in the early 1990s is appearance of private higher educational establishments on national market of educational services. I am proud of the fact that Kharkov Institute of Business and Management was a pioneer in this field: we accepted our first entrants as early as 13 years ago, in 1992.

Business education plays an important role in economic development of all nations. In a developing country trying to be competitive, higher educational establishments must promote processes of development providing high quality services based on modern knowledge of business, developing management skills and constantly improving them in accordance with international requirements and standards.

During 1992-1999 important positive changes initiated and actively supported by Consortium on improvement of business education in Ukraine (CEUME) established with American partners, took place. At the Consortium Constituent Assembly in April 1999 the plans to establish a project for development of Ukrainian business education were announced. The project “Activity on improvement of business education in

Ukraine” was financially supported by US Agency on international development. The project involved two American universities (University of Minnesota and St.Thomas’ Business school), two Polish universities (Warsaw School of Economics and Wanninsko-Mazursky University) and invited for collaboration about a hundred and fifty Ukrainian educational establishments, more than 6500 lecturers and business managers from them.

At the first conference “Development of business education in Ukraine” in December 1999 there were present more than 250 participants, i. e. twice as many as at the Constituent Assembly. This national conference became the first important stage in the development of pressing changes in business education in Ukraine. For the first time representatives of different fields of education (state and private) and different specialties (arts, technical, economic, state management) reached the consensus about what should be done to improve business education in the country. Leading lecturers and business managers of higher educational establishments united efforts to develop a strategic program to reform a new branch of higher education which was named “The Action Program”.

Informal discussions on the main points of the “Program” were held at the national level within the framework of Summer Academies More than 1400 proposals received from teachers, business managers and international experts followed the above discussions. Discussion of the Program continued at the Second national conference of 2000, which resulted in adoption of the final document “Development of Business Education in Ukraine: action program”, which became the second important stage in the development of our business education. Publishing and distribution of “Action Program” was a new stage of reformation movement, i.e. implementation of main issues of the document at the level of individual educational establishments and among those interested in business environment. The program describes main problems and possibilities which business education faces on the way to creation of the required qualified human capital during the period of deep economic, social and political changes. Culmination point in the process of the Program’s ideas approbation was the Third national conference with more than 250 representatives of education, business, government structures, national and international donor organizations participating in it. The success achieved on the way of business education reformation inspired the Conference participants to adopt the final document “Development of Management education in Ukraine: recommendations implementation results”. The purpose of the Third national conference was discussion of efficient steps in implementation of recommendations of “Action Program” and dissemination of positive results among universities and business schools in Ukraine.

The Fourth Annual International Conference devoted to the problems of business education improvement in Ukraine took place in 2002 in Kiev. Achievements of the previous period of the Consortium activity which became possible thanks to the collaboration between American, Polish and Ukrainian specialists in the field of education were discussed there. During the conference there was presented a new five-year program of support of further development of business education in Ukraine accomplished by joint partnership efforts of a number of American, Polish and Ukrainian higher educational establishments headed by Minnesota University , USA, at the expense of US Agency on International Development.

The Fifth conference of 2004 concentrated its attention on discussion of urgent problems of curricula on business and management subjects’ quality, as well as necessity to create an independent system of curricula evaluation, which will promote adaptation process acceleration of Ukrainian business education services to international standards. The problem of social responsibility of educational establishments and business structures to the society was also in the limelight.

The fact that questions of integration of national education and economy into European community as well as new requirements of international competitive medium to national business education, readiness of Ukrainian educational establishments to professional independent accreditation under the conditions of Ukraine’s joining the Bologne process, Ukraine’s entering WTO and its transformation into an immediate neighbor of European Union are of priority in Ukraine, made Ukrainian Association of management and business education development devote the Sixth Publication of “Strategic intentions and recommendations - 2005” to definitely assist in acquaintance of wide strata of Ukrainian people with purposes of European Community in development of competitive system of business education in Ukraine.

Its development in modern world Ukraine regards in common context of European integration with the sense of direction towards fundamental values of western culture, such as parliamentary, human rights, freedom of movement, equality in access to qualitative education of any level, etc., which are integral attributes of civil democratic society. Ukraine is striving to be an equal participant of European integration. That is why modernization of higher education is being done in full agreement with regulations of Lisbon’s Agreement signed and ratified by Ukraine, as well as with principles of Bologne process. Integration of national higher education into European and international educational space corresponds both to interests of Ukraine on the whole, and interests of each individual educational establishment.

National doctrine of education development in Ukraine passed examination by the experts in Council of Europe in 2003. What criteria determine necessity of modernization of higher education of Ukraine? First of all, these are circumstances connected with evolution of new economy, i.e. gradual change of national production structure, formation of information - communication markets, expansion of a sector of analytical consultation and marketing services, strengthening of workers' motivation to acquiring and updating knowledge, abilities and skills.

Globalization of economy of Ukraine, its plans to join EU make new demands to modernization of higher education. This group of factors include increase in demand for creative, highly professional managers, analysts, market specialists, increase of workers mobility, rise of education quality, increase in competitiveness on the market of educational services, widening of possibilities to get education. To achieve the aims set, i.e. to competently join European educational space, Ukraine has to successfully complete the following processes in structural transformation of high school:

- introduction of a two-stage education (Bachelor - 3-4 years, Master - 2 years) as it is practiced in all European countries;
- it is necessary to develop diversification of training programs for Bachelor and Master degree training programs for employers;

Introduction of credit units system (ESTS);

- development of European sample diploma and its application;
- providing efficient control of education quality;
- providing high level of academic mobility of students, teachers and research workers;
- ensuring graduates' Employment problems coordination with employers;
- development of system and modern legal basis of functioning of education system and science.

The basic component of joining European educational space is quality of higher education which concerns teaching, research, educational establishment management, attention to students' needs, providing extra-curricula educational services. Respect for quality always was an integral part of Ukrainian higher education. In order not to lose best traditions of Ukrainian high school and be ready for Ukraine's joining European educational space, great preparatory work is being done in all educational establishments. Planning measures to increase level of educational establishments management main attention should be paid to motivation increase of all participants in educational process (teachers, research workers, auxiliary personnel) as well as students' responsibility for the results of their academic activity.

Ukrainian high school should not only join European processes of a two-stage model of education formation, adopt a single system of credit units, achieve greater mobility of both students and teachers but, first of all, to develop Ukrainian standards and models which would harmonize with the European ones, originating, however, from the national educational paradigm, our own strategy and competitiveness of our education in the context of Bologna Declaration.

As the national business education has just taken the path of global competitiveness, the factors of its raising demand deep theoretical comprehension.

Principal drawbacks of home non-governmental educational establishments impeding integration into Bologna process are the following:

- declarations and contradictions of mission formation;
- formal attitude to determination of inner philosophy of HEE activity;
- non-coordination of HEE inner elements with the formulated mission;
- lack of strategic vision;
- insufficient work on employment and career growth of the graduates;
- inflexibility of curricula and programs;
- lack of individuality of curricula and programs, them being closed to students' influence as well as business environment;
- lack of harmonious links between labor market, curriculum, program and quality of specialists' training;
- insufficient mobility of teaching staff;
- absence of real evaluation system of teaching staff work quality;
- passivity of teachers;
- insufficient professional direction of arts and general scientific subjects;
- insufficient professional understanding of enrollees;
- insufficient ties between HEE and the chairs with public, business environment and non-coordination of such contacts;
- weak information provision of an academic process;
- obsolete computers;

- simplified understanding of international cooperation development principles;
- absence of joint international projects and programs;
- Non-coordination of the academic process elements which does not allow curricula and programs to integrate.

The first and topmost tasks to be solved by business education of Ukraine in the context of preparation to joining the Bologna process are the following:

- to form a critical mass of supporters of European education among teachers and administration of HEE;
- to widen and strengthen business ties and contacts with power authorities, management, scientific institutions, well-known statesmen, corporate world, enterprises and graduates aiming at popularization of HEE and further collaboration;
- to strengthen international ties and collaboration with foreign educational establishments, paying attention to the necessity of closer integration of international teaching experience, exchange programs for students, participation in joint research;
- to form information packs of educational- professional programs of stage training in each direction according to the requirements of Bologna Declaration;
- to actively participate in joint national and international programs, development and implementation of educational and scientific projects;
- to improve academic - methodological provision of the subjects paying special attention to efficient organization of individual work, practical training and students' probation period;
- to raise lessons efficiency by improving methods of subjects' teaching, provision by innovation didactic materials, visual and technical equipment of the academic process, to implement new teaching technologies, to attract teachers from other HEE, business representatives and corporate clients;
- to improve the control system of students' knowledge, to raise the meaning of current control and certification as a stabilizing factor in providing high quality of knowledge,
- to implement the system of rating control in students' activity as a complex index of students' achievements in academic, research, public activity, cultural and sport work;
- to analyze the state of specialists' organizational preparation (Bachelors, specialists, masters) according to the types of training (primary, post-graduate education) to formulate tasks to raise quality of students' education to the level of international accreditation requirements;
- to undertake measures raising the quality of academic-pedagogical staff, capable of performing their mission and aims of educational establishment, which should make the basis of personnel policy;
- to employ teachers both on regular basis and those combining jobs, capable of teaching at a high level and in foreign languages;
- to actively attract to teaching teachers with international experience, representatives of business with up-to-date knowledge and practical work experience;
- to give chance to academic and scientific personnel to work abroad as invited professors and consultants in corporate structures;
- to establish formal procedures evaluating teachers' activity, to develop and implement rating system of evaluation of teaching staff work;
- to improve the system of material incentive and stimulation of academic - pedagogical staff, differentiating depending on specialists' training quality, consequences of pedagogical innovations realizations, publishing textbooks and teaching materials, monographs, research results and attraction of off-budget funds;
- to promote publication of textbooks, electronic textbooks by teachers, including the ones in foreign languages;
- to widen information database of academic process at the expense of improvement of library work;
- to provide all subdivisions of HEE with modern computers and information resources, to create conditions for efficient use of Internet.

For Ukraine in cultural – civilizational aspect European integration means joining the single family of European peoples, return to European political and cultural traditions. As the deliberated public choice, the prospect of European integration is an important incentive for carrying out successful economic and political transformation which can become the basis for national consolidation. Thus, European integration is becoming a key link for the world to discover Ukraine, a transition from closed totalitarian to open democratic society.

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MULTINATIONAL CORPORATIONS’ ACTIVITIES IN THE WORLD FOOD AND BEVERAGE MARKET IN THE AGE OF GLOBALIZATION

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Summary: Over the past two decades, transnational corporations engaged in the production of food and beverages have increased their influence on the development of the world economy. Production of foodstuffs is one of the forming elements of the national economy of any country because companies of this sector form food security of the state.

Key words: foreign direct investment, globalization, transnational corporations, transnationalization.

Анотація: Протягом останніх двох десятиліть збільшився вплив на розвиток світового господарства зі сторони транснаціональних корпорацій, що зайняті виробництвом харчових продуктів та напоїв. Виробництво харчової продукції є одним із системоутворюючих елементів національної економіки кожної країни, оскільки підприємства цієї галузі формують продовольчу безпеку держави.

Ключові слова: глобалізація, прямі іноземні інвестиції, ТНК, транснаціоналізація.

Аннотация: В течение последних двух десятилетий увеличилось влияние на развитие мирового хозяйства со стороны транснациональных корпораций, занятых производством пищевых продуктов. Производство пищевой продукции является одним из системообразующих элементов национальной экономики каждой страны, поскольку предприятия этой отрасли формируют продовольственную безопасность государства.

Ключевые слова: глобализация, прямые иностранные инвестиции, ТНК, транснационализация.

In the modern world there is no significant process in the global economy which would be held without participation of transnational corporations (TNCs). They take both direct and indirect participation in global economic processes. Although TNCs operate internationally, their influence extends to all countries and all walks of life. Therefore the TNC phenomenon is still controversial both to scientists engaged in research of international relations and to heads of state and companies.

Today, there are already 81 thousand TNCs in the world which have about 810 thousand branches abroad and possess a strong network of local enterprises that act as their partners in various markets. Total assets of foreign subsidiaries have already achieved a vast sum in the amount of 68,7 trillion dollars USA. The international production output, which is represented by sales of foreign subsidiaries of TNCs, is already 31,2 trillion dollars, while total exports is 5,7 trillion dollars USA [4].

In the process of the world economic globalization, transnational corporations are influential investors in the food industry. Compared to other multinational corporations in agribusiness, companies engaged in the production of food and beverages are very large: each of the ten largest TNCs (all of them are based in developed countries) controls foreign assets worth about 20 billion dollars USA; together they account for more than 2/3 of the foreign assets of the 50 largest TNCs of food industry [4]. The largest TNCs of the food industry in 2014 were: «Nestle» (Switzerland, the production of instant coffee, mineral water, ice cream, soup, dairy products, baby food), «Unilever» (UK/Netherlands, production of ice cream, cheese and tea), «Monsanto» (USA, production of the seeds for agriculture), «Kraft Foods Inc.» (USA, production of chocolate, coffee, salty snacks and cookies), «Danone» (France, dairy products), «General Mills» (USA, foodstuffs), «Kellogg» (USA, cereals and instant food), «HJ Heinz» (USA, ketchup, frozen foods, baby food) «ABF» (United Kingdom, foodstuffs) (Table. 1) [3].

Table 1

10 world's largest multinational corporations by the level of foreign assets in 2014 [3]

№	Company name	Headquarter of mother company	Level of market capitalization billion \$ USA	Turnover, billion \$ USA	Profit, billion \$ USA	Returns, billion \$ USA
1	Nestle	Switzerland	238,8	100,6	11,6	134,6

2	Unilever	Netherlands/ Great Britain	117,8	67,7	5,9	59,9
3	Monsanto	USA	56,6	13,5	2,0	19,7
4	Mondelez International	USA	54,4	35,0	3,0	75,5
5	Danone	France	44,2	27,5	2,3	38,1
6	General Mills	USA	31,8	16,7	1,6	21,2
7	Kraft	USA	30,6	18,3	1,6	23,3
8	Kellogg	USA	23,5	14,2	1	15,2
9	HJ Heinz	USA	23,2	11,6	0,9	12
10	ABF	Great Britain	22,9	19,8	0,9	16,2

Food and beverage industry in terms of export surplus takes the third place after the engineering and chemical industries. Therefore, it is an indication that the production of food and beverages is a promising field of activity. In recent years, total world foreign direct investment (FDI) of TNCs in the food industry has been increasing, although its total amount remains limited and small in comparison with other sectors. Over the past twenty years, the total FDI in the food industry has increased more than 6 times, although the share of FDI in the food industry in total FDI has decreased from 4 % to 3 %.

The global financial crisis had a negative impact on foreign direct investment in the food industry. Although FDI in the food industry in developed countries was resumed after a sharp fall in 2009, they remained at the historically low level of total global FDI flows (39%). Otherwise the situation with FDI inflow of transnational corporations from developing countries and countries with economies in transition, their share reached a record mark and equals 39% of world exports FDI.

In the post-crisis 2010 compared with 2009 there was an increase in the number of mergers and acquisitions in the food industry for more than 50%. The net sales agreements increased 4 times, and net transactions of buying increased 36 times. In 2011, the situation changed and the number of mergers and acquisitions declined markedly. In 2010, the most significant mergers and acquisitions were the purchase of the British «Cadbury plc» by the US «Kraft Foods Inc.» (transaction price was 14 375 million dollars USA), in 2011 it was the purchase of the Turkish «Mey Icki» by the English «Diageo plc» (transaction price was 1 539 million dollars USA)[4].

Recently, TNCs operating in the food industry have changed their investment strategy significantly. The main flow of FDI (80%) has been allocated to the financing of mergers and acquisitions. This strategy allows the TNC to enter the market of the host country as soon as possible and at relatively low cost. The new strategy eliminates the major positive effects of FDI for the host country, because buying a local company by a TNC might not be accompanied by the transfer of new technologies, a significant increase in jobs and exports. Perhaps even the opposite effect, there is an outflow of capital from the country, exported to foreign investors as a return on their investment. Thus the possibility of national governments to regulate the activities of TNCs subsidiaries are limited [1]. This is due to two factors: the presence of TNCs competitive advantages for local companies and the significant pressure on national governments by powerful international economic organizations – the IMF and the WTO. In this situation, the solution can be found only if industrialized countries realize that the income that they get from the activities of TNCs is obtained by reducing the welfare of other countries and agree on the introduction of supranational regulation of TNCs, would which would take into account the interests of countries outside the "golden billion".

Over the past decade the role of TNCs in the world economy has increased significantly. Transnational corporations make a contribution to the development of the investment environment and affect the political, financial, economic and social processes in the host country. Investment activities of transnational corporations is one of the most important components of international investment. In the end, there are the following factors of TNC's entry into food markets in developing countries such as: the necessity to develop its global business; government incentives; standardization of the company's products; a large market and a low cost of production factors.

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VIOLATIONS OF JOURNALISTS' RIGHTS AND WAYS TO SOLVE THIS PROBLEM

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Summary: Freedom of speech in the work of the media is one of the most important institutions of modern democracy. The article deals with the main legal and fundamental ethical guidelines, which the journalists must stick to while performing their professional duties in order to contribute to the identification of their most effective and creative abilities in the name of goodness and justice.

Keywords: freedom of speech, journalism, law, media, journalists' rights, rightlessness.

Анотація: Свобода слова в діяльності засобів масової інформації є одним з найбільш важливих інститутів сучасної демократії. У статті розглядаються основні правові та основні морально-етичні орієнтири, яких повинен дотримуватися журналіст при виконанні своїх професійних обов'язків, для того щоб його діяльність сприяла якнайкращому і найефективнішому виявленню власних творчих здібностей в ім'я утвердження добра і справедливості.

Ключові слова: свобода слова, журналістика, право, засоби масової інформації, права журналістів, безправність.

Аннотация: Свобода слова в деятельности средств массовой информации является одним из наиболее важных институтов современной демократии. В статье рассматриваются основные правовые и основные морально-этические ориентиры, которых должен придерживаться журналист при выполнении своих профессиональных обязанностей, для того чтобы его деятельность способствовала наилучшему и самому эффективному выявлению собственных творческих способностей во имя утверждения добра и справедливости.

Ключевые слова: свобода слова, журналистика, право, средства массовой информации, права журналистов, бесправность.

The Universal Declaration of Human Rights proclaimed the rights of people and political rights and freedoms: equality beyond the law, the right to liberty and security of person, freedom of conscience, etc. We can also see economic and social rights of the individual: labor, social welfare, recreation, etc. Despite this, in today's political situation in our country, human rights are often violated. In most of these situations people even don't know that their rights are often violated and continue to live in the same vein. Ignorance of the law is a typical situation for most of the people who are not connected with jurisprudence. In cases when government stays idle of violated rights, some people usually ask journalists for help. But what should journalists do when the question of violated rights concerns them directly?

The expert of the "Institute of mass information" Ekaterina Dyachuk says that the number of violations of the journalistic rights in our country remains significant year by year. "Institute of mass information" is a public organization which deals with issues of observance of journalists' rights in Ukraine. The point is that only in eight months in 2015 they recorded 224 violations of journalists' rights.

Today, according to E. Dyachuk, the Ukrainian journalists most often become the victims of attacks from unknown persons. Thus, Dyachuk says, deputies of local councils and judges often try to interfere with journalists' work. Law enforcement agencies open very few criminal proceedings concerning violation of the rights of journalists, noted in the Institute. For half a year only fifty proceedings were opened, and only three of them were sent to a court. "Impunity for violation of the journalistic rights is going on", Dyachuk says [1]. So, today I'm going to illustrate the situations, when the law regarding the journalists is broken.

Most of us at least once in our life have got into the situations when some people try to limit our rights and actions with respect to different events. A popular example of such prohibition is a situation with a shooting in public places. Many people usually see a plate with a sign "shooting is forbidden" while entering a mall or a supermarket or a shop. Of course this rule regards journalists who sometimes come with their camera and shoot people in this place. As a rule, in this situation a security guard runs to you quickly with a purpose not to allow you to shoot and take you away from the supermarket with your camera. But does he have rights to do this?

According to article № 34 of Ukraine Constitution [2], journalist (and any citizen) have rights to free gathering, saving and using information orally, in writing or in any other ways. Implementation of these rights can be limited to the law: in interests of national security, territorial integrity or a public regime for the purpose of prevention of disorders or crimes, for public health care, for protection of reputation or the rights of other people, etc. According to point 3 of article №26 of the Law "About Printing Mass Media (Press) in Ukraine" [2] journalists are given the right to make records, including using the means of audio-and video equipment, shooting and photographing in public places, except for the cases provided by the law. As we can see, the supermarket administration isn't right, because on the basis of the law about the press, the requirement to stop shooting interferes journalist to fulfill his professional duties and violates his right and the right of citizens to obtain information.

It seems essential to emphasize that we also should remember that there are some cases when the permission for the shooting and photographing in public places is not required [2]: in the territory of government bodies (outside and inside), on events for the press, press conferences (if organizers don't forbid), in courts (inside — except halls of court sessions when there is a court session), on squares, on streets and avenues, in parks, forest zones, in the territory of stations, in the subway. Protection of interests of the natural person when carrying out photo, film, TV and video filming is an essential guarantee of realization of many personal non-property rights: rights to identity, rights to private life, rights to respect of advantage and honor, rights to inviolability of business reputation [2].

A process of the corresponding shooting can significantly violate certain personal non-property rights of the person, so the legislator predetermines that the natural person can be removed on photo, film, TV or a video film only by his consent. The consent of the natural person can be expressed both in written, and in an oral form, depending on circumstances under which the corresponding shooting is conducted. In some cases it isn't obligatory to receive person's consent to shoot at all. It is presumed that the person is considered as agreed to be shot until he objects to it. So, returning to the supermarket administration, we can declare confidently that law is on the side of a journalist.

Let's consider another example of violation of the rights of journalists— a limit to attend and shoot events such as court session, different conferences and others. Recently my familiar journalists started to tell me the stories when a security guard doesn't allow them to attend a court session, regional council session and City Council session. As was told, there had been made lists with surnames of people who could attend the session, and the guard didn't let journalists whose surnames were absent on the list enter. This case caused much indignation among journalists. Has the administration right to do this kind of actions?

Let's consider this situation deeper. According to the operating Ukrainian legislation, the modification of the law of Ukraine "About local government" and Regulations of the Verkhovna Rada of Ukraine (Supreme Council of Ukraine) opens an opportunity for people to attend session of local councils and Supreme Council of Ukraine. As it was told in the point 3 of the law "About local government" [6], "citizens of Ukraine exercise the right for participation in local government on belonging to the corresponding territorial communities." But, in article 2 of Regulations of the Kharkov city council available on the official site of the city hall, it is said that "during a public meeting of the City Council in a hall have the right to be present, except deputies, the mayor and the secretary of the City Council, officials of executive authorities, executive bodies of the City Council, the accredited journalists, leading TV and photographing, members of delegations who are in the City Council on an official visit, the citizens and persons invited to participation in session in the order determined by article 7"[3]. Article 7 ("The invitation to plenary session of city council") defines that people whose presence is necessary to consider the questions of the agenda, and also those who were invited by the deputy, the mayor, the secretary of the City Council, representatives of a constant or temporary control commission can be invited to session[3]. In case if someone wants to invite people to session, it is necessary to submit the application two days in advance to the secretary of the City Council. In turn, the secretary has to give a task to specialized department. "Demands for registration of presence permission for the persons invited by the deputy of city council, constants or temporary control commissions of council move them to the secretary of city council not later, than in 48 hours prior to carrying out plenary session of session of city council for working off and their further direction in Department of organizational work of city council for drawing up the final list invited to plenary session. On the day of session of city council presence permission for the invited persons who aren't included on the list, is provided by the mayor, the secretary of the City Council" — it is told in point 2 of article 7 of Regulations [3].

As for the journalists, according to point 4 of Regulations, representatives of media must be accredited for a term of work of the current session at the press service of the office of the city council and executive committee in the order determined by the Situation approved by the mayor. The accredited media

representatives are provided with materials spread among deputies, except for those intended for private meetings [3].

So, in short, there is a law that allows us to attend any of sessions in our Councils, and there are Regulations that limit sessions attendance. The limit is that you will be able to attend the session if there are free places and if you register in the office 48 hours before. As regards journalists, they have to be accredited to be let in. So, the law is observed, but with some corrections.

As to our situation when the security guard doesn't allow journalists to attend the session of Council, we can come to the conclusion, that the guard has full authority not to let them in, if they don't have necessary accreditation.

Online-platform to protect journalists' rights

Besides, everybody knows cases with beating journalists, damaging their property. Influenced by these stories the president of the International federation of journalists (IFJ) Jim Bumelha and the president of the European federation of journalists (EFJ) Mogens Blicher Bjerregard signed the Memorandum of Common Understanding with the Council of Europe about assistance to protection of journalism and their safety. This information is given on the site of the International federation of journalists. The Council of Europe created a special online-platform aimed at gathering and distributing information about different violations of journalists rights. The main task of this web-site is also to promote collecting, processing and distribution of information which causes serious concern from the point of view of freedom of mass media and safety of journalists. The memorandum of the Council of Europe outlines such subjects as threats of physical violences and safety of journalists, media managers, bloggers, etc; impunity in these affairs; "chilling effects" in media – a question of judicial intimidations of journalists, abusing laws on a defamation [4].

The online platform of the Council of Europe will reflect actions of SE in response to alarm signals, and also regular reports and comments of the interested State Parties. As it is stated in the memorandum, overall performance of an online platform will be defined in a year of a trial period. So, as we can see, if something goes wrong, journalists are always able to write on this platform and protect themselves.

Local ways to protect the rights of journalists

Answers to the questions of protecting rights and how to behave while discussing with a policeman gave the executive director of the Ukrainian Helsinki union of human rights Vladimir Yavorsky on the training organized by Kiev independent media labor union. He suggested a list of actions you should do if you got in the trial with a law representative. First of all, you should quote the law about information and keep a policeman at a distance. If you're forbidden to go to institution, to do photo- or video-filming in a public place, act due to the scheme: 1) Show the journalistic certification or other documents and ask a law representative to make the same; 2) Referring to the law "About Information" demand to provide a written ban to you, where it will be accurately written who forbade, to whom, where to pass, on what basis and when; 3) Ask the policeman who is his direct boss and where it is possible to find who is specifically ordered not to let journalists on the territory.

If you are arrested, you should always bear in mind that there are two main bases for arrest – for committing an administrative offense and on suspicion of committing a crime. The administrative detention can last no more than three hours. When you are brought to a regional department, you will be registered in the special Police documents, where the time of detention will be accurately recorded, which will be the beginning of counting hours of your compelled stay in the police. You should also remember that you don't have to sign a protocol without your lawyer. Always try to remember a name and a surname of the policeman and try to get acquainted with the witnesses [5].

To conclude, I would like to say that journalists due to their profession must never ignore law. We should always remember that if a situation of this type happens, we don't have to leave it without attention. As we all are the guardians of people, so we have to protect people from the lawlessness, but first of all we have to protect ourselves.

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THE BUDGET OF THE EUROPEAN UNION
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Summary: The present paper deals with the issue of the European Union budget. The main characteristic features of such type of budget are outlined. One of them lies in the fact that the EU is funded only through the system of its own inner resources. The budget procedure is described in the paper. The EU Commission, Council and the EU Parliament all take part in this process. The role of multiannual financial framework as a long-term spending plan is highlighted in the article.

Key words: budget, economy, finance, resources, the European Union.

Анотація: В статті розглянуто питання бюджету Європейського Союзу. Основні характерні риси такого бюджету вказано в статті. Одна з них полягає в тому, що Європейський Союз фінансується тільки за рахунок системи внутрішніх власних ресурсів. Процедура написання бюджету описана в статті. В ній беруть участь Європейська Комісія, Рада Європи та Парламент Європейського союзу. Особливу увагу приділено ролі багаторічного фінансового плану як довгострокового плану витрат країн Європейського Союзу.

Ключові слова: бюджет, економіка, Європейський Союз, ресурси, фінанси.

Аннотация: Данная статья рассматривает вопрос бюджета Европейского Союза. Основные характерные черты такого бюджета указаны в статье. Одна из них заключается в том, что Европейский Союз финансируется только за счет системы внутренних собственных ресурсов. Процедура создания бюджета описана в статье. В ней принимают участие Европейская комиссия, Совет Европы и Парламент ЕС. Особое внимание уделяется роли многолетнего финансового плана как долгосрочного плана трат стран Европейского Союза.

Ключевые слова: бюджет, Европейский Союз, ресурсы, финансы, экономика.

The annual EU budget is €145 bn – a large sum in absolute terms, but only about 1% of the wealth generated by EU economies every year.

The budget is subject to limits established by the multiannual financial framework. This sets the maximum annual amounts which the EU can spend in various policy areas over a given period (usually 7 years).

The EU budget is used in areas where it makes sense to pool resources for the good of Europe as a whole, such as:

- improving transport, energy and communications links between EU countries
- protecting the environment Europe-wide
- making the European economy more competitive globally
- helping European scientists and researchers join forces across borders.

The annual budget – subject to the ceilings set out in the multiannual financial framework, is decided democratically as follows:

- The European Commission proposes a budget.
- The national governments, and the directly elected European Parliament approve the proposal.

This becomes next year's budget.[1]

The lion's share of the EU budget supports growth and jobs. Another significant share goes on agriculture and rural development.

Top expenditure areas (2015)

46% – smart and inclusive growth in the EU, subdivided into:

- 34% – helping underdeveloped EU regions and disadvantaged sections of society
- 12% – making European firms more competitive.

41% – producing safe and secure food supplies, innovative farming and efficient and sustainable use of land and forests.

Some programmes & budgets in 2015:

- Horizon 2020 – research & innovation programme (**€10 bn**)
- Youth Employment Initiative (**€1.4 bn**)
- COSME – programme for small businesses (**€0.3 bn**)
- Connecting Europe Facility – transport, energy & digital networks (**€3.4 bn**)
- Erasmus+ – education, training, youth & sport (**€1.6 bn**)
- Life – environment programme (**€0.4 bn**) [1].

Feature that distinguishes the EU from other international bodies and that reflects the depth of the integration process is its budget. Unlike international institutions that receive funding from their member states, the EU is financed exclusively by a system of “own resources”. In the early years of the Community, the member states paid into the budget as in a traditional international organization. Under the budget treaties of 1970 and 1975, however, the EC gained an autonomous source of revenue. This consisted of three elements:

1. The customs duties collected under the common external tariff
2. Levies on imported agriculture products
3. Proportion of the value-added tax (VAT) collected in each of the members states.

In 1988 the EC added a fourth own resource, which consists of an automatic assessment of each of the member states based on their total and per capita gross national products (GNPs). The composition of the own resources has changed over time, as the relative share of revenue from agriculture and custom duties has declined. In 2004, 73.4 percent of the revenue of the EU budget was expected to come from national income assessments, 14.1 percent from VAT-based resources, 10.4 percent from customs duties, and 1.3 percent from agriculture duties.

The member states set the level of own resources – and by extension the over-all spending level- by unanimous decision in the Council of Ministers. For much of the period that the own resource system has been in operation, the member states have been quite generous with the budget. It has grown more quickly than national budgets, allowing the EU to expand into new areas of activity such as regional policy, precompetitive industrial research, and extensive foreign aid programs for central and eastern Europe and the Mediterranean countries. In recent years, however, the member states have tried to rein in the growth of the EU budget, especially since their own national budgets have had to be trimmed to meet the Maastricht EMU convergence criteria and subsequently the strictures on government deficits contained in the Stability and Growth Pact.

Commitments in the 2003 EU budget totaled 99.812 billion, or some 125 billion. This was the last budget for the EU of fifteen member states. Spending in 2004 was expected to increase by approximately 10 percent to account for the enlargement to ten new member states. In national terms, this is modest figure, amounting to about 2.5 percent of combined public spending of the member states. By most other standards, it is a substantial sum that provides the means of the EU budget goes to agriculture, down from nearly 70 percent in the mid-1980s. About a third of the budget goes to the structural funds to support economic development in the poorer regions of the Union. Approximately 7 percent of the budget is used to pay for EU internal policies, including research and development (by far the largest share of this category), the environment, transport, and trans-European networks. Almost 5 percent goes to external action, chiefly foreign aid but also actions undertaken under CFSP, not counting pre-accession aid for the candidate countries, which comprises another 3.5 percent of the budget. Administrative expenditure- staff, facilities, and other expenses associated with the EU’s institutions – accounts for just over 5 percent of expenditure. [2]

Budgetary procedure

Under the EU budgetary procedures, the Commission draws up a preliminary draft budget which it presents to the Council Ministers. The Council may usually does amend the Commission’s draft. It then establishes, by qualified majority vote, the draft budget and sends it to the Parliament, which has the right to propose amendments before approving the final budget. In the event of differences between the Council and the Parliament, the Council makes the final decision on compulsory spending. The Parliament makes the final decision regarding noncompulsory spending, but it is only allowed to increase such expenditure within a certain percentage that is determined each year on the basis of economic growth, inflation, and increases in government spending in the member states. The Parliament also can reject, by a two-thirds vote, the draft budget as a whole and ask that a new budget be submitted.

The budget frequently has been a matter of contention among the member states. In early 1980s the Community went through a protracted crisis over Britain’s contribution to the budget. Because support for farmers was the largest part of the budget and because Britain’s agriculture sector was smaller in relative terms than those in other member countries, it paid far more into Community budget than it received back, even though its per capita GDP trailed the Community average. Prime Minister Thatcher demanded a rebate to bring UK contributions more into line with payments. The other states were reluctant to meet this demand, which in

their view would undermine the supranational basis of the Community and establish a principle that states must receive back the equivalent of what they pay into budget. Nonetheless, after many acrimonious debates in the European Council, at the Fontainebleau summit of 1984 the other member states agreed to British demands for a rebate.

The accessions of Greece in 1981 and Spain and Portugal in 1986 also led to new budgetary challenges. Led by Spain, these countries and Ireland successfully pressed for transfers from the Community budget (structural funds) to help them cope with the economic and political challenges of joining with more advanced countries in the single market program and later EMU. More recently, the question of enlargement and excessive payments by Germany and the Netherlands into the budget have been points of contention.[2]

In preparing its proposals for the future budget of the European Union, the Commission has faced the challenge of being able to fund the growing number of policy areas where the EU can be more effective by acting through the EU level in the current climate of national austerity and fiscal consolidation. This has led it to propose a budget with a strong pan-European logic, designed to drive the Europe 2020 growth strategy. This proposal is innovative in terms of the quality of its spending proposals and also in terms of how the EU budget should be funded in future, potentially easing the direct impact on national budgets and making it a truly European budget. In the wake of the economic and financial crisis, the European Union has taken significant steps to improve coordination of economic governance to underpin recovery. The European Parliament and the Member States have recognised the benefits of managing the EU's interdependence through the structured approach set out in the European semester of economic policy coordination. The next Financial Framework has been designed to support this process. It provides a long term vision of the European economy going beyond the current fiscal difficulties of some Member States. The EU budget is not a budget for "Brussels" - it is a budget for EU citizens. It is small in size and is a budget that is invested in the Member States in order to produce benefits for the European Union and its citizens. It helps to deliver the EU's growth strategy because it has a strong catalytic effect, in particular when harnessed to meeting the targets of the Europe 2020 strategy. Smart, sustainable and inclusive growth is the leading theme for this proposal.

The MFF: the EU long-term spending plan

The multiannual financial framework (MFF) lays down the maximum annual amounts ('ceilings') which the EU may spend in different political fields ('headings') over a period of at least 5 years. The upcoming MFF covers seven years: from 2014 to 2020.

The MFF is not the budget of the EU for seven years. It provides a framework for financial programming and budgetary discipline by ensuring that EU spending is predictable and stays within the agreed limits. It also allows the EU to carry out common policies over a period that is long enough to make them effective. This long term vision is important for potential beneficiaries of EU funds, co-financing authorities as well as national treasuries.

By defining in which areas the EU should invest more or less over the seven years, the MFF is an expression of political priorities as much as a budgetary planning tool. The annual budget is adopted within this framework and usually remains below the MFF expenditure ceilings in order to retain some flexibility to cope with unforeseen needs. Proposed by the European Commission, the regulation laying down the MFF must be adopted by the Council by unanimity after obtaining the consent of the European Parliament.

The MFF is part of a comprehensive package which also comprises the EU own resources and a set of sector-specific legislations defining the conditions of eligibility and the criteria for the allocation of funds for each EU spending programme. The functioning of the MFF 2014-20 will be reviewed by the Commission in 2016 taking full account of the economic situation at the time as well as the latest macroeconomic projections.

[3]

The Commission is proposing to increase the amounts allocated to research and innovation, education and SME development. It is proposing to unlock more of the potential of the Single Market by equipping it with the infrastructure it needs to function in the twenty first century. It is proposing to make the Common Agricultural Policy more resource efficient, so that it not only delivers high quality food but also helps to manage our environment and fight climate change. The theme of solidarity also runs through this proposal – solidarity with the poorest Member States and regions by concentrating the biggest part of cohesion spending on their needs, solidarity in tackling together the challenges of migration and in coping with disasters, solidarity in terms of energy security and solidarity with people in third countries who need our support for their immediate humanitarian needs and their long term development. The Commission shares the concern of the European Parliament¹ that "the way the system of own resources has evolved ... places disproportionate emphasis on net balances between Member States thus contradicting the principle of EU solidarity, diluting the European common interest and largely ignoring European added value". In making these proposals, the Commission is seeking to put the EU's finances on a different track – to begin moving away from a budget dominated by

contributions based on gross national income by giving the EU budget a share of genuinely "own resources", more in line with the Treaty provisions, which state that the budget shall be financed wholly from own resources. In drawing up this proposal for the next multiannual financial framework (MFF), the Commission has examined the impact of current spending instruments and programmes, has consulted widely with stakeholders and has analysed options for the design of instruments and programmes under the next multiannual financial framework.[4]

Conclusion

The Commission proposes in accompanying legislative texts a Regulation adopting a new multiannual financial framework, an inter-institutional agreement (IIA) on budgetary matters and sound financial management, and for a Decision on own resources (with relevant implementing legislation). In the months to come before the end of 2011, the approach outlined in this Communication will be set out in detail in the legislative proposals for the expenditure programmes and instruments in the individual policy areas. The European Parliament and the Council are invited to endorse the orientations set out in this Communication and to take the necessary steps in the negotiation process to ensure that the relevant legislative acts, including the sectoral expenditure programmes and instruments, have been adopted in time to allow for the smooth implementation of the new multiannual financial framework on 1 January 2014. The Commission will propose the necessary adjustments to this framework if, as expected, the Republic of Croatia becomes a Member State of the European Union before the next Multiannual Financial Framework enters into force.

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THE ANALYS OF TESLA'S MARKET AND PRODUCT DEVELOPMENT STRATEGIES

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Summary: The article deals with investigation of Tesla's business and corporate strategies, the article will also include suggested strategies, their evaluations and implementations as well as conclusion and recommendations. The results of the study are as follows: in order to increase brand loyalty, Tesla needs to continue to introduce innovative products in order to attract potential and keep current customers. Furthermore, while introducing a new brand Tesla should use advertising tools in order to create product awareness.

Key words: international market, market development, product development.

Анотація: Стаття присвячена дослідженню корпоративної та бізнес стратегій компанії Тесла, стаття включає запропоновані стратегії, їх оцінки і методи реалізації, а також висновки і рекомендації. Результати дослідження такі: з метою підвищення лояльності бренду, компанії Тесла необхідно продовжувати впроваджувати інноваційні продукти, щоб привернути потенціальних і зберегти існуючих клієнтів. Крім того, при введенні нового бренду компанія Тесла повинна використовувати рекламні інструменти для кращого розуміння продукту клієнтами.

Ключові слова: міжнародний ринок, розвиток продукту, розвиток ринку.

Аннотация: Статья посвящена исследованию корпоративной и бизнес стратегий компании Тесла, статья включает предложенные стратегии, их оценки и методы реализации, а также выводы и рекомендации. Результаты исследования таковы: с целью повышения лояльности бренда, компании Тесла необходимо продолжать внедрять инновационные продукты, чтобы привлечь потенциальных и сохранить существующих клиентов. Кроме того, при введении нового бренда компания Тесла должна использовать рекламные инструменты для улучшения понимания продукта клиентами.

Ключевые слова: международный рынок, развитие продукта, развитие рынка.

The increasing environmental awareness and the opinion that automotive industry is the biggest contributor to global warming made stakeholders take action in order to perceive effects on the globe. Governments are introducing environmental regulations that affect automotive industry and therefore, force

automakers move to the alternative fuel vehicles in order to remain competitive. Tesla Motors is the leading electric vehicles EV's manufacturer in the current EV's market.

Tesla motors Inc. is an American electric car manufacturing company that was established by Martin Eberhard and Marc Tarpenning in 2003. In 2006 the company launched the production of the first electric sport car, and first gained widespread attention in 2008 by introducing the Roadster, and proved that EV's could be a good substitute of oil and gasoline powered cars. Besides designing and producing electric vehicles, Tesla also provides advance electric vehicle powertrain components to other companies such as Toyota and Daimler [7]. Tesla aims to offer high performance electric vehicles to the target audience (celebrities, corporate executives and car buffs) whose income is above average [3]. Tesla eventually expanded its technological advantage to the luxury sedan segment by introducing Model S in 2012, zero emission and sustainable luxury sedan. Thus, Tesla is the only automaker that sells zero-emission sports cars in serial production at present [5]. Tesla provides its customers with a high quality service and complementary tools such as supercharger stations. Moreover, the company has its own distribution channel, which consists of stores in 18 countries [2].

There are a number of strategies for the development of Tesla: Growth Strategy for the Market Development (Horizontal Growth), Growth Strategy for the Product Development (Horizontal growth), Stability Strategy (Pause/Proceed with caution).

As for Growth Strategy for the Market Development, a new market usually means more customers who will buy more products, which in the same time allows the company to concentrate on its primary business [4]. New markets could be reached through increased online presence, enlargement of the target audience and expansion of retailation nationally and internationally. In order to avoid fierce competition within the USA, Tesla should expand into Europe and Asia markets, and at the same time, keep focusing on its current niche segments. There are some advantages of this strategy: building of strong brand recognition within domestic and international market; increasing of sales and market share; new marketing opportunities, such as global presence in media; an opportunity to become a stronger competitor for the companies such and Nissan, Ford, Toyota, etc. in the global market. There are some disadvantages of this strategy: large capital is required in order to expand; it is necessary to have good monitoring tools on the global scale in order to manage crises efficiently.

As for Growth Strategy for the Market Development Product Development (Horizontal growth), since Tesla has a strong R&D department, it can be turned into creation of new innovative EV's models that will be targeted on a wider range of customers [6]. By covering different target audience, Tesla will increase its brand reputation and sales, which will have a significant impact on the company's market share. There are some advantages of this strategy: to increase profit by attracting more customers with different preferences; to increase brand awareness; to increase the number of customers and customers' loyalty; value creation for customers by introducing cars for different type of customers; risk diversification due to multiple product lines; competitive advantage over larger companies yet. There are some disadvantages of this strategy: the number of competitors will increase due to the number of new products; risk of rapidly changing customers' behavior; previous models with more outdated features might be less desirable.

As for Stability Strategy (Pause/Proceed with caution), Tesla is currently doing well by introducing their last model, however huge investment in R&D is required in order to develop and introduce new products, instead of that it might be better to test the ground using a full-fledged ground strategy by trying to cover pervious losses, which in turn, will unable Tesla to move on with growth strategies. Therefore Stability Strategy could be considered temporary [6]. There are some advantages of this strategy: an opportunity to focus on a new company's product; an opportunity to gain additional profit in order to overcome previous losses; an enhancing internal process by focusing on internal issues. There are some disadvantages of this strategy: a risk to reduce market share; a possibility to lose potential investments into a new product development; a risk to not keep pace with new technologies.

According to the company's current financial position and capacity, it is advisable to start with the Growth Strategy (Product development), which will allow Tesla to gain competitive advantage through increase in the number of customers, since they will expand their target audience and provide different types of EV's for different people with different tastes, which will in turn increase brand awareness over the USA. After the company achieves its objectives on that level, they could start to expand, since they will be an already well-known USA brand, their market share increased, hence they would became stronger financially, which will provide them with an opportunity to expand into new markets.

The ongoing comparing analysis of the company's performance and development against competitors is required in order to not lose competitive advantage and identify new business opportunities. Moreover, it is necessary to compare the company's own intelligence function against competitors using GIA (Global Market Intelligence) survey in order to be aware of the competitor's performance and control over own annual budget and level of development [1].

Tesla has formed partnership with many companies such as Panasonic, Toyota and Daimler, which allows the company to make additional profit. In order to implement future strategies Tesla might merge with Google to create autonomous electric cars in order to be innovative in product development. Moreover, consulting and working with High Street Partner might be a good implementation while expanding into the global market. Partnering with social media like YouTube could be helpful in promotion of the company's products, which will in turn increase Tesla's public exposure.

Nowadays Tesla Motors is an EV's leading company and they are planning to expand into 25 countries within 2 years. However, due to the lack of necessary recourses such as labor and tight timeline in many countries this expansion may be a challenge [7]. Therefore, it is necessary for Tesla to have providers that could meet its strict deadlines while infusing company's culture into the hiring process. Moreover, Tesla should have a single source partner, such as High Street Partner, who can maintain hiring process and help the company to keep growing globally through successful HR management and assist in an in-depth stock option analysis. Moreover, development of the charging stations infrastructure is necessary for the convenient use of electric vehicles since lack of charging stations would diminish consumer's interest to EV's and thus reduce in sales.

Since Tesla's cars are unique, high-tech and attractive, branding is very important in order to increase market share and help to differentiate product in a concrete manner. In order to increase brand loyalty, Tesla needs to continue to introduce innovative products in order to attract potential and keep current customers. Furthermore, while introducing a new brand Tesla should use advertising tools in order to create product awareness. Moreover, usage of the media applications might allow Tesla to become a well-known brand globally.

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PROBLEMS OF SOCIAL WORK IMAGE

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Summary: The article deals with social work in Ukraine with a focus on its value and image. Because of low prestige of social sphere in Ukraine, it is relevant to find out the main problems of image politics within this activity and to identify the role of media in its image formation. The article presents the empirical data that show a distorted view on the importance of social work for building a civil society. Special attention is paid to the necessity to overcome the crisis in order to intensify the Ukrainian social sector, which rests mostly on volunteers and has no qualified personnel predominantly because of the negative image of social work-related activities.

Key words: building a civil society, image of social work, public opinion, state support of social sphere.

Анотація: Стаття присвячена цінності соціальної роботи та її іміджу в Україні. Через низький престиж соціальної сфери в Україні, актуально з'ясувати, які головні проблеми іміджевої політики цієї діяльності, роль ЗМІ в формуванні іміджу. В статті подані емпіричні матеріали, що свідчать про спотворене уявлення в масовій свідомості щодо значення соціальної роботи для побудови громадянського суспільства. Особлива увага зосереджена на активізації соціальної сфери у подоланні

кризового стану, яка у нашій країні тримається здебільшого на волонтерах і не має кваліфікованих кадрів, великою мірою через негативний імідж цієї діяльності.

Ключові слова: громадська думка, державна підтримка соціальної сфери, імідж соціальної роботи, соціальна робота в побудові громадянського суспільства.

Анотація: Стаття посвячена цінності соціальної роботи і її іміджу в Україні. Из-за низкого престижа соціальної сфери в Україні, актуально в'яснити, які головні проблеми іміджевої політики цієї діяльності, роль СМІ в формуванні іміджа. В статті представлені емпіричні матеріали, які свідчать про іскаженне представлення масового свідчення о значенні соціальної роботи в побудові громадянського суспільства. Для преодолення кризового стану особене уваження зосереджено на необхідності активізувати соціальну сферу для преодолення кризового стану, котра в нашій країні держиться в основному на волонтерах і не має кваліфікованих кадрів, во многом из-за негативного іміджа цієї діяльності.

Ключевые слова: государственная поддержка социальной сферы, имидж социальной работы, общественное мнение, социальная работа, построение гражданского общества.

Social work has an exclusive value in the life of society, since it plays a part of a mediator between individuals, social groups and state organizations. Social work is indispensable even for the countries with a high level of social and economic development, not to mention the societies which are in crisis conditions. In the countries of the European Union and in the USA social work occupies a leading position. Here, professional engagement in social sphere is considered to be prestigious. It reflects a fairly positive social and state image of social work as a professional occupation. As for Ukraine, the situation is diametrically opposite. The state does not properly support this sphere, which is convincingly illustrated by a quantitative ratio of people engaged in this activity on a voluntary and professional basis, where the number of volunteers exceeds the number of professionals.

Today we can talk about a whole complex of problems hindering this activity final professionalization. Despite advances in the reform of social policy, the prestige of social work as a profession is rated quite low by public opinion. This is due to the limited possibilities of material rewards and to some bias in the representation of the professional field of experts' activity, which is reflected by the effectiveness evaluation of state social policy and is expressed through a general sense of "inactivity power" in the social sphere [3].

Based on the foregoing information, it is not surprising that most citizens of this country have a negative image of social work as a sphere of professional activity in their minds. The general public has a distorted perception of workers employed in social sphere, and as a result, young people are not willing to be trained in this specialty. But without skilled staff members and a professional approach to solving social issues it is impossible to build a civil society, which Ukraine so desperately needs. Therefore a research on the social work image and the ways to improve it is quite relevant nowadays.

To analyze the image of social work, one should define what is meant by this term. According to one of the definitions found in literature, the image is the impression created in others as a result of the communication of the object with the environment [3]. From our point of view, the image of social work should be considered at the average citizens' level, the media, and the state. All these subjects demonstrate awareness and misconceptions of social work, associating it with the care of needy people, direct assistance in satisfying their basic needs only. When one speaks of a social worker, typically there arises an image of an aged woman without any specialized education, who lives on a low wage. This opinion exists through lack of information from the media and those state organizations which are to provide social services. Equally important to determining the image of social work as profession is a factor of the sources capable of informing the public about the social institutions and the services they provide [3, p. 51]. In this context, the mentality of Ukrainians – namely their total mistrust – serves as an aggravating factor. Thus, the most effective way of promoting social services is the "word of mouth," because people are much more likely to trust the firsthand information than, for example, the Internet or TV sources.

According to the research on the social work image among citizens held in Yekaterinburg, among those seeking for a professional help more than a third believe that people do not apply to social service agencies, because they simply do not know where exactly they can apply for help to. What can be added here is this group's opinion concerning the lack of specific information about the assistance to be obtained from these facilities and services [2]. Low frequency of applying to social services makes up another reason related to the mentality of the Ukrainians, who are used to solving their problems by their own, turning to relatives and friends. Obviously, the government does not look as a reliable support in their eyes, although in many cases it really could help find a solution, even in the form of advice. Here, along with the mentality-related factor, there appears a problem of the public awareness of a low level of social services.

One fundamental principle of social work, referred to as a cornerstone of this profession, is the interpersonal communication between the client and a social worker. But the system of social support has currently become overloaded with too many bureaucratic (red tape) procedures, which deforms the very principle of social support and reduces its prestige among the population. In order to gain access to assistance from the social services, the client must collect a huge amount of different documents, certificates, labels, etc. However, the majority of people run out of patience, rather than preserve their capacity to complete the formal procedure. Too much formality of social work makes it depersonalized. Those who need assistance, realize that their words have a chance to be heard only after a stack of papers having been collected. And this does nothing to improve the image of social work among its immediate consumers.

It can be noted that the state has so-called a "deputy's" (in the bad sense of the word) attitude to the way social activity is implemented. Instead of clear understanding the goal common to all workers in this field, managers and organizations are closed to their customers and rival rather than cooperate. Consequently, all this raises suspicions among the public. On a variety of levels, initiatives get blocked, which greatly complicates the structure of a coherent and transparent system of social work and affects its image among the authorities, the media and public in general. The authorities do not want to allocate money for the social work sector, because they believe that there is no one who can properly dispose it. An access to the organizations is closed for the media, which confirms the suspicions of their illegal actions and unclean intentions. The public cannot see the results of social workers' activity and become convinced of their inability to help. If the state social services and public organizations actually pursue a philanthropic purpose, it is reasonable for them to combine efforts to make the whole system of social support much more effective.

Thus, the basic problems related to social work are negative factors having a bad influence on its image. Therefore, to improve the image, we need to solve real problems. However, there remains no less important issue of a distorted image of social activity in the media and society as well as specific features of our citizens' mentality, such as distrust and a habit to rely on the immediate social surrounding.

Social work in Ukraine is in a special condition: one can observe the prevalence of volunteers over the professionals on both the number and the outcomes of this activity. This shows that people want to participate in the creation of a civil society in the country and are aware of the importance of the social sphere. Volunteers take on a colossal mass of the functions of the state because of a mere inability of the latter to perform their responsibilities. In this case, we can talk about a vicious circle in terms of socio-economic sphere. The country's economy has stagnated, pulling down with itself the level and quality of life. Reducing the living standards has led to an enormous increase in the number of citizens who need help from the state. Undoubtedly, this can hardly contribute to the economic renaissance.

In conclusion, we can say that social work has a significant impact on the formation of civil society. By supporting its clients, social work generates a certain level of their culture, which further becomes part of the public culture and directly affects the level of development of society as a whole. Social work has a low prestige, but one can observe the trends indicating the positive way this image is changing. It is known that building a civil society means the welfare of all its layers and the orientation of all the forces of the state, public organizations, mass media, ordinary people to the creation of the welfare based on the principles of openness, honesty, responsibility and a deep sense of patriotism to their country and people.

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THE HISTORY OF SOCIOLOGY AS AN INSTRUMENT OF THE CRITICAL SOCIOLOGY

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Summary: This article discusses the theoretical achievements of classic sociological authors from the perspective of how they affected the public mood of their times. The idea of Max Weber of the impartial position of the sociologist is questioned as such, that, on the contrary, it makes latent the subjectivity of sociological thought. Examples from the history of sociology demonstrate how the personal position of representatives of sociological thought (served as an objective science) legitimized social racism, Nazism. The author's analysis of sociological texts, and the developments of the representatives of critical sociology are employed in the article

Key words: critical sociology, history of sociology, Holocaust, racism.

Анотація: У даній статті розглядаються теоретичні напрацювання класичних соціологічних авторів з позиції того, як вони впливали на суспільні настрої свого часу. Ідея М. Вебера про неупереджену позицію соціолога піддається сумніву як така, що, навпаки, латентизує суб'єктивність соціологічної думки. Приклади з історії соціології показують, як особиста позиція представників соціологічної думки (що подається як об'єктивна наукова) легітимувала соціал-расизм, нацизм. У статті використовується як авторський аналіз соціологічних текстів, так і розробки представників критичної соціології.

Ключові слова: історія соціології, критична соціологія, расизм, Холокост.

Аннотация: В данной статье рассматриваются теоретические наработки классических социологических авторов с позиции того, как они влияли на общественные настроения своего времени. Идея М. Вебера о беспристрастной позиции социолога поддается сомнению как таковая, что, наоборот, латентизирует субъективность социологической мысли. Примеры из истории социологии показывают, как личная позиция представителей социологической мысли (подающаяся как объективная научная) легитимировала социал-расизм, нацизм. В статье используется как авторский анализ социологических текстов, так и разработки представителей критической социологии.

Ключевые слова: история социологии, критическая социология, расизм, Холокост.

The Maximilian Weber's approval of avoiding of the value judgments in social sciences [5] at a discourse level proclaimed the end of the times when social sciences were a set of personal views but, in fact, it just made this characteristic latent [10]. M. Weber created an illusion of sociologists' objectivity [10]. The works of Frankfurt School stirred the first significant wave of critical approach to this myth. They created a new branch of sociological knowledge – critical sociology which included criticism of sociology as a science. Despite the set of critical thinking by the representatives of different approaches, sociology continues to employ a shield of objectivity that hides the subjective face of sociological works and its significant influence on a society. One of the ways to uncover this is to review cases of the sociological history and to trace the influence of social sciences on significant historical events.

Thus, the object of this work comprises the classic theories of sociological science. The subject is the effect of their ideas on historical events especially on those which are conventionally seen as negative. The topicality of this article is stipulated by a research interest to the above-mentioned study, and also by the necessity of detection of similar subjective approaches of today and avoiding of such thinking in sociological works.

The critical view of sociological objectivity was peculiar to a number of sociologists. In his social experiments, Harold Garfinkel, an Ethnomethodologist, demonstrates the impossibility of truly objective judgments in any sphere of life [6]. In terms of a system approach Niklas Luhmann claims that scientists cannot be impartial in the study of society because of a simple fact that the instruments of studying are inner parts of a social system (to be fully objective in the research of a social system a sociologist cannot be a part of a social system that is 'a priori' impossible) [11]. Finally, Pierre Bourdieu, a neomarxist and a structural constructivist, substantiates that a sociologist, while striving for objectivity, must expose his or her disposition as an impact factor in opinion building [3; 4]. No one can be detached from his or her point of view as a social scientist, so sociologists have to outline all of their value orientations, political views etc. to show the influence of personal positions on a scientific theory – that is the only way to make a social theory credible where it can be objective from the very beginning [3].

Despite these arguments, Weber's myth of objectivity of sociology continues to exist, firstly, among sociologists [3]. The latter circumstance unguards social scientists in their conclusions, because Bourdieu-promoted reflection is unactualized while the assurance in objectiveness dominates.

Tensions in the world politics accompanied by so-called information wars make sociological conclusions affect not only the scientific sphere but the social sphere. Social scientists are significant agents of influence on social moods (albeit indirectly). So, their theoretical positions need to be reflected to understand

the content of such influence. One of the instruments of reflection could be the history of sociology. We are going to employ it to review cases of sociological influence on tragic historical events.

In our previous work on a similar topic we reviewed how sociology authors triggered the Holocaust and in which ways social science hides this circumstance [8]. Following Zygmunt Bauman, we showed that the official discourse seeks to present the phenomenon of Nazism and the Holocaust as a pathology to the development of a civilized society [1]. And this explanation (that hides the fact that the Holocaust was a logical development of capitalism [1]) completely satisfied sociologists [8].

After all these events, sociologists continue to believe that "... our social theory does not require any major revision; our vision of modernity, its hidden but well known potential, its historical tendency requires no more immediate attention because the methods and concepts available to sociology are suitable for "explanations", for "giving the sense" and thus for its understanding. The result is theoretical complacency... Nothing has been done to justify another critical approach to the model of a modern society, which plays the role of a theoretical framework and a pragmatic justification of a sociological framework "[1, p. 20]. "So, being pre-social and immune to cultural manipulation, factors, responsible for the Holocaust, are effectively moved from the area of a sociological interest" [1, p.12].

Thus, sociologists avoid the issue of the Holocaust, on the one hand, on the other hand, sociology fails to realize that its theories were among those who laid the foundation of Nazism. "... In Weber's description of modern bureaucracy, rational spirit, the principles of efficiency, scientific mentality transfer values in the space of subjectivity not mentioning the mechanism that would exclude the possibility of Nazi excess; moreover, in Weber's ideal types there is nothing that would be forced to describe the activities of the Nazi state as kurtosis. For example, "in the midst of terrible things committed by the German medical or German technocrats was not such that would have been incompatible with the view that values are subjective in nature and science is an instrumental activity, indifferent to the values" [1, p. 26].

Yet, Durkheim's theory of norm and pathology does not aid to prevent Nazism [6; 8]. Nor did it anything to disclose the essence of the crime, it rather hid it. A sociologist tries to legitimize this vicious circle: the crime and the punishment [6; 8], as the circle is favorable to capitalist society [7; 8].

There are more vivid examples. Gustave Le Bon is considered as one of the classics of the sociological theory. His achievements serve as a subject of apologetics in the textbooks. And it glossed over the fact that Gustave Le Bon's scientific works were full of social (and not only) racism [12]. On the basis of the data obtained by the measuring devices, Lebon developed a classification model of the skull which was later used in voluminous writings on race, anatomy and intellectual abilities [12]. In his works the concept of an inferior race is repeatedly revisited [12].

We cannot claim that these were the sociological works that led to social racism, Nazism and the Holocaust. But the cases we considered show that the position of the scientists was not objective. On the contrary, it represented destructive moods, thus further complicating the issue. More than once sociology legitimized different types of inequality (from biological to material and intellectual) proving it by scientific arguments and naturalization.

The perspectives of the research are in the study of other examples of sociological legitimating of negative historical events. Contemporary sociological authors and their works also fall in the focus of our research. To illustrate the former, there is a need in revisiting some of the issues in the book of abstracts of the recent international Sociological Conference in Kyiv where universal terms are considered with a negative connotation which represents the author's subjective position (but it is not articulated) [7], or the right ideology in Ukraine is legitimized [2].

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MODERN JORDANIAN EDUCATION IN THE ERA OF GLOBALIZATION

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Summary: The opportunities and challenges of higher education system in Jordan under the influence of globalization and internationalization processes are analyzed in the paper. The perspectives of building the “global university” in the constantly changing environment are considered. The drawbacks of modern education in Jordan are defined and the main ways of their solving are proposed.

Key words: challenges, globalization, higher education, market environment, transnational education,.

Анотація: У статті проаналізовано можливості та виклики, які стоять перед системою вищої освіти Йорданії під впливом процесів глобалізації та інтернаціоналізації. Розглянуто перспективи побудови «глобального університету» у середовищі, що постійно змінюється. Визначено недоліки сучасної освіти в Йорданії та запропоновано шляхи їх вирішення.

Ключові слова: виклики, вища освіта, глобалізація, ринкове середовище, транснаціональна освіта.

Аннотация: В статье проанализированы возможности и вызовы, которые стоят перед системой высшего образования Иордании под влиянием процессов глобализации и интернационализации. Рассмотрены перспективы построения «глобального университета» в постоянно изменяющейся среде. Определены недостатки современного образования в Иордании и предложены пути их решения.

Ключевые слова: вызовы, высшее образование, глобализация, рыночная среда, транснациональное образование.

Jordan has entered the new millennium with the emergence of a new era: the era of globalization, which has dramatically transformed world trade, communications and economic relations since the late twentieth century, and is increasingly having a great influence on education at the start of the twenty-first century. This new phenomenon of globalization has both provided great opportunities and posed new challenges for school leaders and their staff in different aspects of education.

For higher education, the phenomenon of globalization can be defined as “forces that are transforming the university from an institution with a monopoly on knowledge to one among many different types of organizations serving as information providers, and from an institution that has always been circumscribed by time and geography to one without boundaries” [2, p. 3]. It is also crucial to differentiate globalization from internationalization because these two terms are often mistakenly used interchangeably. In this paper, globalization is presented as a phenomenon influencing higher education while internationalization refers to the ways in which higher education responds to the opportunities and challenges of globalization. More specifically, E. Egron-Polak viewed “internationalization as a pro-active effort on the part of universities to embrace their universal nature by opening their curriculum, their research, their classrooms and networks to the world” [4, p. 3–4].

It is obvious that advanced information and communication technologies such as the internet and the World Wide Web, electronic libraries are providing powerful new tools to forge global networks for teaching and learning. Students now can have more opportunities to receive “transnational education” such as online courses, internet-based distance learning, off-campus delivery. A “global university” can teach students anywhere. In reality, Jordanian students can take many online programs for postgraduate studies without traveling abroad. Moreover, the growing importance of the knowledge economy brings up highly-qualified human resources who strengthen relationships between industries, mainly the growing technology-based sector and education, especially higher education. Such resources can only be fully obtained through a highly advanced education, and universities must play a pivotal role in knowledge preparation. Thus, a country with good education has stable economy which will attract foreign investments.

In addition to opportunities, the process of globalization has also raised some challenges. The most potential challenges are the problem of brain drain; the problem of intellectual property; and maintaining a university as a learning organization [1, p. 45].

Brain drain is a big problem for many developing countries like Jordan in the process of globalization. Thanks to the social and economic progress and international cooperation in recent years, more Jordanian students can have opportunities to pursue their studies abroad. Although precise statistics are not available, there are significant numbers of students who do not return to Jordan.

Intellectual property is another challenge for higher education, especially for universities in Jordan. In this new market-based economy, the notion of education as a public enterprise is more popular, and knowledge is also commercialized. Individuals and institutions that provide online courses and conduct research expect to be paid for the use of their intellectual property. This “privatization of knowledge” is obviously generating new constraints for the higher education development.

Maintaining the university as a learning organization is also a big challenge because in the era of globalization, universities no longer have a monopoly on the production of knowledge. Universities that have traditionally provided instruction and measured students in the old way are losing their competitiveness with other international institutions. Universities, to meet the increasing social demands, need to reconstruct teaching and learning modes so that students can be motivated and have the skills for independent, self-directed and life-long learning [3].

While every nation may face these challenges, they present special problems in the Jordanian higher education system because of the country’s social, political and economic and cultural conditions. In the process of renovating the economy and integration into the world, Jordanian education in general, and its higher education in particular, have not yet adapted, and some shortfalls are apparent. One of the biggest weaknesses is the lack of stable development strategy along with outdated modes of teaching and learning, which are big obstacles hindering students’ independence, creativity and problem-solving capacity. Re-training labor force before use is becoming very popular, costing society a lot of money, wasting time and discouraging learners. The traditional Jordanian emphasis on rote learning and strict discipline still exists in most universities, but it is no longer appropriate when the business world is demanding that school graduates be able to go beyond simple reproduction of knowledge. In fact, Jordanian universities are very concerned about changing methodologies, encouraging the shift from teacher-centered to learner-centered approach of teaching and learning. However, this process of change is very slow because of the lack of qualified lecturers, facilities and materials. In addition, ineffective utilization of education technology is also the problem for higher education development at present. Although the infrastructure of universities is much better than before with the establishment of modern laboratories, libraries, learning resource centers, intranet, and internet, the utilization has revealed some weaknesses such as the low percentage of regular users including lecturers and students for academic purposes, limitation and low transferring of internet, and lack of supervision and plan of using these modern facilities effectively. In many universities, computers are used as a decoration, and e-mail and internet are mainly used for personal communication. The main reasons are due to the lack of skills in using computers and English: most middle-aged and older lecturers do not wish to learn information technology skills, and students are not well trained. The consequence is that advanced costly facilities are used ineffectively.

All the aforementioned problems can be observed in most universities in Jordan at present. Facing many changes and difficulties in the new era, universities leaders need to redefine their vision for future development, modify core values and establish new policies. Pressures for cultural integration, technological development, critical thinking, and life-long learning are altering many priorities and values of educational system in Jordan. One important task of the Jordanian government and educational leaders is to have adequate investment and long-term strategic plans to complement and fulfill the goals of the country’s higher education: to provide human resources that are capable of meeting the needs of social development in the information and knowledge era; to enhance competitiveness of universities to integrate into international education and reach standards of education accreditation, and assessment; and most importantly, to equip learners with the ability to learn to know, learn to do, learn to live in harmony with other people. Experiences of many countries in the world have revealed that improving the efficiency of management is the first priority for adapting to changes and enhancing the quality and effectiveness of education. Like many other universities in the world, Jordanian universities need a radical transformation to improve the quality and effectiveness of education in order to meet the diversified demand for human resources.

Globalization, as an inevitable and irreversible process, has significantly affected Jordanian society in different aspects, and has posed both challenges and opportunities for the country’s higher education system. Higher education today is a complex, demanding, and competitive reality. In efforts to optimize good performance in serving society in this age of globalization, university administrators and leaders need to

recognize key changes and develop good strategies to manage changes. A university in the new millennium will only succeed if it is able to manage major changes effectively.

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PROFESSIONAL IMAGE **Galushchak A.S. (Kharkov)** **Language supervisor: Chernysh T.V.**

Summary: The article deals with the characteristics of the professional image as a factor of successful professional life. It concerns the ways of creating an effective professional image

Key words: archetype, identity, image, perception, professional status.

Анотація: Стаття розглядає характеристики професійного іміджу як фактору успішного професійного життя. Були розглянуті засоби формування ефективного професійного іміджу.

Ключові слова: архетип, ідентичність, імідж, професійний статус, сприйняття

Аннотация: Статья рассматривает характеристики профессионального имиджа как фактора успешной профессиональной жизни. Были рассмотрены способы формирования эффективного профессионального имиджа.

Ключевые слова: архетип, восприятие, идентичность, имидж, профессиональный статус.

The subject of the given research is psychology of the image. An image is a representation of a person, organization or products; the general impression that a person, group, or product presents to the public. [6, p. 25]

This problem is studied by J.Baumgartner, A.Bodalev, J.Fast, L.Froiland, E.Hall, M.Mark, F.A.Parsons, S.L.Paek, C.S.Pearson, E.Petrova, E.Perelygina, W.I.Thomas, S.M.Heathman.

There are four main types of image: individual image, image of the product, image of the organization, image of groups.

The first type is an individual image that is the image of a personality, that can be created using one of the two strategies: the orientation on perception or the orientation on self-feeling. The image oriented on perception meets the needs and expectations of target audience while the image oriented on self-feeling expresses self-concept, ideals and unique characteristics of a personality.

The second type is the image of a product. It is a symbolic representation of an object that leads to the perception of an object as a subject. The image of a product is based on the mechanism of personification.

The third type is the image of an organization leads to the perception of the organization as a subject. This type is based on personification and stereotyping. The image of an organization includes both external and internal aspects. The external aspect represents the perception of public whereas the internal aspect represents the perception of the members.

And the last one is the image of groups. It is a generalized impression of a group of people based on stereotyping. It includes cognitions about typical member of a group and his/her characteristics and the predictions about his/her behavior [6, p. 172].

The image of a group can be restricted by several kinds of image, such as a gender image, a national image and a professional image. So, a professional image is a representation of stereotypes about people of a certain profession. Like every type of an image it includes three components: internal, external and procedural. An internal component deals with personal characteristics (beliefs that IT-workers are introverts, accountants are orderly). An external components represent stereotypes about a manner of clothing, handwriting and speaking. For example, unreadable handwriting of doctors is one of the common stereotypes, a white collar became a non-official name of office workers, while the phrase “blue collar” means working class. A procedural component includes characteristics of psychological processes (active journalists) [2, p. 19].

A professional image is the factor of finding a professional identity and belonging to a professional community. It concerns the characteristics that are important to the particular profession satisfying to the demands of a society and a work place; an assimilation of professional ethic and rules of behavior. It is a part of professional culture and a component of success because a professional image provides the link between professional knowledge and abilities and a personal development.

Professional image includes such components as:

1. Outward appearance, clothing style, voice and smell;
2. Environment (perception background);
3. Individual psychological characteristics;
4. Features of professional activities;
5. Features of professional communication [1, p. 94].

The creation of a professional image can be considered in two ways. It can be the process of creating stereotype idea about the members of a certain professional group or the process of acquisition of professional skills.

The most effective professional image is considered to be based both on individual characteristics of a personality and psychological attraction for clients. It is important to create an image on the basis of a real personality and values, because non-authentic image can be the reason of personal discomfort and bad social response, as the “mask” [3, p. 55].

There are three main principles of creating an effective image. First of all, it is important to understand personal advantages and disadvantages and how other people perceive the representation of a personality. The second step is to define the optimal image and the ways to reach it. And the third step is to understand that a professional image can be changed and extended in the communication with different people. The manner of speaking can be more or less speedy, full of scientific terms or easy and clear, taking into consideration the age, the characteristics of an educational level, a professional and social status of a client [1, p. 98].

Professor Laura Morgan Roberts suggests that people use social identity-based impression management (SIM) to create a positive professional image. It means presenting an individual meaning of social identity. There are two overarching SIM strategies: “positive distinctiveness” and “social recategorization” [8].

“Positive distinctiveness” means using verbal and non-verbal signals to claim the aspects of a personal identity that are personally and socially valued, in an attempt to create a new, more positive meaning for that identity. Positive distinctiveness usually involves the representation of positive qualities of a personal identity group and incorporate background and identity-related experiences into workplace interactions and innovations.

“Social recategorization” means using verbal and non-verbal signals to suppress the other aspects of a personal identity that are personally and socially devalued with a purpose to distance from negative stereotypes associated with that group. Social recategorization includes a tendency to minimize and avoid the influence of these stereotypes.

A professional image represents some important psychological characteristics by using archetypes. An archetype is a pattern of behavior, speaking and tendency to some thoughts or emotion. The theory of using archetypes in creating an effective image is presented by M.Mark and C.S.Pearson. They described twelve archetypes that can be the basis for a professional image or an image of an organization. These archetypes are Caregiver (to help others), Ruler (to bring the order), Creator (to create new ideas), Innocent (to help being authentic), Explorer (to explore new territories), Sage (to provide wisdom), Everyperson (to provide the sense of community), Lover (to provide beauty and romantic), Jester (to provide fun), Hero (to win), Revolutionary (to build new rules) and Magician (to turn the problems into opportunities) [7].

Each archetype presents different values, patterns and symbols and can be used for a certain profession. Some profession can be expressed by several archetypes, besides some archetypes do not correspond to certain professional groups. Thus, both archetypes of Sage (the target is to provide the wisdom) and Ruler (to bring the order) are good as a base of a professional image of a lawyer, whereas neither Jester (providing fun) nor Lover (providing beauty and romantic) is common to this professional group. However, the archetypes of Lover and Jester are good to such professions as singers, actors or even fashion designers.

All archetypes have their own external markers. Thus, Sage is associated with deep colours and a smart-casual style, Ruler is associated with a classical style and contrasts. Both alternatives are good for a creating a professional image of a lawyer, a journalist, a manager, etc. Caregiver archetype is associated with a casual style, soft materials and warm colors and it is good for creating an image of the head of a charity organization or a primary school teacher.

So, a professional image is a part of such type of image as the image of groups. It is a representation of idea of typical member of a certain professional group. To be effective a professional image has to match social expectations about important characteristics of personality behavior and to express the true personality.

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REFLECTION OF FITZGERALD'S PERSONALITY IN HIS CHARACTERS

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Summary: The article considers Fitzgerald's life, views and ideas parallel to the lives of his characters. Similarity between author's life and heroes of his books, especially with "Great Gatsby", is emphasized. Theme is actual, because Fitzgerald's works may become another source for his biographers' studying.

Keywords: American Dream, characters, Double Vision, F. Scott Fitzgerald, Emotional Bankruptcy.

Анотація: В статті розглядаються життя, погляди і ідеї Фіцджеральда паралельно до життів його героїв, виділяється схожість життя автора з героями його книжок, зокрема з «Великим Гетсбі». Тема є актуальною, адже твори Фіцджеральда можуть стати ще одним джерелом інформації для його біографів.

Ключові слова: американська мрія, герої, емоціональне банкрутство, подвійний погляд, Френсіс Скотт Фіцджеральд.

Аннотация: В статье рассматриваются жизнь, взгляды и идеи Фицджеральда параллельно с жизнями его героев, выделяется схожесть жизни автора с героями его книг, в особенности, с «Великим Гэтсби». Тема является актуальной потому, что сочинения Фицджеральда могут стать еще одним источником информации для его биографов.

Ключевые слова: американская мечта, герои, двойной взгляд, Френсис Скотт Фицджеральд, эмоциональное банкротство.

F. Scott Fitzgerald occupied an outstanding place in the annals of American Literary history in the fiction arena of the twentieth century. The importance of his influence cannot be overestimated. The realistic effort of the late 19th century writers — especially in this case, F. Scott Fitzgerald — who accurately shows life and its problems attempted to give a comprehensive picture of modern life by presenting the entire world picture. He did not try to give one view of life but instead attempted to show the different manners, classes, and stratification of life in America and he created this picture by combining a wide variety of details derived from observation and documentation to approach the norm of his experience. Along with this technique, he compared the objective or absolute existence in America to that of the universal truths, or observed facts of life.

Every biography may have mistakes, not every story is true from the beginning to the end and people tend to invent different crazy legends, where only a little part of words is true. In order to learn the truth, real hopes and dreams of the author, to cognize the real figure of Fitzgerald, we can appeal to his work which became a reflection of his individuality and life.

Many contemporary scientists like Judith S. Baughman, Mathew J. Briccoli, a known Fitzgerald's biographer, Gertrude Stein, a well-known author, Fitzgerald's friend and the editor of his texts, and many others focused their attention on the problem of his rise as an author. "The Far Side Paradise", a biography by Arthur Mizener was the first biography of Fitzgerald to be published and ascribed with renewing public interest in the subject.

But there is a gap of the necessity to analyze the sources relevant to the problem of reflection of Fitzgerald's personality in his works, in his characters, especially in Nick Carraway and Jay Gatsby in his novel "Great Gatsby".

Fitzgerald used his characters to convey his personal vision of the world. In his five novels and 160 stories, he portrayed a wide range of characters. Though he may be most closely identified with his debutantes,

college boys, and ambitious young men seeking the fulfillments promised by wealth, social standing, and personal happiness, he also provided memorable portraits of other kinds of people. Because they are drawn from his own experience, many of Fitzgerald's characters manifest recognizably Fitzgeraldian qualities. His men often combine ambition for early success with the desire for romantic love and the achievement of an ideal life. They often lack the hardness to fulfill their dreams. Certain of Fitzgerald's male characters are actually weak, but the majority of the men portrayed by Fitzgerald fail because the objects of their pursuit do not and cannot measure up to the men's conceptions of them. Because the quests of Fitzgerald's best male characters are usually played out in the real world, their objects, their dreams are assailed by inevitable change and loss, so that youthful beauty fades; innocence hardens into cynicism; and aspiration fades when tested against harsh experience.

For example, in *Great Gatsby* the dominant strain of cultural discourse, which focused on the applicability of Friedrich Nietzsche's philosophies of modern civilization and the modern individual to American interests and concerns is reflected. Like the existentialists, Fitzgerald recognizes the inadequacy of American democracy in an increasingly commercial and consumer culture and rejects the capitalistic values, identities and norms prescribed by and reinforced through the increasingly oppressive social and political structures of American culture. For Fitzgerald, what the individual, the inventive spirit, and the life of the nation are at stake and it echoes all the way through his early works, a sentiment manifest in their portraits of incapable, lost, aimless, and emotionally unfulfilled characters. Extensively, he expatriated himself since he felt America no longer provided an environment for the real growth of the individual or for the cultivation of the resourceful spirit, something particularly in Europe, and Paris, not only offered, but encouraged and held in high esteem. Indeed he presents his readers with art of living for his time, for his readers' personal, unquestionably biased lives.

The personality of Fitzgerald is reflected in Nick Carraway, the storyteller in "*Great Gatsby*", who lived internally fighting to resolve inner conflicts with surroundings. Both were watchers of life who, at once, aspired to reach great heights but also were hesitant to take the falls of the morally dishonest examples that they witnessed. Jay Gatsby also reflects the personal experiences of writer. Gatsby and Fitzgerald were romantics who embarked on love affairs during military service, made new money early in life and hosted wild parties to impress the women they loved. Gatsby and Fitzgerald succumbed to the decadent lifestyle, eventually losing themselves in the affection they had for their lovers, Daisy Buchanan and Zelda Sayre, respectively. Gatsby lived externally, struggling to draw joy from things outside himself, such as the physical representations of his materialism and the people who are drawn to him for his riches. Gatsby's home symbolizes his dream-come-true and his sense of the self as a member of high society.

Mizener argues that, Scott and Zelda Fitzgerald played their parts as the prince and princess of the confident and eager kingdom of the youth [6; p.137]. Recounting stories of Fitzgerald's drunken displays of mischief and near-misses with the law, Mizener adds, that there were great many parties in New York; Fitzgerald as usual provided a good deal of the fun and some of the serious trouble. Women like Fitzgerald's female characters scarcely existed in American fiction before 1920. The best of his heroines are brave, determined, beautiful or attractive, intelligent (but not educated), and chaste. These young women, many of them still in their teens, also understand that their lives depend upon the marital choices they make. Fitzgerald clearly admired attractive, independent, unconventional women, but he also tended to treat his most fully developed women characters rather critically. Many of his most complex female characters are incapable of sharing the lofty dreams and aspirations of the men who love them.

Fitzgerald was not a purely objective reporter or chronicler of the Jazz Age and the 1930s but instead brought a strong moral perspective to his work. His central characters undergo processes of self-assessment (Amory Blaine from "*This Side of Paradise*", for example), or they judge others (Nick Carraway from "*Great Gatsby*"), or they are judged by Fitzgerald himself, who constantly measured the behavior of characters against implicit standards of responsibility, honor, and courage. One of this writer's main methods was his adaption of a standpoint that the critique Malcolm Cowley labeled *Double Vision*, the discernment of events both as an outsider and as an insider. One of the paramount and mainly recognizable embodiments of double vision in Fitzgerald's work is the narrator of *Great Gatsby*, Nick Carraway who both takes part in and explains the action of the novel. In the second chapter Nick describes himself as "entangled" in as well as a "watcher" over the events and his position as both an insider and outsider remains intact throughout the novel.

For many of the young expatriate writers, the American Dream, i.e. the belief that aspiration could be fulfilled through imagination and hard work, seemed dead or at least terribly corrupted. They thus moved to Europe, which appeared to offer a freer, more stimulating, and perhaps less hypocritical environment. Although Fitzgerald lived abroad for nearly six years and was one of the major American writers to emerge during 1920s, he did not share the disillusionment with or contempt for their country of certain expatriate Americans.

In addition to the comparisons that can be drawn between Fitzgerald and the narrator and title character of *Great Gatsby*, the depiction of the upper-class life in the 1920s is illuminated by the author's own experience, as well. In *The Far Side of Paradise: A Biography of F. Scott Fitzgerald*, Arthur Mizener suggests that Fitzgerald's work connected him in many people's minds with 'the Jazz Age,' so that he was for them both the historian of the post-war generation.

The *Great Gatsby* is a novel about ambition and excess, reflecting Fitzgerald's fascination with the reckless abandon of the Jazz Age. Post-war blues were drowned in the alcohol that Constitutional Prohibition could not stop. Achievement and success fed relaxed morals, earning people the money they needed to set aside their stuffy standards and buy a rollicking good time. More than any other author of his era, with the probable exception of Theodore Dreiser, Fitzgerald was conscious of the influence of money on American life and character. As he wrote solemnly about money, ambition, and love, which were generally undividable in his work, he has been labeled a materialist by his critics. He has been considered as an uncritical venerator of the wealthy, a view disseminated by Ernest Hemingway at 1936. It will be of conspicuous importance to see what was in money that a resourceful man of Fitzgerald's personality and mentality was so earnestly after. Money therefore had its obligation. As once Fitzgerald told Hemingway in his 16 July, 1936 reply to *The Snows of Kilimanjaro*: "Riches have never fascinated me unless combined with the greatest charm or distinction [5; p. 302].

In the preface to *The Great Gatsby*, the University of South Carolina's Mathew J. Bruccoli notes, that the novel is appropriately set in the get-rich-quick decade that brought about the organization of crime as a concomitant of Prohibition, hence, *Gatsby's* involvement in bootlegging and stolen securities.

The sad lesson of the lives of the author and the character he created is that the need to dream dies when overindulgence overtakes a person and he receives everything he desires. Life was not perfect for Fitzgerald after he had achieved his dream of a newly successful career and marriage. Mizener wrote that for a moment the delights of anticipation remained a part of the achievement. At the same time Fitzgerald knew that fulfillment destroys the dream [6, p. 272].

Ironically, *Gatsby* and Fitzgerald both led farfetched lives that ended in tragic deaths. When Fitzgerald's writing career began to flourish, he began showing off his money in seemingly tasteless ways. Eventually, as Mizener wrote, Fitzgerald saw his own rise from poverty to affluence as an illustration of the terrible, meaningless power of money [6; p. 273]. Fitzgerald had his own longings for the past. Focused on their happier days together, Fitzgerald struggled with the hope that Zelda would recover from her mental illness.

Life mirroring fiction, Fitzgerald and his wife lived like the characters in his stories who had set out to fulfill their vision of the good life, Mizener says, a life essentially passive and dependent on outside stimuli, a confused and pathetic vision of beautiful, 'civilized' places, 'interesting,' well-to-do people. They ended in emotional bankruptcy. Depression strikes when the money runs out, and the friends with it. Financial difficulties led Fitzgerald "to think of vitality as if it were a fixed sum, like money in the bank. Against this account you drew until, piece by piece, the sum was spent and you found yourself emotionally bankrupt" [6, p. 273]. In many of his works, Fitzgerald linked money to vitality. "Somewhere very deep in his imagination that complicated tangle of feelings he had about the rich interlocked with his feelings about the delight of vitality and the horror of its exhaustion" [6, p. 275]. Though he wrote about the lives of the rich, it was a life Fitzgerald could not live, and financial straits led his wife Zelda to a sanitarium and led Fitzgerald to drink. This process of deterioration coincides with the deterioration of the overindulgence that marked the Jazz Age of the 1920s into the destitution of the Depression Era of the 1930s.

During the 1930s he confided in his notebooks, that he asked a lot of his emotions - one hundred and twenty stories, the price was high, right up with Kipling, because there was one little drop of something not blood, not a tear, not my seed, but me more intimately than these, in every story, it was the extra he had. Now it is gone and I am just like you now"[10, p.92]. In *The Crack-Up* he described his sense of Emotional Bankruptcy through financial metaphors, declaring that like a man over-drawing at his bank, he felt a vast irresponsibility toward every obligation, a deflation of all my values. In his statement he suggested that both he and his countrymen, engaged in quests for the quintessential American Dream of success, wealth, and happiness, must almost inevitably exhaust their energies and resources.

Arthur James Thurber recognized an effect of this mastery when he wrote in 1942, that Fitzgerald's perfection of style and form, as in *Great Gatsby*, has a way of making something that lies between your stomach and your heart quiver a little [9, p. 380-382]. Gertrude Stein declared in 1933 that Fitzgerald was the only one of the younger writers who wrote naturally in sentences [7, p. 268]. It is Fitzgerald's major gift that he can draw the reader into a mesh of emotional connection to a character while concomitantly permitting him to scrutinize the complexity of the mesh. That is what Fitzgerald's double vision at its best is eventually about.

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ECCLESIASTICAL AND RELIGIOUS ACTIVITY OF METROPOLITAN ANDREI SHEPTICKIY

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Summary: The article concerns the analysis of the church and religious activities of the metropolitan of greek and catholic church Andrey Sheptytsky. The conclusion is made that the basic stages of cultural and educational work of metropolitan Sheptytsky are aimed at supporting cultural heritage of Ukraine, metropolitan's patronage activity is directed at supporting of national culture, education and art.

Key words: activity, cultural and religious activity, metropolitan, Ukrainian Greek and Catholic Church.

Анотація: У статті проведено аналіз церковно-релігійної діяльності митрополита греко-католицької церкви Андрея Шептицького. Зроблено висновок, що основні етапи культурної й просвітницької роботи митрополита Шептицького спрямованні на підтримку культурної спадщини України, меценатська діяльність митрополита спрямована на підтримку національної культури, освіти та мистецтва.

Ключові слова: діяльність, культурна та релігійна діяльність, митрополит, українська греко-католицька церква.

Аннотация: В статье проведен анализ церковно-религиозной деятельности митрополита греко-католической церкви Андрея Шептицкого. Сделан вывод, что основные этапы культурной и просветительской работы митрополита Шептицкого направлены на поддержание культурного наследия Украины, меценатская деятельность митрополита направлена на поддержку национальной культуры, образования и искусства.

Ключевые слова: деятельность, культурная и религиозная деятельность, митрополит, украинская греко-католическая церковь.

Metropolitan Andrei Sheptickiy is one of the most famous personalities in the history of Ukraine who contributed to the revival of Ukrainian people. Andrei Sheptickiy devoted himself mainly to ecclesiastical and religious activity, having not forgotten about national and cultural life. Metropolitan's patronage activity was directed at supporting of national culture, education and art of that times.

Numerous scientific works are dedicated to the study of life and activity of Andrei Sheptickiy. Nowadays metropolitan's patronage activity remains to be scantily explored. Certain aspects of patronage activity were considered by V. Laba [7, p. 62], L. Tzegelsky [10, p. 77], A. Kravchenuk [6, p. 62] and P. Kost [5, p. 158]. But the main work regarding this problem has not been created yet, that is why the attempt of considering it is fairly actual.

The main source of studying vectors of metropolitan's activity is his own «Pastor's epistle». The publishing of Andrei Sheptickiy's epistles in Ukraine is a significant event in studying the religious ideas in Ukraine of the XX century. And practically they are the continuation of source publications, dedicated to the life and activity of the leader of the Ukrainian Greek Catholic Church, which commenced in the middle of 90s. The soviet period led to an oblivion of metropolitan's works in Ukraine for several decades, and his teaching and activity were presented in a fabricated manner.

The first attempt of publishing metropolitan's «Pastor's epistle» was implemented in 1935, before his death. The publication included pastor's epistles from 1899 till 1901. The attempt of republishing «Pastor's epistle» was implemented abroad – in Toronto in 1965. Practically, the publication included epistles from 1899 till 1902. In the preface of the book the Chair of Postulatory Commission on Sanctum proceedings, a bishop Michial Hrinchishin wrote: «... there are more unpromulgated compositions of Metropolitan and documents, which we are not aware of. We know about others, but do not possess».

On the whole, the metropolitan wrote about his mission in this World: «I would like to wipe the tears away from those eyes crying, to make happy everyone who is in sorrow, to heal everyone who is ill, to enlighten everyone who is ignorant. And I would like to become everything for everybody to save everyone...» [2, p. 18].

Andrei Sheptickiy had been a Stanislav bishop for a year before he took the metropolitan throne. He was not orientated in social life and co-operated with Western Ukrainian Russophiles, who made the majority among the priesthood of Stanislav diocese. However, metropolitan Andrei established close relationships with the community «Prosvita». The Scientific community was named after Shevchenko and other cultural, educational and political figures of the Ukrainian national life in Galicia. Sheptickiy received vast popularity among opponents. This significantly improved his authority and impulsed the expansion of the movement direction.

However, mainly metropolitan Andrei was interested in the cultural development of Ukrainians, donating exorbitant funds for the youth upbringing, owing to this fact the model bursas of the Ukrainian pedagogical community and ladies' gymnasium worked in Lviv. Metropolitan made an immense step towards young people, who could discover their potential in Ukraine. As Sheptickiy was an expert and patron of art he allotted huge funds for acquiring qualitative European education by young theologians and artists. The range of Ukrainian painters like A. Novakovsky, M. Ctasuk, M. Sosenko, L. Parashuk and others found ample support of metropolitan. They assigned financial scholarships, purchased their works of art, provided free premises for art studios and sent them abroad for studying.

The pinnacle of cultural and educational activity of metropolitan was the foundation and material supply of «National museum» in Lviv [7, p. 62]. It consisted of his own collection. For instance, in 1931 he gifted 9880 various exhibits to the museum. There are manuscripts of XVth - XVIIIth centuries, Black-letter books, archival materials of XVIth - XVIIIth centuries, icons, works of painting and graphics, Roman and Byzantine coins, etc [3, p. 145-147].

The further step of Andrei Sheptickiy in the sphere of preservation and studying cultural legacy was the organization of a group of qualified people in 1920th, which searched and copied documents for printing them from the past of the nation, ecclesiastical life, etc. The other group copied archival documents in Vienna [1, p. 179].

With the patronage assistance of Andrei Sheptickiy the significant contribution to the preservation of memorials of history and culture was made by Lviv theologian academy, opened on the 6th of October, 1929 on the base of the former Lviv theological seminary. The rector of the academy Yosif Slepoy with blessing from metropolitan founded a museum. It was situated in five halls, and the famous researcher of church, architecture Mihail Dragan became its head [9, p. 120-125].

The activity of metropolitan Andrei directed at spiritual and material development of Ukrainians had lasted till 1929. At that time the Ukrainian Greek Catholic Church in Galicia and Zakarpat'ye numbered at 4370000 adherents. Besides the Theological academy, five theological seminaries and two seminary schools worked. Religious journals were released weekly and monthly [4, p. 53].

At the beginning of September in 1939 Ukrainian Galician archdiocese was occupied by Red Army. The Theological seminary and all religious schools were closed immediately, and the publishing of religious books and journals was ceased. Teaching religion at schools was prohibited, and all religious communities stopped its existence for certain time [11, p. 265-270].

At the beginning of 1930s and after 1940s mass arrests of intelligence, priesthood and adherents of Ukrainian Greek Catholic Church began. But on the 1-st of November, 1944 Andrei Sheptickiy joined the angels. At the funeral a lot of delegates of different confessions, peasants and labors who came to take metropolitan's leave were presented [8, p. 436].

Thus, patronage activity of metropolitan Andrei Sheptickiy is a role-model of serving for native nation and land. However, all aspects are not properly explored at present time. Along with ambiguous estimation of Andrei Sheptickiy's political activity it is necessary to point out that charitable efforts on Ukrainian cultural legacy preservation deserve the deepest respect, and ought to become the subject of research subsequently.

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TEXT – UND STILUNTERSUCHUNG DES ARTIKELS „DER MENSCH“

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Zusammenfassung: Dieser Artikel konzentriert sich auf die stilistische Analyse des Textes von Kurt Tucholsky "Der Mensch". Der Text wird aus der Sicht der unterschiedlichen Aspekte betrachtet - lexikalische, grammatikalische und stilistische. Im Text sind verschiedene Arten von Verhältnissen festgestellt - attributive, lokale, modale ... Im Text ist auch Niveau der Autobiographie des Textes festgestellt und eigene Meinung geäußert, mit welchen Zweck Kurt Tucholsky diesen Artikel geschrieben hat.

Stichwörter: Arten von Verhältnissen im Text, Metapher, Stiel, Stieluntersuchung.

Анотація: Дана стаття присвячена стилістичному аналізу тексту Курта Тухольського «Людина». Текст розглянуто з точки зору різних аспектів – лексичного, граматичного та саме стилістичного. Встановлені види відносин у тексті – означальні, локальні, модальні...Виявлено рівень автобіографічності тексту та виражена власна думка щодо мети написання Куртом Тухольським даної статті.

Ключові слова: види відносин в тексті, метафора, стилістичний аналіз, стиль.

Аннотация: Данная статья посвящена стилистическому анализу текста Курта Тухольского «Человек». Текст рассмотрен с точки зрения разных аспектов – лексического, грамматического и конкретно стилистического. Установлены виды отношений в тексте – определительные, локальные, модальные... Установлен уровень автобиографичности текста, а также высказано собственное мнение насчет цели написания Куртом Тухольским данной статьи.

Ключевые слова: виды отношений в тексте, метафора, стилистический анализ, стиль.

Text – und Stiluntersuchung des Artikels „der Mensch“

Der Artikel heißt „der Mensch“ und ist im Jahre 1931 veröffentlicht. Geschrieben war er viel früher von Kurt Tucholsky ungefähr 1901, als er die 6. Klasse besuchte und 11 Jahre alt war. Davon zeugt der letzte Abschnitt im Artikel: „Neben den Menschen gibt es noch Sachsen und Amerikaner, aber die haben wir noch nicht gehabt und bekommen Zoologie erst in der nächsten Klasse“

. Zoologie haben gewöhnlich Schüler in der 7. Klasse.

Wahrscheinlich hat kleiner Kurt Tucholsky Aussagen seiner Eltern entlehnt. Der Text selbst ist eine Mischung der Gedanken von Kurt, seinen Eltern, Lehrern, weil viele Abschnitte nicht beendet sind, und viele Wörter zueinander nicht passen. Aber andererseits kann sein, dass der Junge absichtlich das gemacht hat, um die Unverständlichkeit der Natur von Menschen hervorzuheben. Was die Struktur des Textes betrifft, ähnelt er einem Buch, das mit den Definitionen überfüllt ist. Als ich zum ersten Mal den Artikel gelesen habe, erinnerte ich mich sofort an ein russisches Märchen „Kolobok“, das auch wie unser Text 3 Phasen trägt – Geburt, Leben und Tod.

Das Ziel des Artikels ist einfach solche Abart wie „der Mensch“ zu kritisieren. Der Autor drückt seine kritische Meinung über die Schwachpunkte der gesamten Menschheit, indem er immer nur von Menschen spricht. Er adressiert seinen Artikel an alle Menschen; sowohl an solche, die sich selbst kritisch betrachten können, als auch an solche, die nicht können, um die Letzten zu irgendwelchen Gedanken zu erregen.

Was Topik-Analyse angeht, spricht Kurt Tucholsky immer wieder nur um den Menschen: der Mensch – ein Wirbeltier – ein nützliches Wesen – ein Wesen, das nicht zuhört – er – ein pflanzen- und fleischfressendes Wesen – politisches Geschöpf.

Weil der Text zum Stiel der Rede und Publizistik gehört, ist für ihn verschiedene nationalsprachliche Existenzformen charakteristisch [1]. Den Menschen gegenüber sind folgende Wörter umgangssprachlich gebraucht: Wesen, fressen, Lebenswesen [5]. Nach dem Stilschichtmodell sind folgende Wörter gehoben gebraucht: anfachen, saure Trauben der Welt, die innere Einkehr, Geschöpf [5]. Solche Wörter, die sowohl gehoben als auch umgangssprachlich gebraucht werden, benutzt Kurt Tucholsky um die Bedeutung des Begriffs „Mensch“ zu abzusenken.

Arten von Verhältnissen

Der Artikel ist reich an Arten von Verhältnissen, um das Bild vollständiger darzustellen, und die persönliche Neigung von Kurt Tucholsky wiederzugeben. In dieser Arbeit schreibe ich über folgende Verhältnisse: kausal-konsekutive, alternative, attributive zusammen mit bewertenden, konditionale, temporale, lokale, modale [4, s. 253].

Ich würde sagen, dass alle Arten von Verhältnissen sind zusammengebunden oder folgen einander.

Vergleichen: „Menschen miteinander gibt es nicht. Es gibt nur Menschen, die herrschen, und solche, die beherrscht werden. Doch hat noch niemand sich selber beherrscht; weil der opponierende Sklave immer mächtiger ist als der regierungssüchtige Herr“.

„Menschen miteinander gibt es nicht. Es gibt nur Menschen, die herrschen, und solche, die beherrscht werden“. Wenn dieser Satz allein betrachtet wird, dann sind für ihn sowohl attributive als auch alternative Verhältnisse charakteristisch; wenn zusammen mit zweitem Satz „Doch hat noch niemand sich selber beherrscht“ [6] – alternative. Und im Satz „Doch hat noch niemand sich selber beherrscht; weil der opponierende Sklave immer mächtiger ist als der regierungssüchtige Herr“ herrschen kausal-konsekutive Verhältnisse.

Kurt Tucholsky spielt mit dem Text und benutzt dabei verschiedene Arten der Verhältnisse.

Zuerst möchte ich über attributive oder bewertende Verhältnisse sprechen, weil sie Hintergrund und Grundlage des Artikels sind, aus denen kann man weitere Verhältnisse bestimmen. In dem ganzen Artikel bewertet und definiert der Autor den Begriff „Mensch“ und macht uns bekannt auf solche Weise mit solcher biologischen Art. Als Nachweise können folgende Definitionen sein:

„Man könnte den Menschen geradezu als ein Wesen definieren, das nie zuhört“. „In einen männlichen, der nicht denken will, und in einen weiblichen, der nicht denken kann“. „Der Mensch ist ein politisches Geschöpf, das am liebsten zu Klumpen geballt sein Leben verbringt“. „Im Übrigen ist der Mensch ein Lebewesen, das klopft, schlechte Musik macht und seinen Hund bellen lässt“.

Nach der Zahl gewinnen kausal-konsekutive und alternative Verhältnisse. In dem Artikel Kurt Tucholsky drückt seine kritische Meinung über die Schwachpunkte der gesamten Menschheit, indem er immer nur von Menschen spricht. Er entgegensetzt immer wieder einen Menschen dem anderen, ein Geschehen dem anderen, um seine kritische Stellung zu zeigen, und benutzt dazu alternative Verhältnisse:

„Der Mensch wird auf natürlichem Wege hergestellt, doch empfindet er dies als unnatürlich und spricht nicht gern davon.“ „Er wird gemacht, hingegen nicht gefragt, ob er auch gemacht werden wolle“. „Bei Schmeicheleien empfiehlt es sich, immer drei Nummern gröber zu verfahren als man es grade noch für möglich hält“. „Der Mensch zerfällt in zwei Teile: In einen männlichen, der nicht denken will, und in einen weiblichen, der nicht denken kann“. „Auf Nordpolfahrten frisst er hier und da auch Exemplare seiner eigenen Gattung; doch wird das durch den Faschismus wieder ausgeglichen“. „Es gibt nur Menschen, die herrschen, und solche, die beherrscht werden. „Die verschiedenen Altersstufen des Menschen halten einander für verschiedene Rassen: Alte haben gewöhnlich vergessen, dass sie jung gewesen sind, oder sie vergessen, dass sie alt sind, und Junge begreifen nie, dass sie alt werden können“.

Kausal-konsekutive Verhältnisse sind nicht gleichmäßig im Text dargestellt. Sie befinden sich vorzugsweise im ersten und zweiten Abschnitt. Als Nachweise dienen folgende Sätze:

„Der Mensch ist ein Wirbeltier und hat eine unsterbliche Seele, sowie auch ein Vaterland, damit er nicht zu übermütig wird“. „Der Mensch ist ein nützliches Lebewesen, weil er dazu dient, durch den Soldatentod Petroleumaktien in die Höhe zu treiben, durch den Bergmannstod den Profit der Grubenherren zu erhöhen, sowie auch Kultur, Kunst und Wissenschaft“. „Der Mensch gönnt seiner Gattung nichts, daher hat er die Gesetze erfunden. Er darf nicht, also sollen die andern auch nicht“. „Um sich auf einen Menschen zu verlassen, tut man gut, sich auf ihn zu setzen“. „Jeder Klumpen haßt die andern Klumpen, weil sie die andern sind, und haßt die eignen, weil sie die eignen sind“. „Doch hat noch niemand sich selber beherrscht; weil der opponierende Sklave immer mächtiger ist als der regierungssüchtige Herr“. „Der Mensch möchte nicht gern sterben, weil er nicht weiß, was dann kommt“. „Bildet er sich ein, es zu wissen, dann möchte er es auch nicht

gern; weil er das Alte noch ein wenig mitmachen will“. Ich meine, dass der Text solche Verhältnisse braucht, um uns zu lassen, besser in den Lebenslauf des Menschen zu vertiefen. Sowohl jedes Geschehen als auch das Leben des Menschen hat Gründe und Folge.

Es soll auch darauf hingewiesen werden, dass die Folge in meisten Fällen vor der Ursache steht. Das deutet darauf, dass die endgültige Beurteilung des Menschen für den Autor wichtiger ist, als die Ursachen, die dazu geführt haben.

Es gibt nicht so viele konditionale, lokale, temporale und modale Verhältnisse im Artikel. Beispiele dazu:

konditionale: „Wenn der Mensch fühlt, dass er nicht mehr hinten hoch kann, wird er fromm und weise; er verzichtet dann auf die sauern Trauben der Welt“. „Bildet er sich ein, es zu wissen, dann möchte er es auch nicht gern“. „Der Mensch hat zwei Beine und zwei Überzeugungen: eine, wenns ihm gut geht, und eine, wenns ihm schlecht geht“. „Wenn er weise ist, tut er damit recht“;

lokale: „Auf Nordpolfahrten frißt er hier und da auch Exemplare seiner eigenen Gattung“;

temporale: „Man ist dann wenigstens für diese Zeit sicher, dass er nicht davonläuft“. „Manchmal“. „Nie“. „In der nächsten Klasse“;

modale: „Beide haben sogenannte Gefühle: man ruft diese am sichersten dadurch hervor, dass man gewisse Nervenpunkte des Organismus in Funktion setzt“.

Lexikalische Charakteristika

Die Lexik dieses Textes kann unter mehreren Aspekten betrachtet werden:

1. Unter dem Aspekt der Neuheit (und wir sollen damit rechnen, dass der Artikel im 1901 Jahre geschrieben war) bestimme ich Neologismen: opportunierend (Dieses Wort stand 1905 erstmals im Rechtschreibduden.) und Komplimente (war im 20 Jh. Aus französischer Sprache entlehnt) [5].
2. Unter dem Aspekt des nicht mehr Aktuellen dient folgender Nachweis für Archaismen: Treib [5].
3. Unter fachsprachlichem Aspekt:

Fachwörter – im Bereich der Biologie: Wirbeltier, Fortpflanzung, Gattung, pflanzen- und fleischfressendes Wesen, Leber, Milz, Lunge; im Bereich der Wirtschaft: Petroleumaktien, Profit; Bereich der Politik: Fahne, Vaterland, Patriotismus, politisches Geschöpf.

Grammatische Charakteristika

Unter dem Aspekt der morphologischen Spezifik benutzt Rosemarie Noack 1 Zeitstufe, um seine Kritik darzustellen – Präsens.

Unter dem Aspekt der Satzart kann man nur den Aussagesatz unterstreichen.

Nach dem Aspekt der Satzform ist die Zahl der einfachen und komplexen Sätze sehr unterschieden. Der Text beträgt 38 Sätze, darunter 11 – einfache Sätze und 27 – komplexe. Vorzugsweise dominieren Attributsätze und Sätze der Ursache und Folge. Attributsätze stehen nach der Zahl in der ersten Stelle, weil der Text mit den Definitionen überfüllt ist [4].

Stilistische Charakteristika

Die Sprache von Kurt Tucholsky ist sehr reich an stilistischen Mitteln. Das erste, was mir einfällt, ist die Anapher [2, s. 83]. Der Autor benutzt das Wort Mensch 26 Mal und beginnt jeden Abschnitt mit diesem Wort, außer des letzten Abschnitts: „Neben den Menschen“. Auf solche Weise lockt Kurt Tucholsky die Aufmerksamkeit der Leser und erinnert, dass sich alles in diesem Text um den Menschen dreht. Und noch ein Nachweis für die Anapher und gleichzeitig die Epipher: „eine, wenns ihm gut geht, und eine, wenns ihm schlecht geht“. Der Autor benutzt die Emphase 6 Mal, um wieder unsere Aufmerksamkeit anzulocken: Die letztere heißt Religion; In diesen Fällen sondern manche Menschen Lyrik ab; Den letzteren Haß nennt man Patriotismus; Doch hat noch niemand sich selber beherrscht; Dieses nennt man innere Einkehr; Neben den Menschen gibt es noch Sachsen und Amerikaner. Ich persönlich lese lieber den Text, in dem zweitrangige Satzteile in der ersten Position stehen.

Sehr große Rolle spielen in diesem Text Figuren der Häufung und nämlich Monosyndeton [3, s. 185]: Kultur, Kunst und Wissenschaft; Versprechungen, Schmeicheleien, Anerkennungen und Komplimente; eine Leber, eine Milz, eine Lunge und eine Fahne; den Stierkampf, das Verbrechen, den Sport und die Gerichtspflege.

Zu den Zeugmen gehören folgende Nachweise: der Mensch hat zwei Beine und zwei Überzeugungen; der Mensch ist ein Wirbeltier und hat eine unsterbliche Seele, sowie auch ein Vaterland. Diese Zeugmen bestätigen die Tatsache, das Kind diesen Text als eine Mischung von Gedanken der Anderen geschrieben hat.

Die Ironie ist charakteristisch für den ganzen Text, weil Kurt Tucholsky immer wieder den Menschen betrachtet. EinpaarNachweisedazu.

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УДК 343.25

THE QUESTION OF THE DEATH PENALTY

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Summary: The article deals with the question of the death penalty as the cruelest punishment. The results of the study are as follows: the question of death penalty is of international significance and its essence cannot be considered by some groups of people; statistics on the number of the death penalty in different countries is analyzed and the main advantages and disadvantages of the death penalty in the world in general and especially in Ukraine are identified.

Key words: advantages and disadvantages of the death penalty, death penalty, the cruelest punishment.

Анотація: Стаття присвячена розгляду питання смертної кари як найжорстокішого покарання. У результаті дослідження було виявлено, що питання смертної кари має міжнародне значення і його суть не може розглядатися лише якоюсь групою людей; проаналізовані статистичні дані про кількість смертних покарань у світі; виявлено основні переваги та недоліки смертної кари в світі в цілому, і особливо в Україні.

Ключові слова: найжорстокіше покарання, переваги та недоліки смертної кари, смертна кара.

Аннотация: Статья посвящена рассмотрению вопроса смертной казни как жесточайшего наказания. В результате исследования было выявлено, что вопрос смертной казни имеет международное значение, и его суть не может рассматриваться только какой-то группой людей; проанализированы статистические данные о количестве смертных наказаний в мире; выявлены основные преимущества и недостатки смертной казни в мире в целом, и особенно в Украине.

Ключевые слова: жесточайшее наказание, преимущества и недостатки смертной казни, смертная казнь.

The death penalty as the capital punishment caused and causes vehement debates. Arguments "for" and "against" the death penalty can be found in religious texts ("an eye for an eye", "don't kill"). The death penalty is a form of punishment that involves executing a person after he or she has been found guilty of a crime by his or her legal system. This may be done as an act of retribution, to ensure that the individual cannot commit future crimes, and/or as a deterrent for potential criminals. Most countries have used this form of punishment at some point in modern times for different crimes, putting people to death in a variety of ways that have evolved with society.

In Ukraine the death penalty was allowed for 15 years. Nevertheless, the idea to return the death penalty does not leave the minds of our politicians.

What do people think about the death penalty?

It is well-known, that one of the forms of people's will expression is a poll. Concerning the death penalty a set of them has been carried out in Ukraine for the last decades. With some insignificant fluctuations, all such interrogations testify that three quarters, that is an overwhelming majority of the population of our state, support the death penalty as a punishment under the conditions of almost continuous criminalization of the society.

People think that it has not yet managed to create a justice system that works without errors. And this, in the presence of the death penalty, means that any justice system may execute innocent people. For example, in 1949 Timothy Evans was hanged for the murder of his pregnant wife and a year-old daughter. Only four years later, a serial killer John Christie, who last testified in court against Evans, confessed to the murder. He was hanged, and Timothy Evans was posthumously rehabilitated. The case of Timothy Evans is one of the brightest stories in the debate about the death penalty.

Errors in capital cases are relatively common: according to the research conducted in 1987 among the death sentences in the United States, 349 were false, with 23 of them having been enforced [1].

Why do people want to bring back the death penalty in Ukraine?

Firstly, it is softness of life imprisonment. Many opponents of the death penalty convince opponents that the life sentence is a tougher punishment. However, supporters of the death penalty give proof that life imprisonment is a milder fate for murderers, and criminals are afraid of the death penalty most of all.

Secondly, it is a danger of life imprisonment. Any imprisonment, including life imprisonment, does not completely eliminate the threat to public safety. It is generally known that in the world there are a lot of cases when the convicts successfully escaped from prison during their life imprisonment. In most cases, the criminals were caught and returned to jail, but it took much time. During this time the criminal may commit a new crime.

Thirdly, it is retribution. Whether there is a place in a modern society for the old fashioned principle of "an eye for an eye" is a matter of personal opinion. Retribution is seen by many as a reason for favoring the death penalty. It is also felt by many families of murder victims to be a strong reason for witnessing the execution of their loved one's murderer, in states that allow this, as it provides closure for them.

Fourthly, it is the terrorist threat. It is considered that the death penalty does not have an effect on the religious terrorists as suicide bombers are not afraid of death and they are always ready to take their own lives for a place in heaven. Therefore, in this case the death penalty is not effective. But the writer and well-known defender of the death penalty Michael Weller pointed to another factor in the usefulness of the death penalty in the fight against terrorism. The fact is that in the world there were a lot of seizures of hostages by terrorists, where the requirement in exchange for the release of the captured was the discharge of the other imprisoned terrorists. These incidents were ended a Special Forces assaults or the policy made concessions to terrorists, and the criminals were free [2].

Fifthly, it is the economic injustice of imprisonment. Any kind of imprisonment (including life imprisonment) is paid by the state, namely by the tax of law-abiding citizens. It means that the relatives of the victims also pay taxes, and therefore they pay for killers' life of their relatives. In most states, life prisoners do not work. Under the terms of international agreements the prisons must be well equipped. Life prisoners have comfortable toilets, have three meals a day, listen to the radio, read books and newspapers, and sometimes they watch TV. Although money is not an inexhaustible commodity and the state may very well better spend the tax dollars on the old, the young and the sick rather than the long term imprisonment of murderers, rapists etc. It was estimated that in Ukraine the government spend much more money per month for the maintenance of one prisoner than for the salary of school teachers.

Capital punishment is hardly an adequate method of crime prevention. Statistics fail to show an increase in crime in countries where death penalty is abolished. Furthermore, if the society wanted to deter would-be murderers by the possibility of the death penalty, it would reintroduce public executions, simultaneously running the risk of severely damaging the people's morale. The death penalty itself is a premeditated murder, aggravated by months of suffering and horror. Ukraine occupies the (dis)honorary 5th place in the world death-penalty rating after China, Iraq, Iran and Nigeria. Among the CIS states, it is the most severe to its criminals. Statistically, Ukraine is also the most 'quiet' among the former republics. Although crime rate in Russia is some 300% higher than in Ukraine, only about two dozens of death sentences were passed in Russia in 1995. Criticism of 'the state that kills' by human rights activists causes vigorous objections of the officials. Olexandr Panevin, the head of the department of court statistics and analysis of Ukraine's Supreme Court stated that of those sentenced to death in 1995 more than a half had committed crimes before and 18 persons had been convicted three or more times. In 32 cases murderers took lives of two or more people. The number of those sentenced to death totals 103. 34 criminals were convicted for murders during gang assaults. Every fourth of the convicts had committed 'especially cruel' murders before. Every sixth of them committed a murder trying to cover another crime. Every tenth raped and murdered his minor victim. The majority of cases are group murders, premeditated or 'ordered' murders committed by organized criminal groups [3, c. 150].

The death penalty is the cruelest punishment, which can be used in a number of cases in some countries. Some people support such kind of punishment and think that only such severe actions can keep the society in safety and provide security. People believe that seeing the inevitable punishment, the other people would be afraid to commit crimes. It's only one point of view, there is another one that is absolutely opposite, and, to my mind, it's more suitable for the civilized society with principles of humanity and tolerance.

The actions of the state are the example of behavior for all the other people. Using the death penalty as a punishment the state pulls down the moral norms. Life is a gift given by God, so only God can take it away. Death doesn't correct the mistake; it can only neutralize the murderer, but soon new criminals appear. The murderer must realize his crime and punishment for it. So, deaths on the way of the mankind to achieve peace and stability are not admissible.

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**ROLE OF FASHION IN THE VALUE SYSTEM OF SOVIET SOCIETY:
BETWEEN MYTH AND REALITY**

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Summary: The article deals with the role of fashion in the value system of Soviet society including the research of archival materials. The contradictions in the relations with the capitalist countries during the *Cold War* in official discourse and reality are analyzed. The conclusion is made that the second half of the twentieth century is characterized by the distribution of samples and values of Western culture, including fashion, which begins to play an important role in the Soviet society.

Key words: consumer society, fashion ideology, Soviet fashion, Soviet society, value system, Western fashion.

Анотація: В статті розглядається роль моди в системі цінностей радянського суспільства з залученням до дослідження архівних матеріалів. Проаналізовані протиріччя у взаємовідносинах з капіталістичними країнами в період *холодної війни* в офіційному дискурсі та реальному житті. Робиться висновок, що друга половина ХХ століття характеризується поширенням зразків і цінностей західної культури, в тому числі і моди, яка починає грати важливу роль в радянському суспільстві.

Ключові слова: західна мода, ідеологія моди, радянська мода, радянське суспільство, система цінностей, суспільство споживання.

Анотация: В статье рассматривается роль моды в системе ценностей советского общества с привлечением к исследованию архивных материалов. Анализируются противоречия во взаимоотношениях с капиталистическими странами в период *холодной войны* в официальном дискурсе и реальной жизни. Делается вывод, что вторая половина ХХ века характеризуется распространением образцов и ценностей западной культуры, в том числе и моды, которая начинает играть важную роль в советском обществе.

Ключевые слова: западная мода, идеология моды, общество потребления, система ценностей, советское общество, советская мода.

After the 20th Communist Party Congress (1956), the spread of samples and values of Western culture among the Soviet people characterized the life in the Soviet Union. This period was full of open, multicultural contacts. There were such events as the International Festival of Youth and Students (1957), the 8th International Fashion Congress in Moscow (1957), the International Fashion Congress (1959), the Moscow Film Festival (1961), etc [4, p. 42; 6, p. 8-18; 11, p. 48; 14, p. 10-14]. These contacts opened the door for cultural and trade exchange not only at the state level, but in the daily life of every person as well.

However, in spite of the cultural contacts established with Western countries, the official ideology, as it had always been before, perceived any Western fashion trends negatively and strongly condemning them in Soviet publications. In the official discourse, Soviet fashion promoted the socialist way of life and communist morality. According to the Soviet researchers, West fashion sought to use its fashion standards to create deceiving pictures of the advantages of capitalist regime. They claimed that the Western propaganda strived to impose petty suburban views and ideas and consumer perception upon people. The pages of magazines and movies were swarming with photos and descriptions of goods and advertisements, which were not only the commercial, but also ideological institute [12, p. 8].

It should be noted that from the very beginning the concept of *Soviet fashion* in public discourse was countered with *Western fashion*. For example, the art critic O. Rusanova notes that people in this country take the word *fashion* differently than people in the West [10, p. 86]. A. Golybina in her paper *Taste and Fashion* expresses a position about the youth focused on the West which was characteristic of that time [3, p. 242-243]. Thus, we can see some ideological myths regarding the functions of Soviet and Western fashions.

Despite the negative ideological instructions in the context of Western fashion, in the second part of the 1950s, along with the growth of the USSR's economic potential and the rise in the living standards of its people, we can observe a demand for fashion itself and the promotion of fashion in the Soviet press. In 1956, for example, Iliia Okuniev, the observer of the magazine *Sovyetskaya Zhenshchina*, answering the question about

fashion of the reader from the German Democratic Republic Elena Henke, points that fashion is not a product of capitalist interests. Fashion is one of the areas of culture, a very special and fine art [8; p. 46].

To implement an official socialist costume to everyday life, fashion congresses were launched in the late 1950s and held each year in one of the capitals of socialist countries. The fashion of the countries of the people's democracy was presented as an alternative to the *degrading* Western fashion. Therefore, since 1950, the cooperation in the fashion area had started within the framework of Union of Mutual Economic Assistance (UMEA) that was based not only on mutual assistance in all the sectors of the economy, but also on the exchange of experience of the countries. Moreover, it was also based on common competition of the creative forces of the socialist people. In May 1964, the head of the secretariat of the permanent working group Jan Danielis at the 6th Meeting of the Permanent Working Group in Matters of Clothing Culture of the UMEA Standing Commission on Textile Industry states, that the task is to reach a higher level of clothing [13, p.15]. Within the context of UMEA, the countries of the socialist camp integrated their powers in order to create products of higher quality. The unified methodology of design and principles of clothes modeling developed, exchanging the delegations of artists' and production engineers'. The exhibitions of collections from various countries were organized, etc. It should be noted that the reports of congresses published in the 1950s and 1960s emphasized the unity of socialist countries in determining the future directions of fashion.

Changing every year, fashion had to show the advances of the Soviet industry. The Soviet press justified greater attention to personal appearance with ideological competition, necessity of demonstrating and proving the advantages of the socialist way of life over the capitalist not only in the field of production, but also in consumerism [5, p. 67]. Therefore, Soviet fashion was seen in some way as the opposite of Western fashion.

However, despite the fact the public rhetoric regarding Western fashion remained hostile, the daily life of the USSR was marked by a series of foreign trips of Soviet specialists of textile industry and designers to both socialist and capitalist countries with the purpose of borrowing advanced achievements and sharing experience in the field of textile industry. This is evidenced by the archival materials of the Russian State Archive of Economy (RSAE) and Russian State Archive of Contemporary History (RSACH). For example, the 1967 annual report of the All-Union Fashion House (AUFH) states that "continuous learning and use of foreign experience in design, construction and technology of clothing, close contacts between the specialists of textile industry of foreign countries and the Soviet Union have an impact on the development of a single stylistic direction in design and help to improve the clothing construction methods and technology to reach the level of international standards" [2; p. 23]. Therefore, the communication with the specialists from foreign countries and studying their experience contributed to the professional development of our specialists and expanded creativity to design clothing ensembles at the international level [1, p. 35; 2, p. 24].

Exhibiting fashion products from the Soviet Union enhanced the country's prestige abroad and promoted mutual understanding and establishment of friendly contacts between all nations [9, p. 26]. According to the reports, we can observe the approval of Western fashion and even some glorification of the West. As a result, on archival materials, we can trace the establishment of contacts with Western countries, and foreign trips and exhibitions which can be considered as the important transfer of knowledge about Western fashion.

The selection of specialists and their registration for trips to foreign countries were carried out upon the recommendation of and by the agreement with the corresponding ministries of the USSR. Moreover, the specialists who had to make business trips were instructed at the corresponding departments for the development of textile industry sub-branches, other sectors and all-union associations [9, p. 28].

Therefore, starting from the second half of the twentieth century, after the partial opening of the *Iron Curtain* and the establishment of intercultural contacts, fashion has begun to play a crucial role in the value system of Soviet society. The prevalence of some elements and values of Western culture among Soviet people was characteristic of that time and the process of formation of a consumer society was under way. Judging by official Soviet discourse, we observe the creation of certain ideological myths and comprehensive condemnation of Western fashion but in reality the proof of the approval was seen in a series of the official trips to the *countries-trendsetters* of fashion and in the follow-up reports, most of which had favorable reviews about Western fashion trends.

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SOVIET INTERVENTION IN AFGHANISTAN

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Summary: The article deals with the intervention of the Soviet Union to Afghanistan. The Afghan conflict is analyzed from the point of the view of the sources of the world terrorism and the organization of such groups as the "Al-Qaeda". The conclusion is made that the Soviet intervention in Afghanistan led to a strengthening of international terrorism, drug trafficking, and the impoverishment of the country.

Key words: extremism, international arena, intervention, memorandum.

Анотація: стаття присвячена інтервенції СРСР до Афганістану. Афганський конфлікт аналізується з точки зору джерел світового тероризму та організації такого терористичного угруповання як Аль-Каїда. Робиться висновок про те, що радянська інтервенція до Афганістану призвела до поширення світового тероризму, розповсюдженню наркотиків та збідненню країни.

Ключові слова: екстремізм, втручання, інтервенція, меморандум, світова арена.

Аннотация: статья посвящена интервенции СССР в Афганистан. Афганский конфликт анализируется с точки зрения истоков мирового терроризма и организации такой группировки как «Аль-Каида». Делается вывод, что советская интервенция в Афганистане привела к распространению мирового терроризма, наркоторговле и обеднению страны.

Ключевые слова: интервенция, меморандум, мировая арена, экстремизм.

As a result of the repartition of the spheres of the influence in the world after World War II, the Central Asian region was in the zone of interests of the United States. The Union of the Soviet Socialist Republics began to show interest in Afghanistan in the 1950s [6, p. 150-154]. Its purpose was to involve the country into the orbit of its influence, and strengthening the security of its southern borders and the prevention of the growing influence of the United States. Moreover, Afghanistan in its strategic location was very attractive to the US because its territory was suitable for military bases and airfields, which could be used in a possible war with the Soviet Union. The Soviet Union began to provide various substantial assistance to Afghanistan.

Modern historians and analysts referred the crisis in Afghanistan to the April 1978 revolution. Scientists regard the strengthening of the Soviet influence and activities of the People's Democratic Party of Afghanistan (PDPA) as the main forerunners of the crisis.

The People's Democratic Party of Afghanistan was founded in the first half of 1960 [3, p. 8]. Soon after its establishment, it was divided into two groups - "Khalq" (the leaders are Taraki and Amin) and "Parga" (the leader is Karmal). The representatives of the first group have usurped power, and the leader of the other Karmal was appointed the head of the diplomatic mission in Afghanistan in Czechoslovakia (in fact, it is a kind of expulsion from the country). The USSR attempted to reunificate the PDPA, which was unable to present the result: the coalitions were drowning in internal feuds and intrigues [3, p. 9-11].

Immediately after coming to power, Taraki and Amin tried to instill throughout the communist ideology, to campaign against religion and build a socialist society in a backward multinational Muslim country. This internal policy dictated solely by Marxist principles, lead Afghanistan to an exacerbate, critical situation [5, p. 32-36].

In April 1979, a year after the revolution, the central authority for the suppression of uprisings involved 90 thousand soldiers, but only managed to take control of more or less urbanized area. The power over the central (the most inaccessible) part of the country was lost.

In May 1979, the sole leader of Afghanistan became Hafizullah Amin [4, p. 61]. Under his leadership, the brutal suppression of the uprising began. Despite mass arrests and cleaning out, the interpretation only continued to grow. These events did not cause very great concern of the governments of the Western powers, but the Soviet senior management circles could not rejoice in this prospect. The fall of the government and the coming to power of Islamists could cause unrest among the Muslim population of the Soviet Central Asian republics. The citizens of Uzbekistan, Turkmenistan and Tajikistan, both geographically and by religious principle are very close to the Afghans. In addition, large part of the population of the Central Asian regions of the USSR continued to exist due to the related Plan of Afghans.

Following the April 1978 revolution, Taraki and Amin repeatedly asked the Soviet leadership for help to introduce the Soviet troops into the country [1, p. 31]. This request was due to the fact that the position of the new government was very precarious and fragile, since the revolution in 1978 had a very unreliable support.

The events of August 1979 which resulted in a one-man rule in Afghanistan came to Amin, initially they did not cause much anxiety in the Soviet leadership. Amin received a telegram from United Nations Secretariat of the USSR Brezhnev with official greetings. But after a while it became clear that Amin was planning to take a course of the rapprochement with the United States in the actions on the international arena.

The meeting held on December 8th, which was attended by a limited number of members of the Politburo: Brezhnev, Andropov, Gromyko, Suslov and Ustinov [4, p. 191]. The result of the meeting was the decision on the elaboration of the two options: using the forces of the KGB, passing power to Karmal; and sending to Afghanistan a certain number of troops to accomplish the same task.

The final decision on the introduction of the Soviet troops into Afghanistan was made at the meeting of the Politburo in December 12, 1979. All the members of the Politburo voted in support of this decision.

The operation to capture and eliminate Amin entered history as the assigned code name "Storm-333" [2, p. 58]. In the directive number 312 / 12/001, signed by the Soviet Defense Minister Ustinov and the Chief of General Staff Ogarkov of 24 December 1979, clear objectives for the introduction of the Soviet troops into Afghanistan were defined.

The actions of the Soviet Union in Afghanistan on the international arena were clearly disapproved by the world. The intervention led to the deterioration of the cooperation between the USSR and the United States in many areas, in particular, it affected the agreements between the two superpowers on the limitation of nuclear weapons.

In general, evaluating the response of the international community to the actions of the Soviet Union with respect to Afghanistan, one can say that the intervention did not find those who endorse it. Western countries clearly recognized the growing tensions. It made them speak of the maneuvers of the USSR. They supported opposing forces in the future fighting [5, p. 91].

The period of active hostilities in Afghanistan can be divided into four main periods on the specifics of warfare and the fulfilment of certain tasks. The first period (December 1979 – February 1980) includes the introduction of a limited contingent of the Soviet troops into Afghanistan. The second period (March 1980 – April 1985) was intended for the conducting of a large-scale fighting OKSV together with Afghan formations and units. The beginning of their joint combat operations can be regarded as an operation on the border with Pakistan, Kunar province. The third phase of the Afghan war (April 1985 – January 1986) delineated the transition from active hostilities to the support of the troops DRA by the Soviet aviation, artillery and engineering units. The special units were fighting to curb the flow of arms and ammunition from abroad. It was the first step when the Soviet Union in the Afghan war was considered as a negative phenomenon, a negative impact on the country and the people. The fourth period began in December 1986, when an extraordinary plenary session of the Central Committee of the PDPA declared the official rate on national truce. The adoption of this course reflected the real situation in the country. The main decree was coordinated with the Afghan leadership decision on the withdrawal of the Soviet troops from Afghanistan, providing the cessation of armed Islamists assistance from outside.

According to the Geneva Accords, the withdrawal of the Soviet troops from Afghanistan began in 1988. The negotiations lasted six years, as the country could not come to a common solution of the problem. In February 1989, the last Soviet troops went from Afghanistan, but the conflict did not end. Now, the international community was faced with such a problem, as the organized international terror groups, Islamic extremism and drug production and trafficking in unlimited quantities. In 1988 the terrorist organization "Al Qaeda", led by Saudi millionaire Osama bin Laden, was organized on this basis.

In this war, there is no winning side. The Soviet Union fell apart soon, and the Afghan conflict can be considered as one of the reasons for "the end of the history" of the Soviet empire. The United States, in fact, paid for the creation of the terrorist organization. Thus, the Soviet intervention in Afghanistan can be regarded as a catalyst for global instability.

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УДК 911.3

THE FEATURES OF SETTLEMENT DEVELOPMENT SYSTEM IN KHARKIV REGION

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Summary: The article describes the modern trends in the settlement system of Kharkiv region. It analyzes the density of population in the region and identifies the characteristics of the structure of the settlement system of Kharkiv region. The basic objectives of regional policy aimed at overcoming disparities of the settlement system are outlined.

Key words: centre of gravity population, population density, regional policy, resettlement of population, structure of settlement.

Анотація: У статті розглянуто сучасні тенденції розвитку системи розселення Харківської області, проаналізовано густота населення регіону, окреслено характерні риси структури системи розселення Харківської області; визначено основні завдання регіональної політики, спрямованої на подолання диспропорції розвитку системи розселення.

Ключові слова: густота населення, розселення населення, регіональна політика, розселенська структура, центр тяжіння населення.

Аннотация: В статье рассмотрены современные тенденции развития системы расселения Харьковской области, проанализирована плотность населения региона, определены характерные черты структуры системы расселения Харьковской области; выявлены основные задачи региональной политики, направленной на преодоление диспропорции развития системы расселения.

Ключевые слова: плотность населения, расселение населения, расселенческая структура, региональная политика, центр тяжести населения.

Population resettlement serves as an indicator of the territory development level, since the population tends to be concentrated in cities and regions favorable for life and economic activity [3].

Settling in Kharkiv region is a system of closely related urban and rural settlements of various sizes and economic purposes, which are united by the developed transportation and industrial relations, general production infrastructure, a single network of centers of social and cultural services and places of recreation.

In terms of its administrative-territorial structure, Kharkiv region has 2,178 administrative units (Fig. 1) [4].

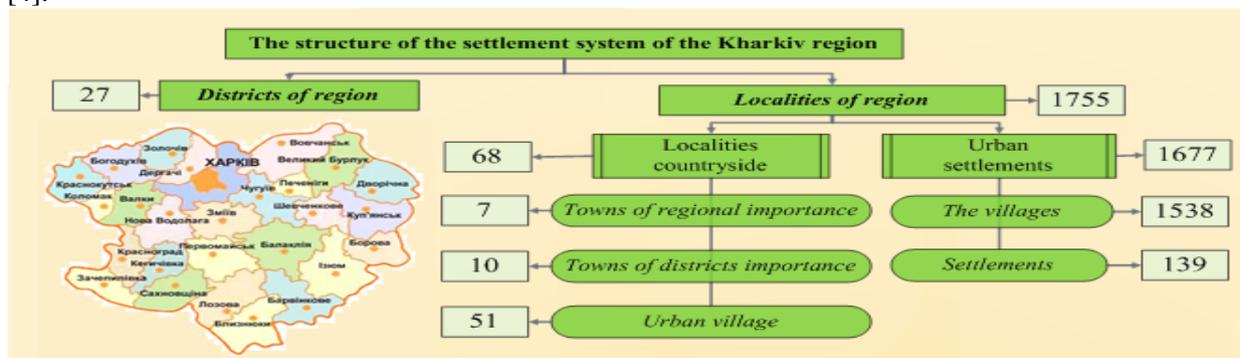


Figure 1. The structure of the settlement system of Kharkiv region in 2015 (constructed by the author according to [4])

The region consists of 27 districts, 17 large and small towns (among them 7 towns of regional importance: Kharkiv, Izyum, Kupiansk, Lozova, Lyubotin Pervomajskiy, Chuguyiv (Fig. 2), 10 towns of district importance: Balakliya, Barvenkovo, Bogodukhov, Valki, Vovchansk, Voroshilov, Zmiiv, Krasnohrad, Merefa, Pivdenne, 61 urban villages, 1,538 villages and 139 settlements [4].

Both Lozova and Chuhuiv are densely populated, which is attributed to considerable industrial growth and profitable transport regulations.

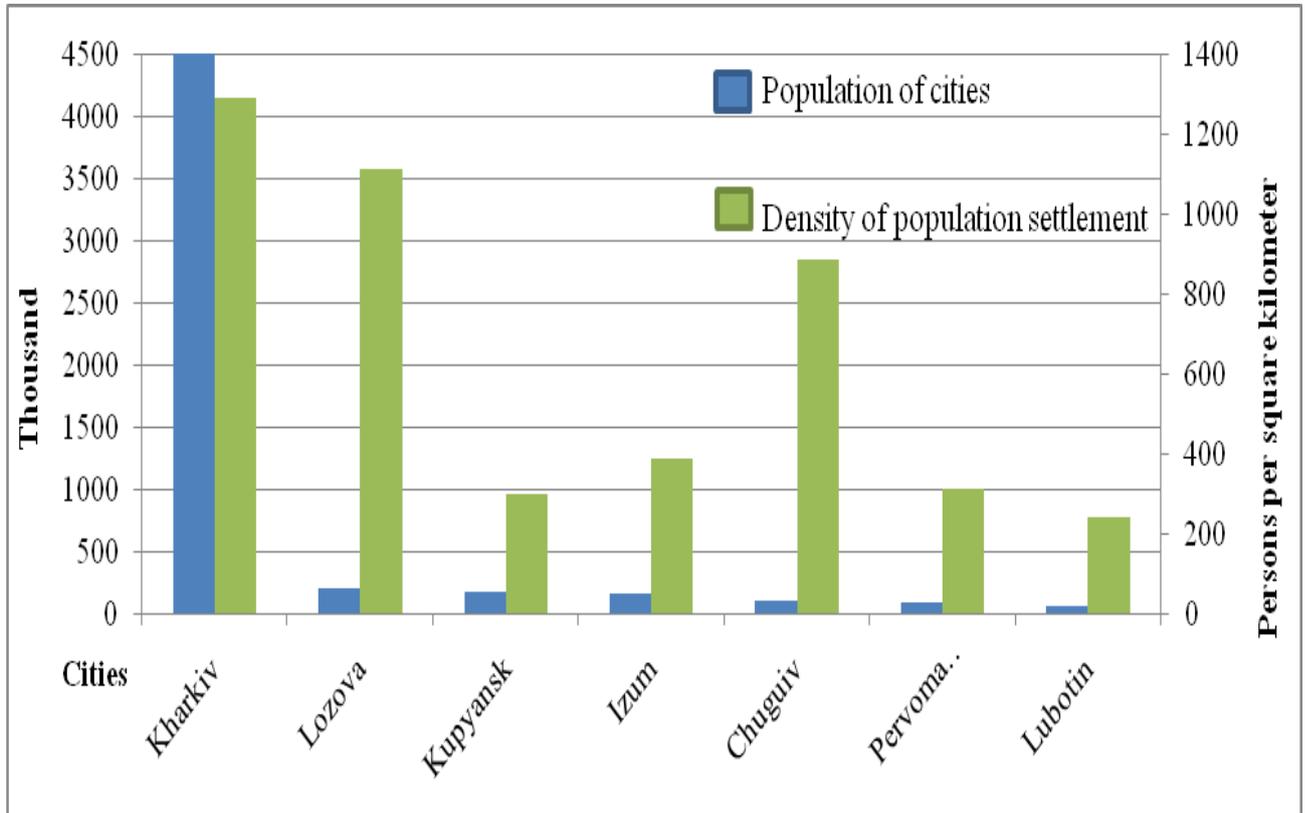


Figure 2. The number and density of population of regional centers of Kharkiv region in 2014 (constructed by the author according to [4])

The settling supporting frame in the region is made up of Kharkiv metropolis, 4 medium-sized cities: Lozova, Izyum, Kupiansk, and Balakliya, 12 small towns and 61 urban villages. The average distance between the cities and towns equals to 20.2 km, which is 4 times more than that in Ukraine. The average distance between cities is 43 km, which is much less within the Kharkiv agglomeration. In 11 districts of the region towns are not available. The number of urban settlements in the areas ranges from 1 to 14, with most of them corresponding to the surrounding areas of Kharkiv. As a rule, from 1 to 2 urban settlements can be found in the peripheral areas of the region.

The districts in the region differ significantly in terms of population, territorial size, and economic development. The number of residents inhabiting the prevailing part of the areas, i.e. 16 administrative districts, equals to 40 thousand, while the population of 3 districts is from 40 to 50 thousand, and that of 8 areas equals to more than 70 thousand people. In turn, the city of Kharkiv is divided into nine areas [1].

The average population density of Kharkiv region is 87 people / km², which is above the mean in Ukraine. This is due to the fact that a city with over a million residents and several large towns can be found in the region. Leaving aside the urban population, one can estimate the average population of the area as 33 people / km², which is lower than a corresponding average figure across Ukraine [4]. The most densely populated areas are industrial and agricultural ones.

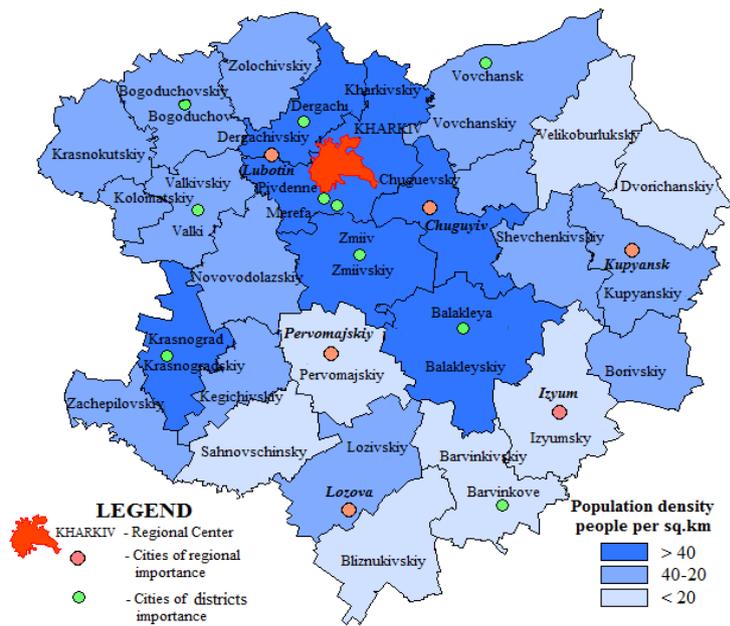


Figure 3. The settling in the Kharkiv region in 2014 (constructed by the author according to [4])

Thus, the population density increases depending on the region advance towards the geographical center of the district and that of the region, with a large population density dominating in the areas locating the largest cities of the region.

One of the important issues of the further development of the settlement system in the Kharkiv region is the shift in gravity center of population from the geometric center of the area to the region centre – the city of Kharkiv.

As a result, the development of the peripheral parts is rather slow. The regional policy acts as an effective tool to overcome the uneven settlement system in the Kharkiv region. This policy is to be directed to solve the following problems (Fig. 3):

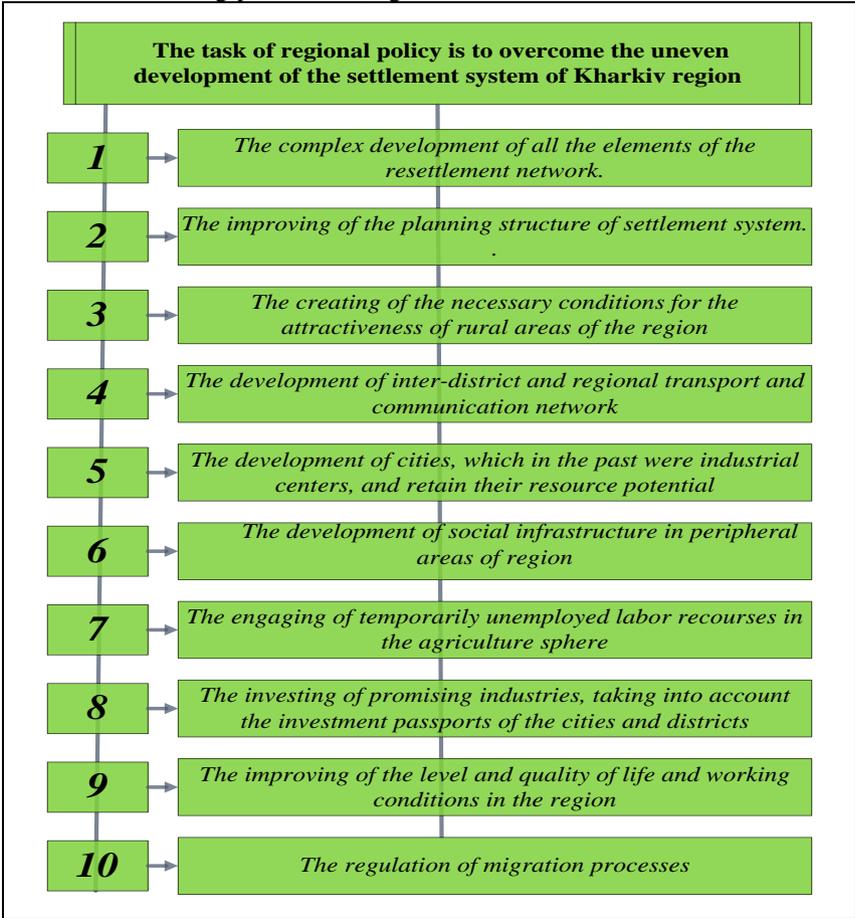


Figure 4. The task of regional policy is to overcome the uneven development of the settlement system of Kharkiv region (constructed by the author according to [2, 3])

Thus, the main problems concerning the development of modern regional settlement system of Kharkiv region consist in its orientation towards the administrative center of the region and the low development level of urban peripheral areas.

However, an effective regional policy for the development of small towns and depressed areas can promote comprehensive development as a settlement system of both Kharkiv region and that of the region as a whole.

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INTERACTIVE GAMES IN EFL CLASS

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Summary: The article discusses the effectiveness of using interactive games in EFL class. It reveals the relevance and practical value of interactive games, features using interactive games as the most effective method of studying foreign language.

Key words: communicative competence, foreign language, interaction, interactive games, increased teaching and learning activities of students, method.

Анотація: У статті розглядається питання ефективності використання інтерактивних ігор на уроках англійської мови. Розкривається актуальність і практична цінність інтерактивних ігор, особливості використання інтерактивних ігор як найбільш ефективного методу вивчення іноземної мови.

Ключові слова: активізація навчально-пізнавальної діяльності учнів, взаємодія, іноземна мова, інтерактивні ігри, комунікативна компетенція, метод.

Аннотация: В статье рассматривается вопрос эффективности использования интерактивных игр на уроках английского языка. Раскрывается актуальность и практическая ценность интерактивных игр, особенности использования интерактивных игр как наиболее эффективного метода изучения иностранного языка

Ключевые слова: активизация учебно-познавательной деятельности учеников взаимодействие, иностранный язык, интерактивные технологии, коммуникативная компетенция, метод.

The main aim of studying a foreign language is to develop students' communicative competence, that provides the ability of using a foreign language as a method of communication in various spheres of life. Today interactive games are actively implemented in studying process and effectively promote absorption of material, as an effect on the student's consciousness and feelings in that manner of the creative personality that can effectively apply the acquired knowledge, skills and abilities on practice in any part of public life. It is essential to perform tasks successfully to create a situation where teacher and student fully deep in the all subjects of education process and that will be the basis of equal dialogue between those who teach and those who study [15].

Methods that encourage students to creative activity should be used on English lessons, they lead to productive work, causing the desire for action, communication and expression students' own thoughts in English. Interactive games as a method of studying fit best for requirements mentioned above.

Interective (from English word interaction) – means the presence of feedback between a teacher and students. Interactive studying - is such a kind of activity that involves interaction between a student and educational environment that serves as a source of digestible experience. Interaction in the way of

understanding as a pedagogical method involves learning both students and teacher in the subjects of study [14].

Interactivity in education may be explained as interoperability, training mode of conversation, dialogue and action. So, interactive is method where the one who is taught is a member too. The student does not only act as a listener or observer, but plays active part in what is happening in the classroom [11].

With this form of educational participatory students become full members of the studying process. The teacher's function is primarily to stimulate them to act independently and find ways to achieve their goals. Students' activity is a priority in the interactive classroom and the teacher's task is to create effective didactic and methodological conditions to identify their initiative. Interactive form of training activities correlated with communicative active approach in studying a foreign language. According to conception of learning a foreign language students are provided with social interaction as interpersonal communication, and the ability of the interlocutors to take another role as a partner in dialogue and therefore interpret the situation, determining their own actions as an important characteristic of the process of studying. In the practice of teaching foreign languages interactive studying can be associated with the development of critical thinking as constructive intellectual students activity during the organization and implementation of speech interaction [7].

Interactive studying is one of the modern trends of active cooperation, during which the student deep into a dialogue with the teacher or other students, is actively involved in the cognitive process, fulfilling creative, search, problematic tasks in a pair or a group [16].

V. Zirova believes that the motivation activity is an important part of the psychological mechanism in the game. Game training technique includes different aspects of motivation:

1. Communicative motives. The joint solution of game problems encourages interpersonal communication and strengthens the relationship between students.

2. Moral motives. In the game, students can stand up for themselves, defend their views, knowledge, express their attitude to work.

3. Cognitive motives. Each game has a close result (the end of the game).

All these encourage students to achieve the goal (or victory) and increase their interest to find ways to achieve the goal. In the game the initially equal and the result depends on the player himself, on his personal qualities. The depersonalized process of learning in the game gets a personal significance. The situation of success creates a favorable emotional background for the development of cognitive interest. In each game there is a mystery - a lack of reply that activates the mental activity of students and pushes them to find the answer [8].

In games there is a replacement of motives: students act out of a desire to have fun but the result can be constructive. Games which are in the basis of gaming techniques are a means of education, though the source of its activity are the tasks voluntarily taken by an individual. In games, the students achieve the aims at different levels:

On the first level there is a satisfaction from the game process. This aim includes the willingness to any activity, if it brings joy.

On the second level the function purpose of the game related to the implementation of the rules, acting out stories and playing roles is achieved.

At the third level students reach the educational purpose, solving game problems. It is at this level that they learn new words of a foreign language and use them in speech [18].

Solving game problems, students reach the educational aim which they often do not realize. Playing in a linguistic game, students concentrate on specific tasks of it, but the result of their work will be the assimilation of new vocabulary, communication in a foreign language. The use of gaming techniques in a class also justifies a huge value of the game for mental development of any age [11].

Game methods have a rich training and psychotherapeutic potential. The intellectual tension produced by the game is a necessary condition for an active learning in a high school. Game is feasible for almost, even for those who had no stable knowledge in the language. Competence in dealing with gambling problems increases the motivation to learn the language, The sense of equality, the atmosphere of enthusiasm, the sense of the affordability of the tasks – all this allows a student to overcome shyness which prevents him from using words of a foreign language in speech. It gradually decreases anxiety and stiffness, and a positive self-image appears [10].

The mastering of the vocabulary demands students of multiple repetition of it, which tires them by its monotony, and the expended efforts do not bring quick satisfaction. The application of gaming methods in education contributes to the important tasks of foreign vocabulary learning:

- 1) creating psychological readiness of students for speech communication;
- 2) providing a natural necessity to repeat the lexical material;

3) training of students in choosing the right version of the utterance, which is a preparation for the spontaneous speech [19].

Interactive studying has both positive and negative sides.

Positive points are:

- Expansion of students' cognitive abilities (obtaining, analyzing, using information from various sources);
- high studying level;
- optimal teacher's control;
- cooperation and partnership between teacher and students;
- search for an alternative approach in evaluating students' knowledge.

Negative points are :

- the lack of teaching materials for foreign language lessons;
- the need for time consuming to study certain information.

Compared to traditional methods, the advantages of interactive studying are:

- all students of the class are involved in working process;
- formation an ability to work in a team;
- developing a friendly attitude to the opponent;
- the opportunity to express their opinion;
- creation of a "situation of success";
- the possibility of mastering a large amount of material in a short period of time;
- communication tolerant translation skills
- the ability to argue their opinion, to find an alternative solution [8].

In EFL class interactive technologies can be considered as creative activities that can create situations of verbal interaction, contribute to improving the students' communication experience. Creative communication tasks can be implemented in various forms, including individually and collectively (pair, group work). This can be detected completely during the role-themed games, project work, in the process of solving educational speech situations, in process of monologue and dialogue communication, where members in the educational process are involved [4].

It provides very specific and predictable goals. One of these goals is to create a comfortable environment to help students feel their success and intellectual competence, making the learning process more productive. Under this approach, an interactive game is useful because it can help to learn a huge amount of a foreign language words at different levels of complexity [2].

Today teachers review producing ways and impacts on the students' minds, will and emotions in order to bring them into the rich world of culture and traditions of the country of the studying language. The ways and means of forming all the types of speech skills (reading, speaking, listening and writing) are also reviewed. Gaming technology in addition to the traditional lessons produces learning process activation and stimulating of the cognitive interest [1].

The main cause of such an increasing interest to games of different kinds –is a departure from traditional forms and methods of teaching. It is also necessary to note a certain decline of cognitive interest in learning foreign languages, which is connected to the fact that students face some difficulties, which they consider as insurmountable. Gaming technologies can be an excellent decision in this situation — it is a method which lets them use all the levels of knowledge. A real way to maintain students' cognitive motives is to provide them with an activity which has a personal meaning for them. It can be a communication, a labour, cognition or a game. [3].

A specific feature of a foreign language (as an educational matter) is that the educational activity here supposes a practical speaking and a communicative activity, in the process of which all the necessary skills and knowledge are formed [9].

The use of games as an educational technique is an efficient instrument of managing the learning activity, stimulating students' intellectual activity and allowing them to make the learning process exciting and entertaining. D.B. Elkonin in his book “The psychology of games” gives the following notion of a game: “A game is a primary spontaneous school, apparently a chaos, which gives a child an opportunity to get acquainted with the world and traditions of people's behaviour” [18]. The definition of a game more appropriate for our study is given by

A.A. Derkach, he says that an educational game is a game which is used in the learning process as one of its tasks and contains an educational problem or a problem situation, the decision of which should provide the achievement of a specific training goal [4]. Analysing this notion of a game we can point out several general ideas.

1. A game is an independent kind of developing activity for people of different age.

2. For adults and children a game is the freest kind of their activity, thought which they can understand and study the outer world. It opens a wide scope for the personal creativity, activity, self-knowledge and self-expression.

3. A game is a practice of development. Children and adults play, because they develop, and they develop, because they play.

4. A game contains the freedom of self-discovery and self-development based on the subconscious mind and creativity.

5. A game is the principal sphere of communication of adults and children. The interpersonal problems are solved and the experience of people's relations is acquired in it.

A game is a powerful motivation to learn foreign languages and an efficient tool for a language teacher. An educational game is an organized task which requires an intense emotional and mental strength. The positive fact is that way students speak a foreign language—so, the gaming method can train large educational potential. For students a game is first of all an entertainment. A game at the lesson contributes to the important methodological problems.[13]:

- it created a psychological readiness of students for speech communication;
- It provides a natural necessity for a multirole repetition of the studied material;
- It trains students to choose the right variations of speech.

All the participants are equal in a game, it is feasible to almost every student—even to those who do not have so much knowledge in the particular language. What's more, a weak student may become the first in the game: inventiveness and ingenuity are more important here than knowledge in the subject. The sense of equality, the atmosphere of enthusiasm and joy, a sense of affordability of jobs—all these give students an opportunity to overcome their shyness which interferes with the free usage of words in speech, reduce the fear of mistakes, and have a beneficial effect on the result of learning. Gaming activity in the educational process performs the following functions:

1. The learning function comprises the development of memory, attention, perception of information, development of extra-curricular skills.

2. The upbringing function comprises learning such qualities as considerate, humanistic attitude to the partner of the game. Students learn phrases— clichés to use in speech—and it helps them to become more polite to each other.

3. The entertaining function is creating a favorable atmosphere at the lesson, transforming the lesson into an interesting and unusual event, adventure, and sometimes into a fairy world.

4. The communicate function is creating the atmosphere of a foreign communication, uniting the students' team, establishing of new emotional and communicative relationship, based on the interaction in a foreign language.

5. The developmental function is the harmonious development of personal qualities and the activation of the individual capacities of students.

6. The psychological function is to provide students with skills to prepare their physiological state to a more efficient operation in the future.

There are several types of games [20]:

- Linguistic (the studied material is worked through at the level of lexic and grammar)
- Communicative (role plays on a given topic).

I.A. Zimnyaya allocates two types of games. Grammar games are lexic, phonetic and orthographic games forming speech skills. Creative games are those which facilitate the further development of language abilities [6].

Thus an educational game is one of the ways of organizing the educational—cognitive activity. Use of games in teaching is not simply an entertainment or an organization form at the lesson. A game has a great heuristic and persuasive potential. Being a part of the system of traditional education a game lets use all the levels of cognition: from the repetitive activity to the creative one. So a game can be not only an entertainment but also the main technology of studying [17].

Now let's examine several important principles of using games at the lessons. Certain principles are in the basic of teaching of all the subjects. They determine the strategy of each educational stage.

Among the principles of studying a foreign language the first place belongs to the principle of visibility, which is important for studying in a game. I.A. Zimnyaya allocates the following ways of using visualization when studying language:

- Creating a speech pattern;
- Creating a visual aid.

It is necessary to note that when teaching a foreign vocabulary one can use gaming technology at all the stages of training. Visual aid is of the paramount importance here, in contrast to the auditory and motor aids, it is applied most of all to limit the circle of events to be discussed and to create an aid which helps to construct a logical utterance [5]. In connection to this, different visual aids, charts, schemes are widespread. There are a few examples of such aids: semantic cards; componential semantic analysis; semantic blocks; illustrative and lexical tables; illustrative and graphical exercises.

According to classical views, represented in the theory speech activity, oral speech is determined as “an oral way of forming and formulating thought by means of language in process of speaking” [12].

It is necessary to dwell on the interactive vocabulary games that help to study oral monologue speech, such as: Match the items; Explain by your own words the meaning of the term; Hangman; Finish a phrase; Think up the end of the story; Puzzles; Carousel, aquarium, great circle microphone, brainstorming, mosaic, debates, talk shows; find a mistake; identify a word by two letters; Interview; Role and business games [20].

A.A. Leontyev mentions that «if a person can communicate appropriately he must have the whole chain of skills. Firstly, he must orientate himself quickly and rightly in the conditions of communication. Secondly, he must be able to plan his speech, to choose contexts of communication act correctly. Thirdly, he must be able to find appropriate means for transfer of this content. Fourthly, he must be able to provide a feedback. If something of this chain of communication act is broken, the communication will not be effective» [12].

Due to this theory it is necessary to mention that such skills will promote an effective studying of oral monologue speech.

In conclusion, thus, interactive methods contribute intensity and optimization of the studying process. During the interactive classes students can:

- analyze educational information and creative studying approach;
- formate their own opinion, express it right, prove their own point of view, argue and debate;
- simulate their own social experience through the inclusion in various life situations;
- develop creative skills and project activities, independent work.

Using interactive studying is not an panacea itself, it is only a method to create atmosphere in the EFL class that best promotes cooperation, understanding and goodwill, can fully realize the personality oriented education.

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THE PERSONALITY OF ALEXANDER THE GREAT

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Summary: The article deals with the personality of Alexander the Great in the world history. His personality is studied in the connection with the historical processes in the ancient world. The conclusion is made that Alexander the Great is an important figure who influenced the course of historical events in the world.

Key words: ancient world, commander, empire, Hellenism, personality, power.

Анотація: У статті розглядається особистість Олександра Македонського у світовій історії. Його особистість вивчається у зв'язку з історичними процесами в стародавньому світі. Зроблено висновок про те, що Олександр Македонський є важливою фігурою, що вплинула на хід історичних подій у світі.

Ключові слова: античність, влада, еллінізм, імперія, особистість, полководець.

Аннотация: В статье рассматривается личность Александра Македонского в мировой истории. Его личность изучается в связи с историческими процессами в древнем мире. Сделан вывод о том, что Александр Македонский является важной фигурой, повлиявшей на ход исторических событий в мире.

Ключевые слова: античность, власть, империя, личность, полководец, эллинизм

The empire created by Alexander the Great rested on the military power of the great commander. He was the stronghold of the huge conglomerate state, which after his death began to disintegrate.

Alexander occupies the leading position in the political arena of the ancient world. His personality is significant because he was one of the first great military leaders, who managed for a little period of time to conquer and subjugate the vast territory, which included Macedonia, European possessions, Egypt, Syria, almost all of Asia Minor, Central Asia, part of Central Asia part of India. As Y.N. Lubchenkov rightly pointed, Alexander inherited a country at the beginning of his historical path [1, p.15].

If a human personality influences historical processes, one of the most prominent roles belongs to Alexander. Medieval literature has preserved up to this day works concerning Alexander's life and campaigns, studies of his amazing destiny. Alexander soon became a protagonist of folk tales. As a result, the cycle of novels and poems of Alexander the Great was widespread in Europe and in the East [2, p.32]. No matter how the data are deleted from the narrative concrete historical reality, they say of the identity of this really extraordinary man [3, p.8]. By itself, Alexander was an extraordinary man. He combines almost childlike credulity with the power of a man, mature meditation with the extraordinary rapidity of action, higher education and love of art with great talent in public performances. All that makes Alexander an extraordinary figure in the gallery of famous historical figures.

Alexander set himself such an ambitious goal as the world domination. Alexander the Great planned to attack territory from Asia to Europe, and Europe to the island of Brittany. He was not limited to these territories and had plans to invade Asia.

In order to achieve that he needs to be at least an extraordinary man or great egoist who does not care about the views of others; or the greatest idealist, convinced that his power over the world will be a boon to mankind, or both. Most likely, the third option is the most typical. The majority of these people are precisely the ones who appeared on the stage of history with the idea of similar attraction. Alexander created the first world empire, which largely determined the further development of the history of mankind [5, p.9].

His teacher, the great philosopher Aristotle, has a great influence on Alexander. Aristotle gave the boy some stock of factual knowledge. But much more important was the fact that he served him as an example. Looking at the philosopher, the boy learned to appreciate all the sublime and noble, learned Greek culture. They did not study arbitrarily torn fragments of various sciences, and the harmony of spiritual existence as a whole. The recognition and the understanding of the beauty, hard work, the good and its embodiment in the best works helped Alexander to become a legend. It was necessary to strive for the highest attainment: "Let no man be afraid to create immortal and divine" [2, p.51]. First of all, Alexander, by his nature, was destined to great things, which later determined his life – the boundless and endless.

The activities of Alexander affected most on the civilized world at that time, giving him a push in a certain direction, the consequences of which could not be changed. The scale of his plans is amazing. It affects the ease with which he won and assimilated new territories. Alexander faced the lack of the understanding of even his closest friends [4, p.35].

Alexander attracts attention of many generations of historians of antiquity. The concept of consecrated antiquity, the biggest names can be found and firmly established in books and articles about him. There were many disputes on general and specific issues, because of the poverty and obscurity of sources the scientists were not always able to come to a reliable, firmly grounded conclusions. In assessing the personality of Alexander the Great by asking scientists to set themselves goals and objectives, disagreement prevailed and prevails [1, p.24].

For example, the famous German scientist B.G. Niebuhr treated the personality of Alexander totally negative. Recognizing him as a great conqueror, an outstanding commander, Niebuhr thought he was a cruel politician. However, he agreed that Alexander is a highly remarkable phenomenon, but his fame, he says, rests solely on his outstanding intelligence and talent. Another famous historian of the first half of the XIXth century, Englishman J. Groth in the assessment of Alexander joined Niebuhr. Groth recognizes Alexander as the great military leader, but only as the outstanding of the quality of its political and cultural figure.

In contrast to B.G. Niebuhr and J. Groth, the famous XIXth century German scholar J.G. Droysen admires the public and cultural activities of Alexander. Droysen argued that Alexander was a genius person of his time. "If the state creation of Alexander at first seems just a sketch that is not deprived of the various errors in particular, if the techniques of his actions seemed to be the promptings of his personal passion, arbitrariness, we should not forget that these first thoughts, flashing like a spark by friction giant event, immediately and hurriedly were formed for him in terms of the norms of the organization and future activities; just we have to remember that these thoughts seemed to open and lit up like lightning, more vast horizons, create even more friction and put on the waiting list more and more urgent problems" [6, p.31].

Even Diodorus in the "Historical Library" wrote: "In a short time, Alexander relying on his own intelligence and courage made the case greater than those who made all the kings of the memory which was transferred to us by history. For twelve years he conquered a large part of Europe, and almost all of Asia, and, of course, gained fame and equal rights to its ancient heroes and demigods" [8, p.247].

The question of Alexander and the significance of his activities is disputable. Alexander was not only a talented military leader, but not the last politician, he has done everything to avoid his empire trends that could lead to its collapse [2, p. 34]. He was appointed to the key positions, that is, those who in their views could not accept the idea of the absolute power and who can be controlled. In addition, Alexander realized that a vast empire can not exist without a strong army. He hoped for the world domination and considered it necessary not to copy predecessors and rely on the Macedonians, Greeks, Persians because he thought they were the best.

Alexander was not an idealist, and was well aware that the material with which he built his empire was imperfect. Continuing to build his empire, he could not finish the main ideas of the last period of his life – the conquest of the West Mediterranean. During this military operation he intended to capture Carthage, Libya, Iberia and neighboring coastal countries, as well as Sicily. But all these plans were not fulfilled. Shortly after returning to the center of his power, after months of almost uninterrupted peers, Alexander arrived at Babylon. He felt bad. In July 13, 323 BC the whole Macedonian army heard the news of the death of its commander [7, p.21]. Alexander's body was in the palace of Nebuchadnezzar, the Babylonian.

Alexander is one of the most famous figures of antiquity, he is remembered for his tactical ability, his conquests, and for spreading Greek culture into the East. He is the measure by which generals compare themselves, and military academies throughout the world still teach his tactical exploits.

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ECOLINGUISTIC APPROACH TO THE STUDY OF LOAN WORDS IN THE ENGLISH LANGUAGE

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Summary: This article studies foreign loanwords in the English language from the ecolinguistic perspective. It is a well-known fact that the English language does not only influence foreign languages, but is also influenced by them in reverse. Language ecology is a science, which can account for the reasons and consequences of such processes. The results of the study are as follows: the meaning of the term “ecolinguistics” is made more precise, ecolinguistic paradigm of the study of English loanwords is described. The relevance of the work lies in the importance of examining foreign borrowings in English from the ecolinguistic point of view and examining the ecolinguistic paradigm of study of loanwords.

Keywords: bilingualism, borrowing, ecolinguistics, English language, influence, language ecology.

Анотація: Стаття присвячена дослідженню іншомовних запозичень в англійській мові з еколінгвістичної точки зору. Як відомо, англійська мова не тільки впливає на інші мови, але й сама зазнає іншомовного впливу. Екологія мови є наукою, що може пояснити причини та наслідки подібного впливу. Результатом дослідження є визначення терміну «еколінгвістика» та основних парадигм дослідження іншомовних запозичень в англійській мові. Актуальність роботи полягає у розгляненні іншомовних запозичень у англійській мові з еколінгвістичної точки зору та визначенні еколінгвістичної парадигми вивчення запозичень.

Ключові слова: англійська мова, білінгвізм, вплив, еколінгвістика, екологія мови, запозичення.

Аннотация: Статья посвящена изучению заимствованных слов в английском языке с эколингвистической точки зрения. Как известно, английский язык не только влияет на другие языки, но и подвергается влиянию этих языков. Экология языка является наукой, которая может объяснить причины и последствия подобного влияния. Результатом исследования стало определение термина «эколингвистика» и основных парадигм исследования иноязычных заимствований в английском языке. Актуальность работы заключается в рассмотрении иноязычных заимствований в английском языке с эколингвистической точки зрения и определении эколингвистической парадигмы рассмотрения заимствований в английском языке.

Ключевые слова: английский язык, билингвизм, влияние, заимствования, эколингвистика, экология языка.

Ecolinguistic or "ecology of language" is a relatively new concept in linguistics. It is a multifaceted field of modern linguistic science, which is located at the junction of several sciences – sociology, psychology, philosophy, linguistics, and ecology. In the early twentieth century scientists developed interest in the relationship between language and environment, but even Wilhelm von Humboldt was the first scientist, who raised a question of the relations between the language and environment. In 1912, the American linguist Edward Sapir publishes in "American Anthropologist" journal an article entitled "Language and environment". In this article, he explains how the language is influenced by factors of the environment and landscape where it is used: the geography and topography of the place. These scientists were the first who began to develop the concept of ecology of language [5, p. 1].

The concept of "ecology" in the linguistic aspect was first introduced by Einar Haugen, an American scientist of Norwegian ancestry. In his work "Ecology of language" (1970) Haugen characterizes the ecology of language as "the relationship between any language and its environment" which includes not only a geographical landscape, but also the society in which a language is used, and a human mind [1]. The basic thesis of ecolinguistics can be formulated under the laws of the ecosystem: how the existence and development of the language depend on the society and vice versa. The most successful are the changes in language that have been able to withstand the environmental pressure successfully and meet all the requirements of language environment. According to N. Lechevrel, a French scientist, P. Ancrev (1967) used a similar approach to the study of ecolinguistics before Haugen. In France, this problem was also studied by J.-B. Marselesie (1975), S. Hagege (1985), L. J. Calvet (1999) [7].

Now several possible ways of further development of the science can be distinguished:

- 1) the study of linguistic diversity (causes, effects);
- 2) recovery of endangered and small languages;
- 3) relationship between cultural and biological diversity;
- 4) search for “green” and “polluting” elements in the grammar of languages;
- 5) analysis of texts about ecological problems;
- 6) education in eco protection (knowledge of universal interconnection in the world).

Linguistics plays an important role in the concept of discourse which the French philosopher Michel Foucault defines as "the total sum of expressed and pronounced" [3, p. 107]. The study of language policy, according to E. Haugen, also refers to the competence of ecolinguistics. According to O. Beley, ecolinguistics

represents the modern ideological position, on the basis of which a modern European democratic language policy is implemented, especially in the context of post-totalitarian Slavic countries, including Ukraine [2].

Approach to the study of the language with the application of the principles and methods of ecology was picked up by a team of German researchers who called their approach "ecological linguistics". Peter Finke used the term "ecosystem" applying it to the language system and culture, and William Trampe and Hans Strohner used this concept to explain the continuous process of interactive exchange between language and the world. Under this approach, the comparison environment, in the traditional sense, and the ecology of language is reduced to the following hypothesis: as our attitude to nature threatens the existence of life, the language is endangered as a result of its usage [1].

In the next decades, the meaning of "ecology" in language has widened. Another parallel between language and ecology was drawn in 1990 when Michael Halliday demonstrated a link between language, class inequality and brutal treatment of animals. He first raised the issue of the interaction of language and the world and urged linguists not to ignore the role of language in solving environmental problems. After the publication of the article "New Ways of Meaning" M. Halliday significantly increased the interest of scientists to the role of language in addressing environmental issues and problems of the surrounding world [ibid]. Several aspects of ecolinguistic studies are distinguished: intralingual, interlingual, and translingual:

- Intralingual – associated with the culture of speech, stylistics, rhetoric, and including studies of violations of correctness, clarity, logic, expression and other communicative properties of speech.
- Interlingual – linked with multilingualism as a habitat of particular ethnic language and the problem of the disappearance of languages, and hence with a reduction of linguistic diversity on the Earth.
- Translingual – linked with expressing the items or realities of one culture in the context of and by means of another language belonging to another culture in fiction, folklore, journalism [7].

The problem of lexical loanwords is examined in translingual aspect because the loanwords are associated with the interaction of languages and their mutual influence. From the point of view of Haugenian paradigm of ecolinguistic study, loanwords "pollute" the language that in a certain way is deprived of its identity. Typically, all languages are influenced by the dominant language, such as an international language – it can be spread in a certain region. But in our case we are dealing with the borrowings, not from the dominant language community, which are the English and the English-speaking world now due to globalization, but with the influence of a "secondary" language on a dominant one. Nowadays communication acquires special forms of bilingualism which are becoming more popular. On the Internet, we can see such a form of communication: "national language + dominant regional language + international language". In the network society of our times, a particular variant of bilingualism has become the primary type of communication, i.e. national language-English bilingualism, with the national language as the primary language (e.g. German, Spanish, Swedish, Russian) and English as the second language, and the functions of the global language component (i.e. English) range from verbal interaction to virtual communication in the digital sphere (the internet, e-mail, and other electronic media). In some regions of Europe, virtual communication extends to a combination of three elements (e.g. Catalan-Spanish-English; Tatar-Russian-English; Sami-Finnish-English) [6].

The analysis of the language ecology involves not only the description of the social and psychological state of the language but also the impact of these phenomena on the language itself. In this case, we must specify the full description of general vocabulary and all the language layers. A fuller account would require some description of the composition of the total vocabulary from this point of view. For English, for example, it involves recognition of the existence of at least two structural layers, the Germanic and the non-Germanic, mostly Mediterranean (French, Latin, Greek, Italian). Historically this means that at certain periods in the life of each language, influential men have learned certain languages and have enriched (or in the opinion of some, corrupted) their languages, according to some researchers, were contaminated under their influence [4]. By E. Haugen, it is of less interest to know that ten percent of the speakers use a language than to know whether they also use other languages and under which circumstances. It is important to know whether their bilingualism is stable or transitional, i.e. what the trend in language learning is within the group of speakers. A typical profile of a speech community (A) in contact with another (B) is that A, if it is dominated by B, may change from monolingual A to bilingual Ab (A dominant, B subordinate), AB (A and B equal), aB (A subordinate, B dominant), and finally to monolingual B., These three types of bilingualism may be described as supplementary (Ab: in which B is only an occasional "Hilfssprache" for specific purposes), complementary (AB: in which the two alternate according to important functions in the speakers' lives), and relative (aB: in which A has become only a language used with older people while B fulfills all the important functions). These three types are seen as historically ordered in a transitional bilingualism. But each one of them can also be stable, if there is no incentive or possibility for change of group membership through learning language B [ibid].

For Haugen, the concept of "borrowing" is only a small aspect of a given cross-language relations. Since language is not a monolithic structure, it changes and we deal with linguistic symbiosis. Studying the bilingual community using the example of immigrant communities in the U.S., the scientist saw that over time, the language of the immigrants acquires the features of a dominant language environment. The reason for this is the ability to "switch" from one language to another and change in the language [ibid]. Also due to the linguistic demography, the position of the user is relative to the social class, locations, religion, in the sphere of use of languages, etc.

Thus, ecolinguistics is a new direction of the development of linguistic science. Ecolinguistics has several possible paradigms for the analysis of language – how language is connected to the surrounding world and cross-language links, for research which applies the principles of ecology. Also according to some scholars the subject of ecolinguistic study is the clean speech and its "contamination" vocabulary from other languages. From this point of view, ecolinguistic intercultural and interlingual relations affect the emergence of loanwords and mutual language changes. These processes affect contact between native speakers, as well as the status of the carriers relates to each other, linguistic demographics, and areas of use. Also, ecolinguistics sphere scholars suggest that language policy, which significantly affects changes not only in the society but also in the language, is the subject of ecolinguistic studies.

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RELIGION WARS IN 21ST CENTURY AND THEIR INFLUENCE ON SCIENCE'S DEVELOPMENT

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Summary: The article deals with the essence of the problem of religion wars in XXI century and their influence of scientific, technical and international relationships' development. The results of the study are as follows: armed conflicts have a threat for humanity in the future and the religion like a phenomenon prevents to scientific and technical development. The author of the article calls on to refuse of religion and wars for it in favor of scientific researches and discovers.

Key words: religion wars and conflicts, their threat for humanity and influence on scientific development.

Анотація: Стаття присвячена розгляду проблеми релігійних війн у XXI столітті і їх впливу на розвиток науки, техніки і міжнародних відносин. У результаті дослідження виявлено, що такі збройні конфлікти мають загрозу для людства у майбутньому, а сама релігія як явище, заважає розвитку науки і технологій. Автор статті закликає відмовитись від релігії і війн за неї на користь наукових досліджень і відкриттів.

Ключові слова: релігійні війни і конфлікти, їх загроза для людства і вплив на розвиток науки.

Аннотация: Статья посвящена рассмотрению проблемы религиозных войн в XXI веке и их влияния на развитие науки, техники и международных отношений. В результате исследования выявлено, что такие вооруженные конфликты имеют угрозу для человечества в будущем, а сама религия как явление, мешает развитию науки и технологий. Автор статьи призывает отказаться от религии и войн за неё в пользу научных исследований и открытий.

Ключевые слова: религиозные войны и конфликты, их угроза для человечества и влияние на развитие науки.

One of the most dangerous phenomenons of our century is a religion war and terrorism. There are a lot of different religion conflicts nowadays. It's paradoxically that we have that type of armed conflict in the 21st century. What is "religion"? Religion is an organized collection of [beliefs](#), [cultural systems](#), and [world views](#) that relate [humanity](#) to an order of existence [2].

The object of the paper is religion wars of XXI century.

The subject of the paper is the influence of religion wars on science's development.

Do we need a religion in the century of high technologies? Religion was founded by primeval people, who couldn't describe all of the developments they saw. In theory, religion had to die at the moment, when people started to do the first steps in the discovering of the world. It is the thing that disturbs us in findings in science, makes us afraid of mysterious "God's punishment" and creates the conflicts between people.

Now we have at least 5 types of religion conflicts. The most global and dangerous is the activity of Islamic groups. Their first armed conflicts were starting in 90s. The biggest performance of Islamic terrorists was happened on 11th of September 2001. Terrorists ruined the World Trade Center and tried to ruin the Pentagon.

Now is 2015 and we can see it all again. The organization ISIL made terroristic acts in France and threaten to the entire world. So terrorism is a result of religion. These people have an ideology to killing "infidel" people – parts of other religions or atheists. Religions only generate the bloodshed.

The other type of religion wars is the opposition of Christian branches. For the brightest example can be considered the Catholic and Protestant fight in North Ireland. Catholic people are like separatists in this situation, because they want to separate from the territory of The Great Britain, but this is no a good idea for Protestant. The armed conflict is stopped now, but they are waiting for new outbreaks of protests in the future.

The same situation is between Catholic Croatians and Orthodox Serbs that started during the World War II. Two nations of one ethnos were separated by different views about God.

There is an example when two religion branches separate one nation. It is the most important thing to our society to save nations from separatism. Civil wars are one of the biggest problems in 21st century. Religion separates people and countries.

The strained situation in India and Pakistan had started when Pakistan were separated because of religion differences. India is a Hindu country and Pakistan is Islamic, but India has Islamic regions nowadays, so Pakistan wants to pick them up.

The result of religion differences in this situation is a split of one united country and the constant threat of the armed conflict every day. People in India and Pakistan live under the stress all the time. Parts of the conflict often blame each other for the armed attacks. One can see how religion ruins nations and even countries and forces neighbors to be in enmity.

The next conflict is between Palestine and Israel.

This fight started because these two countries couldn't decide who the real owner of Jerusalem was. This city is important not only for parts of the conflict (Islamists and Jews) – it's important for all the representatives of Christian confessions. Although Jerusalem is under the protection because of sacred values it has, a lot of armed fights have been happening since last decade. The Muslims say that they will fight for Islamic shrines located in Jerusalem, but Jews will save Jerusalem like the Jews capital and the holy place for Israel people and all the Christians.

The result of this war may be terrifying. The great city with the big history can be ruined because to countries from different confessions can't choose the owner and decide whose religion is more important.

All these nations fight for their religion for a long time. They spent a lot of money, time and people recourses on these wars. All these recourses were lost because of religion. Meanwhile a great deal of these countries is falling in the sense of scientific, technical and economic development. People should understand what is really necessary for them: to be right and satisfied in their creeds or to be developed. We have a global problem caused by religion: the decline of science. One of the goals of religion is to liberate mankind as far as possible from the bondage of egocentric cravings, desires, and fears [1].

The relationship between religion and science has been a subject of study since [classical antiquity](#), addressed by philosophers, theologians, scientists, and others. Perspectives from different geographical regions, cultures and historical epochs are diverse, with some characterizing the relationship as one of conflict, others describing it as one of harmony, and others proposing little interaction.

Science acknowledges reason, empiricism, and evidence, while religions include revelation, faith and sacredness whilst also acknowledging philosophical and metaphysical explanations with regard to the study of the Universe [3].

As a general view, this holds that while interactions are complex between influences of science, theology, politics, social, and economic concerns, the productive engagements between science and religion throughout history should be duly stressed as the norm. But I think that it isn't normal for our society to make complex of religion and science.

To conclude, religion is an evil. In our century we should discover the space, find some medicine and make new steps in high technologies. Religion and wars that it creates return us to primeval society and prevent us from important things. We should make new friends from other nations, create affiliate relations with the countries and help each other to live in this world. But instead of this we generate the violence that prevents us from discovering the world.

Religion is unnecessary form of self-determination in 21st century. People can show their superiority a different ways: in art, economics, relations, technologies. If people will eradicate the religion like a phenomenon, planet and our children will be saved from extinction, violence and a lot of social problems.

Let us make our world without enmity that religion wars can generate.

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THE CABINET OF MINISTERS OF UKRAINE. THE STRUCTURE AND DIVISION OF RESPONSIBILITIES AMONG THE MEMBERS OF THE GOVERNMENT.

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Summary: The article deals with functions and structure of the Cabinet of Ministers of Ukraine. According to the Constitution of Ukraine it seeks to ensure the rights and freedoms of man and citizen, the guarantee of liability to the citizens by providing them with decent living conditions. The Cabinet exercises its powers within the limits established by the Constitution and laws of Ukraine. The study has proved the Cabinet of Ministers of Ukraine to be one of the most important bodies in the state mechanism of Ukraine, as it participates in directing vector policy and international relations with other countries and in solving nationwide issues. Understanding of the organization and improvement of its functioning is relevant to all areas of Ukraine's population.

Key words: Constitution of Ukraine, government, the Law of Ukraine “On the Cabinet of Ministers of Ukraine”, the structure of CMU.

Анотація: Стаття присвячена розгляду функцій та структури Кабінету Міністрів України. Згідно Конституції України він спрямовує свою діяльність на забезпечення прав і свобод людини і громадянина, гарантування відповідальності держави перед громадянами за забезпечення їм гідних умов життя, здійснює свої повноваження в межах, установлених Конституцією та законами України. У результаті дослідження було виявлено, що Кабінет Міністрів України є одним з найважливіших органів у державному механізмі України, бо він приймає участь у спрямуванні вектору політики й міжнародних відносин з іншими країнами та у вирішенні загальноукраїнських питань. Розуміння організації та покращення функціонування КМУ є актуальним для усіх сфер населення України.

Ключові слова: Закон України “Про Кабінет Міністрів України”, Конституція України, структура КМУ, уряд.

Аннотация: Статья посвящена рассмотрению функций и структуры Кабинета Министров Украины. Согласно Конституции Украины он направляет свою деятельность на обеспечение прав и свобод человека и гражданина, обеспечения ответственности перед гражданами за обеспечение им достойных условий жизни, осуществляет свои полномочия в пределах, установленных Конституцией и законами Украины. В результате исследования было выявлено, что Кабинет Министров Украины является одним из важнейших органов в государственном механизме Украины, потому что он принимает участие в направлении вектора политики и международных отношений с другими странами и в решении всеукраинских вопросов. Понимание организации и улучшения функционирования КМУ является актуальным для всех сфер населения Украины.

Ключевые слова: Закон Украины “О Кабинете Министров Украины”, Конституция Украины, правительство, структура КМУ.

The Cabinet of Ministers of Ukraine is the highest organ in the executive power. It is responsible to the President of Ukraine and the Verkhovna Rada of Ukraine and is controlled by and accountable to the Verkhovna Rada of Ukraine within the limits of envisaged by the Constitution of Ukraine. The Cabinet of Ministers of Ukraine is guided by the Constitution and laws of Ukraine and decrees of the President of Ukraine and resolutions of the Verkhovna Rada of Ukraine in accordance with the Constitution and laws of Ukraine.

The Cabinet of Ministers of Ukraine exercises executive power directly and through ministries, other central executive authorities, local state administrations, directs, coordinates and supervises the activities of these bodies.

The Cabinet of Ministers of Ukraine is a collective body, which takes the decision after discussions at its meetings, unless otherwise provided by law. The Cabinet of Ministers of Ukraine, according to the Constitution and laws of Ukraine, approves the Regulation of the Cabinet of Ministers of Ukraine, which defines the organization of the Cabinet of Ministers of Ukraine, and solves other current issues of its activity.

Posts of members of the CMU are political posts, on who do not spread civil service legislation and labor legislation. Specifics of service on these posts are determined by law.

As the supreme executive authority the Cabinet:

- heads the system of executive power in Ukraine;
- ensures in accordance with the Constitution of Ukraine the functions and powers of the executive power in Ukraine;
- directs the activities of ministries and other executive agencies;
- decides issues referred to the Constitution of Ukraine and laws of its competence.

Part 1 of Article 114 of the Basic Law stipulates that the Cabinet of Ministers of Ukraine consists of the Prime Minister of Ukraine, the Prime Minister First Vice, the Vices of Prime Minister and Ministers [3].

According to the same paragraph 12 of part 1 of article 85, paragraph 10 of part 1 of article 106 and part 4 of article 114 of the Constitution of Ukraine implies the presence of two required posts: Minister of Foreign Affairs of Ukraine and the Minister of Defense of Ukraine.

Thus consolidating the overall composition of the Government (Article 114), the Constitution of Ukraine provides the existence in its composition: the Minister of Foreign Affairs of Ukraine, the Minister of Defense of Ukraine, the Minister of Internal Affairs of Ukraine, the Minister of Justice of Ukraine. These posts are “classic” for most modern governments.

For example, V.Y. Malinovsky said that analyzing the structure and composition of the cabinets in different periods of history one may note that there is a classic list of ministries, heads of which must be members of the government boards [7, p. 35]. First of all, the Ministry of Foreign and Internal Affairs, Defense, Finance, Justice, whose leaders have traditionally formed the Cabinet since the beginning of the modern state. Subsequently, the expansion of state functions led to joining the Government ministers in charge of economy, education, science and technology, health, social issues and others [5, p. 505].

The Decision of the Constitutional Court of Ukraine on 01.28.2003 year rightly noted that fixing the names of individual ministries and other central bodies of executive power, the Constitution of Ukraine thus predicted their existence and a stable operation [7].

According to paragraph 2 of Article 6 of the Law of Ukraine “On the Cabinet of Ministers of Ukraine” official composition (number and the list of posts) newly formed Cabinet of Ministers of Ukraine is determined by Verkhovna Rada of Ukraine and on the proposal by the Prime Minister of Ukraine together with the appointment of the personal composition of the Cabinet of Ministers of Ukraine. In case the Cabinet of Ministers of Ukraine takes decision about establishment, reorganization or liquidation of ministry, official composition of the Cabinet of Ministers of Ukraine is considered to be modified from the date of the decision [1].

The powers of the Government to establish, reorganize and liquidate ministries noted pursuant to the paragraph 9-1 of Article 116 of the Basic Law. Thus, according to the Law of Ukraine “On the Cabinet of Ministers of Ukraine” there should be indicated the notions “newly formed composition of Government” and “composition of the Government during its activities”.

Scientists say that the present situation of legal regulation changes in the government under the influence of political factors may pose a risk to the organization of both the government and the entire system of executive power. Thus, in accordance with paragraph 5 of Article 10 of the Law of Ukraine “On the Cabinet of Ministers of Ukraine”, the Cabinet of Ministers of Ukraine acquires powers and starts after taking the oath of not less than two-thirds of its official staff. Then appears an opportunity to “correct” its official staff.

Researchers, including O. Sovhyrya, note that for the prevention of appearance of such scenarios of events development, one should make additions to the Law of Ukraine “On the Cabinet of Ministers of Ukraine”, which provides that, in case when the Cabinet of Ministers of Ukraine takes decision about

establishment, reorganization or liquidation of ministry, official composition of the Cabinet of Ministers of Ukraine should not be less than two-thirds of its membership, defined by the Verkhovna Rada of Ukraine for the newly formed government [6, p. 37].

Since the adoption of the Constitution of Ukraine the government has been the part of a different number of ministers. Thus, in 1996 it consisted of 27 ministers, then later – it consisted of 15 ministers. However, in 2005 the number of ministers, members of the Cabinet of Ministers of Ukraine increased to 17. In 2006 the composition of the government was determined, which included 26 ministers. In the government, formed in 2010, the number of officials was already 27 people. The literature points to the need to determine scientifically proven efficient size of the Cabinet of Ministers of Ukraine. It is noted that it should be set in law. It is also necessary to restrict its maximum size through legislation [4, p. 63].

In conclusion, we would note that while conducting a more detailed study of the organ as the Cabinet of Ministers of Ukraine, we have revealed the establishment of the Cabinet and the history of its development as well as the change of powers in the process of Ukraine becoming an independent and sovereign state.

So according to the Constitution of Ukraine, the Cabinet of Ministers of Ukraine is the highest organ in the system of the executive power, which consists of the central and local organs of the executive power. As the highest collegiate organ, it has the power, both directly and through the central and local organs of the executive power, directing and controlling its activities.

According to the Constitution of Ukraine (Art. 107) such organ as the National Security and Defense Council of Ukraine under the President of Ukraine works. The Cabinet of Ministers of Ukraine is obliged to carry out the decisions of this Council which are put into effect by decrees of the President of Ukraine, to ensure the implementation of its measures for coordination and control the activities of the organs of the executive power in the National Security and Defense. The Prime Minister is a part of the Council of National Security and Defense Council of Ukraine.

Among the powers of the Cabinet of Ministers of Ukraine in relations with the Verkhovna Rada of Ukraine we should, first of all, note its participation in the legislative activities. According to Art. 93 of the Constitution of Ukraine Government has the right of legislative initiative in the Verkhovna Rada of Ukraine [2].

The Members of the Cabinet of Ministers of Ukraine on behalf of senior officials and experts of the government administration and also the central organs of executive power may participate in meetings of committees, temporary special commissions of the Verkhovna Rada on issues affecting the competence of the Cabinet of Ministers.

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THE NATURE OF SELF-LOVE OF THE MODERN WORLD

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Summary: The article deals with the problem of an exceedingly high level of human selfishness and self-centeredness on the example of researches of the modern society. It emphasizes the significance and the depth of the described phenomena while growing and reinforcing the influence on the mankind from the very beginning of human existence.

Keywords: egocentrism, human nature, narcissism, self-esteem, selfishness, self-love.

Анотація: Стаття розглядає проблему надзвичайно високого рівня егоїзму та егоцентризму людини на прикладі сучасного суспільства. Стаття наголошує на значущості та глибині описаних явищ у мірі того як вони зростали та посилювали свій вплив на людство з самого початку існування людини.

Ключові слова: егоїзм, егоцентризм, нарцисизм, природа людини, самозакоханість, самооцінка.

Аннотация: Статья рассматривает проблему чрезвычайно высокого уровня эгоизма и эгоцентризма человека на примере исследований современного общества. Статья выделяет значимость и глубину описанных явлений по мере того, как они росли и усиливали свое влияние на человечество с самого начала его существования.

Ключевые слова: нарциссизм, самовлюбленность, самооценка, природа человека, эгоизм, эгоцентризм.

Poised somewhere between sinful vanity and self-destructive submissiveness is a golden mean of self-esteem appropriate to the human condition.

The fact that through centuries people are becoming more and more self-centered is hardly argued. The mass media and social environment foster to think that human beings should take care of themselves and appreciate the importance of themselves. The media promotes unrealistic body image and makes people care about themselves even more. The so-called “selfies” flooded the internet is another stream appeared on the wave of self-loving. Psychologists are greatly concerned about the impact exerted on society and some of the perspective consequences that it will bring with high probability. The obsessive need to take photos of themselves is not only dangerous by pursuing people in the competition of the best “selfies” to endanger their life, but also favors and accelerates the development of such psychological disorders and problems as anxiety, low self-esteem, complicated cases of egocentrism and egomania. Advertising companies do not miss the opportunity to benefit from this world’s changing issue, and they really have progress in it. The commodities containing something special like names, interests, hobbies and/or specifically customized for a certain person are immediately swept from store shelves as it indulges people’s inner pursuit for narcissism and self-love.

The whole world is captivated by self-caring and self-indulgence. Nowadays the life of the majority of people is revolving around them. Starting a chain of thoughts in explaining the people’s actions, there is no way but end up with the opinion that people are selfish especially in the deepest unconscious levels. For instance, getting a pet seems to be a good deed, however, taking a closer look the true meaning is revealed. Taking care of someone, feeding and brushing a cute animal, spending time with it and treating it is definitely worth doing. But in reality, it is the action completely devoted to your own pleasures, as having a dog adds YOU a new friend (the problem of YOUR loneliness is partly solved), it satisfies YOUR desire to be dedicated to someone, if you get a pet out of sympathy it deprives YOU of that annoying feeling, it adds more positive emotions to YOUR life and so on. Thus in the end everything is centered in YOU.

Merriam-Webster dictionary defines *selfishness* as being concerned excessively or exclusively with oneself, seeking or concentrating on one’s own advantage, pleasure, or well-being without regard for others.

Narcissism is described as inordinate fascination with oneself; excessive self-love; vanity. This term has different definitions in various psychological approaches, e.g. psychoanalysis regards narcissism as erotic gratification derived from admiration of one’s own physical or mental attributes, being a normal condition at the infantile level of personality development.

Egocentrism is the inability to differentiate between self and other. More specifically, it is the inability to untangle subjective schemas from objective reality; an inability to understand or assume any perspective other than their own.

Although egocentrism and narcissism appear to be similar, they are not the same. Egocentric people believe that they are the centre of attention, like narcissists, but do not receive gratification by one's own admiration. An egotist is a person whose ego is greatly influenced by the approval of others while a narcissist is not. The examples of these phenomena are seen in the modern society when people pursue their own interests without regard to the needs of others.

It is this latter view to which Sue Gerhardt subscribes calling for an end to greed, materialism and selfishness that turn people into monsters devouring everything on the way for self-indulgence. She reminds that there are other more important values than material well-being and self-satisfaction: the value of community, family and caring for other people [5].

David G. Meyers studies the people’s attitude to themselves and to the world in general. Expressing the ideas about the common features of human behavior and self-attitude he does not concern selfishness itself but describes such a human phenomenon as pride. He delineates the inclination for favorably biased self-ratings as higher than average, self-serving bias, cognitive conceit, self-justification, misremembering the past in self-enhancing ways, believing in flattering rather than in self-deflating descriptions, unrealistic self-images,

superiority complexes and a variety of other observable facts forming modern personalities. The fact that most drivers (even those who have been hospitalized for accidents) believe them to be more skillful than an average driver is an example of good biased self-rating. High school seniors estimate them to be higher than average in most areas of ability in comparison to average people of their age. Nobody sees himself or herself as average. This makes wonder about people's self-esteem. Speaking of such human features, he does not deny the possible low self-esteem problems, but talks about a general tendency [2].

The described tendency for selfishness has found its determination and justification in the gene-centered view of evolution. The example of such a concept is presented in Richard Dawkins's controversial book built on the principal theory of George C. Williams. Dawkins uses the term "selfish gene" as a way of expressing the gene-centered view of evolution. He creates a model of a society in which selfishness is understood as something undoubtedly, involuntarily and necessarily inherent to human nature. More specifically, he claims that all living creatures are machines created by genes. In some cases the genes have survived in a highly competitive world for millions of years. This entitles people to expect certain qualities in the genes. Dawkins argues that a predominant quality to be expected in a successful gene is ruthless selfishness; as a result, this gene selfishness usually gives rise to selfishness in individual behavior. However, there are special circumstances in which a gene can achieve its own selfish goals best by fostering a limited form of altruism at the level of individual animals. Much as people might wish to believe otherwise, universal love and the welfare of the species as a whole are concepts that simply do not make evolutionary sense [4]. Though being criticized for the inappropriate usage of the word "selfish" regarding genes, it does not cross out the notion that even in DNA there is some background making people behave selfish. And if people have such a strong excuse to behave selfish it is obvious to see them start questioning if it is really necessary to condemn selfishness.

Paul K. Piff claims that people are more narcissistic now than ever, but narcissism is not evenly distributed across social strata. Five of his studies demonstrate that a high social class is associated with an increased entitlement and narcissism. Upper-class individuals report greater narcissistic personality tendencies, and they are more likely to behave in a narcissistic fashion. He describes a shift from communal values toward self-interest. His observation is corroborated by mounting empirical evidence. However, growing societal narcissism may be qualified by an important caveat. Paul K. Piff believes that narcissism varies by a people's social class or socioeconomic status and that a social class uniquely shapes people's patterns of thoughts, feelings, and actions. Relatively abundant resources and an elevated rank afford upper-class individuals to have the increased control over their lives, the reduced exposure to external influences, and more personal choice, all of which promote greater independence and self-focus. In contrast, lower-class individuals, who have reduced resources, a subordinate rank, and the reduced personal control, are interdependent and other-focused. Guided by these findings, he hypothesizes that relative to their lower class counterparts, upper-class individuals exhibit increased narcissism and will do so, in part, because of their increased sense of entitlement [3].

David Foster Wallace states that people have changed the way they think of themselves as citizens. They do not think of themselves as citizens in the old sense of being small parts of something larger and infinitely more important to which they have serious responsibilities. They think of themselves now as eaters of the [American] pie [1].

Considering everything aforesaid, it is necessary to conclude that all the authors mentioned and many others are concerned about the current situation of the world and are looking for the explanation of the factors underlying these processes and ways of solving these problems. Moreover, as people are aware of it and realize the significance of such phenomena, humankind is able to really direct the efforts to change themselves and thus the world for better.

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**ARABIAN GLOBALISM AS A NEW PHENOMENON
OF THE ARABIAN-MUSLIM COUNTRIES**

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Summary: The present paper covers the notion of Arabian globalism which is a type of globalization process at the same time possessing its own distinctive characteristics. The general Arabian tendency to preserve their own identity can be seen in all the aspects of life in Arabian-Muslim countries including the language, which is also viewed in the article.

Keywords: Arabian states, globalization, globalism, national identity.

Анотація: У статті розглядається поняття арабського глобалізму, який є одним з прикладів реалізації процесу глобалізації, який в той же час має свої відмінні характерні риси. Загальна арабська тенденція зберігати власну ідентичність може бути простежена в усіх аспектах життя, включаючи мову, що також відображено у статті.

Ключові слова: арабські держави, глобалізація, глобалізм, національна ідентичність.

Аннотация: В статье рассматривается понятие арабского глобализма, который является одним из примеров реализации процесса глобализации, который в то же время имеет свои отличные характерные черты. Общая арабская тенденция сохранять собственную идентичность может проследиваться во всех аспектах жизни, включая язык, что также отображено в статье.

Ключевые слова: арабские государства, глобализация, глобализм, национальная идентичность.

The growth of conflict in the political arena led to increasing international interest to the processes of globalization and their impact on the position of countries. The countries of the Arabian East became the focus of researchers only in recent years. Despite the growth indices of democracy and economic growth, there are growing conflict and religious tensions there.

According to the KOF Index of Globalization [5] the Arabian East in the period from 2012 to 2013 increased its own index of globalization. Calculation of the index accounts for more than 24 economic, social and political settings. Among the countries of the Arabian East the most developed ones possess low index growth (about 0.3-0.7), whereas developing countries have high rates (around 1.2-1.5). Moreover, the index of democratization and informatization countries is also gradually increasing.

Countries of the Arabian East are actively involved in international processes through articulation of their interests in the international scene through regional organizations. Except general political interests and questions of economic cooperation, the Muslim world addresses to the international community concerning preservation of cultural uniqueness for inheritances. On the other hand, total closure and the backwardness of the Arabian East raise questions about the prospects for the implementation of globalization.

It should be noted that researchers of the Arabian countries do not meet a consensus on how globalization takes root and it develops in general in this territory. It is believed that all the current trends in the Arabian world can be called tribalization – return to the structure of the Arabian Caliphate with its distinct religious identity and close ties between the Arabs. This process is the general background of disappointment in the possibility of democratic reforms, increasing the role of religion and national identity.

The Arab world has become an example of tribalization in two ways: authoritarian nationalism and religious fanaticism. Both ways of feuding among themselves nationalists accuse the Islamists is that they put religion in the first place, and the Islamists, in turn, accused the nationalists in lead religion to the background. The propaganda war between the two camps shows that this is only the beginning of a deep and destructive conflict [2].

Ukrainian researchers, including J. Igoshina and D. Arkhipova put forward three main ways of implementation and the perception of globalization among Muslims:

- The first approach is because part of the Arab population, as well as some governments completely deny the need for globalization. They follow the idea that Muslim countries need to isolate the "pernicious influence of Western culture." The process of globalization in this version is seen as "the enemy" unique and original culture for the Arabian East. [1]
- The second approach is based on a desire to implement trends of globalization only partially. Researchers are inclined to think that American culture tends to dominate and admire the world space, not only economically, but also culturally. In this case, "national mission of the entire Arabian world is to protect their own culture and technical development of the event for their own development potential of Islamic culture" [4; with. 37].

• The third approach is reflected in the full support of globalization and the need to reform the political and economic structure of the state. This process is seen as essential and inevitable, and if the Arab East seeking to enter the international political arena, they must adhere to the general trend [3; with. 115].

None of these approaches provides bright reflection of the realities of the countries opposed to opinions, of "authenticity globalization of the Arabian East." The main feature of the Arabian East is their desire to preserve their national identity under any circumstances. Under the influence of consolidating religion role among the Arab population special "scenario" of globalization gradually was formed and developed, among the Arab researchers was fixed as "the Arabian globalism". The Arab-Muslim world did not go on the way of simple loan of the terminology offered by the western scientists. It agrees with grammar of the Arabic language were own terms are created. The term "aulyama" formed from the word "alyam" – "world", on a formula is analog of the term "globalization" in the Arabic language, "updating" or "addition" matters. For the first time the term "aulyama" was used by the famous Arabian scientist Samir Amine [1].

It is necessary to emphasize unwillingness of representatives of the Arab-Muslim world to borrow foreign words, and attempt of a deep reflection over these concepts, testifies the special relation to influence of the western culture and desire to keep a cultural originality [1]. In the 20th century the process of standardization of the Arabic language amplifies that, in turn, leads to reduction of a gap between literary Arabic and its numerous dialects. This tendency can promote gradual transformation of the Arabic language, which certainly will create a more consolidated space on the Arabian territories.

"The Arabian globalism" gradually became "business card" of the Muslim countries. It is necessary to say that such option of globalization became the first prerequisite for an entrance of the Arabian countries to the international political arena. The main signs of the Arab globalism, among which were gradually allocated:

- refusing from loans of cultural and national achievements of the western countries;
- use of achievements of technical progress of the western countries and cooperation with the European countries in "the intellectual capital";
- "Arabization" of foreign-language terminology;
- creation of opportunities for an exchange among student's youth;
- representation of the Arab population at the level of the interstate regional organizations;
- activity of the organization is regulated only by supranational interests of the Arab population and is guided by the Koran and laws of Sharia;
- minimizing political and maximizing economic integration of the countries of the Arabian East [1]

Such strategy of the countries of the Arabian East caused their rapid growth and development. At the general tendency to unification and standardization of the existing processes, the Muslim countries acted as innovators – they not only kept the existing regional features, but also extended own cultural influence on other countries.

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TRANSNATIONAL CORPORATIONS' INFLUENCE ON THE GLOBAL ECONOMY AND FORMING OF MODERN INTERNATIONAL ECONOMIC RELATIONS

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Summary: The article studies transnational corporations TNCs in the context of international economic relations, their economic and social impact, influence on economic development and the social sector. The article gives an account of economic reasons of TNCs developing. The article contains analysis of data on the largest TNCs and their impact on individual states and global economy.

Keywords: cash holdings, foreign direct investment, home country, national development, subsidiaries, transnational company.

Аннотація: У статті розглянуті транснаціональні корпорації в контексті міжнародних економічних відносин, їх економічний та соціальний вплив на економічний розвиток і соціальний сектор. У статті пояснено економічні причини розвитку ТНК. В статті проаналізовані дані по найбільшим ТНК та їх вплив на окремі держави і світову економіку.

Ключові слова: грошові авуари, дочірня компанія, країна базування, національний розвиток, прямі іноземні інвестиції, транснаціональна корпорація.

Аннотация: В статье рассмотрены транснациональные корпорации в контексте международных экономических отношений, их экономическое и социальное влияние на экономическое развитие и социальный сектор. В статье разъясняются причины развития ТНК. В статье проанализированы данные по крупнейшим ТНК и их влияние на отдельные государства и мировую экономику.

Ключевые слова: денежные авуары, дочерняя компания, национальное развитие, прямые иностранные инвестиции, страна базирования, транснациональная корпорация.

The emergence and further development of transnational corporations have significant influence on the world economy, economies of individual states and the development of international economic relations.

They cooperate well with governments and businesses in many countries. Most often this occurs because of the low level of socio-economic development of the region and the economic crisis. TNCs can assist in the development of extractive industries, and sometimes create branches or subsidiaries in the field of manufacturing. Using the plight of the country, its territory is transferred to the most complex manufacturing, and environmentally hazardous industries, which could harm the environment.

TNCs are participating more and more in the economy of developing countries, multinational corporations occupy the leading position in some very important areas. In addition, MNCs are attracted to their expertise by local companies, mainly SMEs. They become dependent on large companies. Yet it may have a positive effect on the economy of a developing country. TNCs contribute to the development of economic sectors that are associated with their activities, can change the structure of the economy and increase the involvement of the state in international economic relations.

But multinationals influence developed countries too. In the case when a foreign company launches a significant impact on the economy, it naturally begins to meddle in macroeconomic processes, generating contradictions between the interests of multinational corporations and the interests of the State.

Multinationals impact the global economy as a whole. They occupy a dominant position in a number of industries in individual countries, regions and the global economy as a whole. And it is not only in production but also in the trade. TNCs are investing in the economy of many countries, they are developing their businesses on countries' territory and contribute to the development of other industries [2].

International corporations have been heavily criticized, because they exploit the economies of developing countries, they do not impose favorable policies for them, carry back most hazardous industries, because they cause damage to their country, transferring production to other countries thereby depriving the inhabitants of the country of the jobs.

But the activities of transnational corporations can not be evaluated only from the worst side. TNCs promote international division of labor, production and development of science and technology. Despite the fact that wages in the branches of the company are lower than in the home country, it is still often very high for developing countries, and, in addition, such large companies give their employees some social guarantees. Sometimes the most underdeveloped countries open their markets to large multinational companies, aware of their benefits.

The activities of transnational corporations are connected with the interests of their states. Each country is trying to do the best for its citizens and to preserve national characteristics. Countries interact in the course of achieving goals of national development, and thus make international relations. Naturally, they disagree on questions about fuel, raw materials and human resources, as well as struggle for new markets continue [3].

The interests of transnational corporations and the ones of the country in which they are based are generally the same. Transnational corporations allow their country to access the resources of other countries. In addition, products manufactured overseas will not be subject to duties of the state where the product was manufactured.

TNCs provide the impact of the basing state on the economy of other countries. Earlier control was carried over Colonial Countries and over free ones with pressure on their governments. Now, even in case of some of the political independence of the state through its large international corporations some countries can maintain economic dominance. The benefit of such states is obvious, and so they provide the most influential corporations with their political support.

As can be seen from the above, the economic and political importance of transnational corporations is very high. They help to develop mutual understanding, trust with partner countries to strengthen economic impact on the world economy. Thus, the state should help to develop its TNCs, which is important at the moment for Ukraine, which seeks to strengthen its position in international economic relations [1].

Cash holdings of TNCs are record high, but they still do not result in a steady increase of investment. The current excess liquidity can facilitate the growth of FDI in the future. TNCs are still no hurry to invest their record high holdings. In 2013, the economic activity of foreign affiliates increased by all indicators of international production (Table 1).

Table 1

Selected indicators of FDI and international production, 1990-2013 (cost volume in current prices, in billions of dollars)

Indicator	1990	2005–2007 (average pre-crisis rate)	2009	2011	2013
FDI inflow	207	1473	1198	1309	1524
FDI outflow	241	1501	1175	1451	1694
The volume of imported FDI	2081	14588	18041	19907	20438
The volume of exported FDI	2093	15812	19326	20865	21168
Income from imported FDI	75	1020	960	1178	1359
Profitability of imported FDI	4,2	7,3	5,6	6,3	7,1
Income from exported FDI	122	1100	1049	1278	1470
Profitability of exported FDI	6,1	7,2	5,6	6,4	7,3
Sales volume of foreign affiliates	5102	20656	23866	25622	27877
World GDP	22206	50411	57920	63075	69660

Source: UNCTAD, World Investment Report 2014 [4].

The volume of international production of transnational corporations increased, but they still refrain from investing their record high cash holdings.

This year foreign affiliates have employed approximately 69 million. People who provide sales of 28 trillion dollars and value added of 7 trillion dollars, which is about 9% more than in 2012. Annual data survey of the 100 largest TNCs prepared by UNCTAD reflecting the overall up-trend in the field of international production: the volume of foreign sales of these firms and the number of workers abroad is growing much faster than in their home countries. Despite the gradual growth of international production by TNCs, their record levels of cash holdings have not yet resulted in a steady increase of investment. According to UNCTAD, the level of cash holdings reached more than 5 trillion dollars, including retained earnings of foreign subsidiaries.

The data of these 100 largest TNCs suggest that during the global financial crisis, they have reduced capital expenditures for fixed assets and acquisition (especially abroad), making a choice in favor of increasing their own funds. In 2011, the amount of funds of only those 100 companies reached a record high: 1.03 trillion dollars, 166 billion dollars of which exceeded the projected amount, that were higher than the level which was assumed on the basis of the average pre-crisis level of cash holdings. Although recent data indicate that the capital cost of TNCs on production assets and acquisition growth (their growth in 2013 was 12%), additional funds they own (about 105 billion in 2013) are still not fully available. Recurrence of instability in international financial markets will continue to contribute to the build-up of liquidity and their use for other purposes – payment of dividends or reducing debt. However, the improvement of the conditions of the current excess liquidity in the future may result in the growth of FDI. If you build investment forecasts for the 100 largest TNCs, the amount of capital that can be placed in the form of investment is 500 billion dollars, or about one-third of global FDI flows.

Today multinational corporations control 80% of industrial production, especially with high added value. Also, over 60% of world foreign trade easily allows them to do their extensive grid branches and associated companies. And most importantly, TNCs control 92% of global FDI flows.

Almost all the major multinationals by their domestic supplies refer to the "triad" – three economic centers of our planet: the US, EU and Japan.

In recent years multinationals of newly industrialized countries are developing business in the global market. Industry structure of TNC is diversified: 60% of international companies are engaged in production (they specialize primarily in electronics, automotive, chemical and pharmaceutical industries), 37% - in the service sector and 3% - in the mining industry and agriculture.

Summing up the above, we can say that the impact of transnational corporations on the world economy is complex, it is not always positive for the host country, but TNCs help to develop international markets of goods, services, labor and capital, and in total international economic relations and to adapt to the standards of today.

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SOME ASPECTS OF THE PROCEDURAL STATUS OF MINORS IN THE CRIMINAL PROCEEDINGS OF UKRAINE

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Summary: The article explores the particularities of the legal status of minors in the country and regards the procedural status of persons who have not attained the age of majority. Particularities of criminal-procedure activity in the production of socially dangerous acts of persons under the age of criminal responsibility and their criminal procedure provisions during the proceedings have been given. Recommendations for further improvement of the criminal procedure legislation of Ukraine in respect of the participation of minors have been given.

Keywords: criminal proceedings, criminal responsibility, incapacity, legal personality, legal status, minors, procedural status of a minor.

Анотація: Стаття досліджує особливості правового статусу неповнолітніх у державі та стосується процесуального становища осіб, які не досягли повноліття. Досліджуються особливості кримінально-процесуальної діяльності у провадженнях про суспільно небезпечні діяння неповнолітніх, які не досягли віку кримінальної відповідальності, та їх кримінально-процесуальне становище під час провадження у таких справах. Надаються рекомендації щодо подальшого удосконалення кримінального процесуального законодавства України в частині, що стосується участі у ньому неповнолітніх.

Ключові слова: кримінальна відповідальність, кримінальне судочинство, недієздатність, неповнолітні, правовий статус, правосуб'єктність, процесуальний статус неповнолітнього.

Аннотация: Статья исследует особенности правового статуса несовершеннолетних в государстве, и касается процессуального положения лиц, не достигших совершеннолетия. Исследуются особенности уголовно-процессуальной деятельности в производствах об общественно опасных деяниях несовершеннолетних, не достигших возраста уголовной ответственности, и их уголовно-процессуальное положение во время производства по таким делам. Даются рекомендации по дальнейшему совершенствованию уголовного процессуального законодательства Украины в части, касающейся участия в нем несовершеннолетних.

Ключевые слова: уголовная ответственность, уголовное судопроизводство, недееспособность, несовершеннолетние, правовой статус, правосубъектность, процессуальный статус несовершеннолетнего.

The essential changes in the Law of Ukraine, having a significant impact on the regulation of legal status of minors in our country and concerning the procedural status of under-age persons, should contribute to the fulfillment of tasks facing the criminal proceedings and consisting in the enhancement of legal protection of minors.

The analysis of the current Criminal Procedural Law, regulating the legal status of a minor who committed a crime or became its victim, shows that it does not fully conform to the task of ensuring the rights and legitimate interests of this person and to the international standards of treating a child, especially the one being in the difficult conditions of criminal investigation. The Criminal Justice Science has not completely studied the procedural status of minor participants of criminal proceedings, especially those who violated the law on criminal responsibility [3; 4; 5; 6].

The authors O.M. Bandurka, Y.V. Baulin, V.K. Shkarupa, O.G. Frolova and others dedicated their works to the general aspects of legal status of minors and a number of related issues. As to the Criminal Justice Science, such scientists in the field of criminal proceedings as A.Y. Vetrova, O.K. Galimov, L.M. Golubeva, Y.M. Groshevoy, L.L. Kanevskiy, G.K. Kozhevnikov, O.S. Lando, O.O. Levendarenko, V.V. Leonenko, I.S. Manova, V.I. Maryniv, E.B. Melnikova, G.M. Minkovskiy, G.M. Omelyanenko, D.P. Pysmennyi, V.A. Rybalska, N. Sh. Safin, V.M. Trubnikov, V.V. Shimanovskiy and N.V. Shost' developed this issue in their works. However, in most works the legal status of minors was studied only in terms of the features of procedure of investigating these persons' crimes, while the analysis of their legal status as the participants of proceedings was carried out without taking into account the whole set of issues, resulting from the specific character of these subjects of criminal proceedings.

Speaking about the whole group of minors involved in the criminal proceedings and pursuing the selected issue (the criminal status of a minor), we can take up the aspect of criminal status of minors who committed an action, stipulated by the Special Part of the Criminal Code of Ukraine, within the limits of status of a person in this field of proceedings (criminal status). In general, the status of this group of minors can be also subdivided into the criminal status of minors who committed a crime and the criminal status of minors who committed a socially dangerous action, being under the age of criminal responsibility. As most minors can be referred to the first group and the criminal status of minors of the second group is related to a number of issues discussed below, we shall mainly focus on the specificity of formation of the criminal status of minors who committed a crime and of introduction of this status into the Criminal Code of Ukraine [8].

It should be noted that the criminal status of minors who committed a crime coincides with the status of an adult (an adult suspect, accused, defendant), which is stipulated in the relevant articles of the Criminal Code of Ukraine. But if the specificity of general impact of nonage as a legal fact-status is taken into account, the minors, involved in the criminal proceedings, in general, and the minors, who committed a crime, in particular, are actually limited as a rule in their legal personality (legal capacity and ability) compared to the adult participants of criminal proceedings [2]. With due regard to the number of previous conclusions, related to the prospects of criminal procedure development, we should note that the theoretical model of criminal status of minors who committed a crime shall take the following aspects into account:

- specificity of psychophysiological development of minors, displayed when participating in the criminal proceedings;
- legal consequences, related to the existing legal restrictions on the one hand and to the introduction of additional legal means of protection of rights and legitimate interests of these persons on the other hand;
- existence of the connection between the general and the special, i.e. both the general procedural rights and obligations (of subjects of criminal proceedings) and the special procedural rights and obligations (of minors as subjects of criminal proceedings) must be vested in the minors, participating in the criminal proceeding.

The criminal status of minors who committed a crime will be based on the relevant criminal status of adult suspect, accused, defendant, pursuant to the same nature of participation in the criminal proceedings (both the general criminal status of a person in this field of proceedings and the institutional criminal status), accordingly adapted to the psychophysiological characteristics of minors. Therefore, the procedural status of a minor who committed a crime should be a kind of revised criminal status of a common (adult) suspect, accused, defendant, which corresponds to the minor's ability to percept it, be aware of it (at the information level) and realize it, and it should include not only the generally known procedural rights and obligations, but, as an exclusion, special rights and obligations as well (let us say: special for the minors) [7, c. 193-195].

The legal status is vested in every person, including the minors, which makes it possible to characterize them as subjects of right. The criminal status of a person is established with due regard: to his/her being related to the crime, the legal nature of participation in the proceedings, nature of legal relations, the person's specific features [1]. The possibility of status-based differentiation between the groups of subjects of criminal proceedings determines a general approach to the regulation of their situation. A special attention should be paid to the mutual consistency of status of the participants of proceedings.

The nonage of a person has the following legal consequences: certain legal restrictions are established for him/her; the additional legal means of protection of his/her rights and legitimate interests are provided. The existence of these special features requires that they are obligatory taken into account in the laws, when the status of a minor is formed, i.e. both the general procedural rights and obligations (of subjects of criminal proceedings) and the special procedural rights and obligations (of minors as subjects of criminal proceedings) must be vested in the minors participating in the criminal proceeding. It applies not only to those of them who committed a crime, but to all persons under 18, involved in the criminal proceedings.

Taking the foregoing into account and aiming at the perfection of procedural status of a suspect, accused, defendant, we offer the following: 1) to increase the application of emulation principle at the stage of pre-trial proceedings; 2) to introduce the standards of international legal acts, establishing the status of a person during the proceedings, to the full extent; 3) to work out in detail and extend the rights of accused person and to secure new rights, covering the major part of legitimate interests of accused person but not legislatively secured. Besides, some provisions, taking into account the specific nature of procedural status of minors, brought to the criminal responsibility, in compliance with their age, mental and psychological characteristics, should be introduced in Part 6, Chapter 38 of the Criminal Code of Ukraine, dealing with the proceedings in case of crimes of minors. It is advisable to apply this procedure when regulating the criminal status of any minor, involved in the criminal proceedings.

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MATHEMATICS AND ART
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Summary: The article describes Mathematics and Art in terms of the one representation of the three-dimensional world on a two-dimensional canvass. The article deals with a valuable linear perspective and interconnection between Mathematics and Art. The result of the study is: some individuals known as artists have needed to develop or use mathematical thinking to carry out their artistic vision.

Key words: art, golden ratio, linear perspective, mathematical thinking, mathematics.

Анотація: У статті описується математика та мистецтво з точки зору представлення примірною світу у двомірному полотні. Стаття присвячена розгляду лінійної перспективи й взаємозв'язку між математикою та мистецтвом. У результаті дослідження було виявлено, що деякі люди, відомі як художники використовують математичне мислення, щоб втілювати своє художнє бачення.

Ключові слова: золотий перетин, лінійна перспектива, математика, математичне мислення, мистецтво.

Аннотация: В статье описываются математика и искусство с точки зрения представления трехмерного мира на двумерном полотне. Статья посвящена рассмотрению линейной перспективы взаимосвязи математики и искусства. В результате исследования было выявлено, что некоторые люди, известные как художники, используют математическое мышление, чтобы воплощать свое художественное видение.

Ключевые слова: золотое сечение, искусство, линейная перспектива, математика, математическое мышление.

There is an implausible relationship between art and mathematics. After all, the two domains seem to depend on absolutely different thinking patterns. We do not question the interrelationship between science and mathematics, and the scientific process is clearly contingent on mathematics. How then did Ferguson manage to put together a historical review linking art and technology? Ferguson's research indicates that inventors and art are closely connected [3]. Ferguson cites many examples of how inventors have depended on art. Benjamin Henry Latrobe, a prominent architect and engineer, was an accomplished watercolorist. Samuel Morse,

American inventor of the Morse Code and the telegraph, as well as Robert Fulton [6], inventor of the steamboat frame, were both artists before they converted to careers in technology. Ferguson's testimony of artists-turned-technologists and vice-versa is extensive and persuasive. The relationship between technology and art is truly exist. At the most practical level, mathematical tools have always been used in an essential way in the creation of art.

During the Renaissance, several artists used simple grids and mathematically-based devices to accurately portray scenes on a flat surface, according to the principles of linear perspective. The symbiosis of art and mathematics was developing from these times. Linear perspective and projective geometry are the most striking examples of art and mathematics evolving almost simultaneously in new directions. So, how does one represent the three-dimensional world on a two-dimensional canvass? There are two aspects to the problem, namely how does one use mathematics to make realistic paintings and secondly what is the impact of the ideas for the study of geometry. By the 13th Century Giotto was painting scenes in which he was able to create the impression of depth by using certain rules which he followed. Some of his last works suggest that he may have come close to the correct understanding of linear perspective near the end of his life.

The person who is credited with the first correct formulation of linear perspective is Brunelleschi. He appears to have made the discovery in about 1413. He understood that there should be a single vanishing point to which all parallel lines in a plane, other than the plane of the canvas, converge. His understanding of scale was also important. He correctly computed the relation between the actual length of an object and its length in the picture depending on its distance behind the plane of the canvas. Using these mathematical principles, he drew two demonstration pictures of Florence on wooden panels with correct perspective.

Now in Leonardo's early writings [2] we find him echoing the precise theory of perspective as set out by Alberti and Piero. He writes that perspective is a rational demonstration by which experience confirms that the images of all things are transmitted to the eye by pyramidal lines. Those bodies of equal size will make greater or lesser angles in their pyramids according to the different distances between the one and the other. By a pyramid of lines I mean those which depart from the superficial edges of bodies and converge over a distance to be drawn together in a single point. He developed mathematical formulas to compute the relationship between the distance from the eye to the object and its size on the intersecting plane, that is the canvas on which the picture will be painted. If you place the intersection one metre from the eye, the first object, being four metres from the eye, will diminish by three-quarters of its height on the intersection; and if it is eight metres from the eye it will diminish by seven-eighths and if it is sixteen metres away it will diminish by fifteen-sixteenths, and so on. As the distance doubles so the diminution will double. Perhaps in Leonardo, more than any other person we mention in this article, mathematics and art were fused in a single concept.

Today's mathematical tools are more sophisticated, with digital technology fast becoming a primary choice. In the hands of an artist, computers can produce art. Mathematical transformations provide the means by which an image or form in one surface or space is represented in another. Art is illusion, and transformations are important in creating illusion. Isometries, similarities, and affine transformations can transform images exactly or with purposeful distortion, projections can represent three (and higher)-dimensional forms on two-dimensional picture surfaces, even curved ones.

Transformations and symmetry are also fundamental concepts in both mathematics and art. Mathematicians actually define symmetry of objects (functions, matrices, designs or forms on surfaces or in space) by their invariance under a group of transformations. Conversely, the application of a group of transformations to simple designs or spatial objects automatically generates beautifully symmetric patterns and forms. Each of these is richly associated with mathematics. Among the connections to the visual arts, mathematics can provide tools for artists, such as the rules of linear perspective.

Mathematics has directly influenced art with conceptual tools, the analysis of symmetry and mathematical objects such as polyhedra and the Möbius strip. Mathematical concepts such as recursion and logical paradox can be seen in paintings by Rene Magritte and in engravings by M. C. Escher.

The golden ratio, roughly equal to 1.618, was known to Euclid. The golden ratio has persistently been claimed in modern times to have been used in art and architecture by the ancients in Egypt, Greece and elsewhere, without reliable evidence. The golden ratio is more definitely discernible in artworks including Leonardo's Mona Lisa.

Often, viewers ask why it is that the painting of the Mona Lisa draws them to her face and that mysterious smile. How did Da Vinci design his painting in just such a way as to cause onlookers to first look at the face, specifically the lips? Da Vinci understood, like many other artists from ancient times through the 20th century, concept of the Golden Ratio. When used as the solution to a quadratic equation, Phi is the ratio of the line segments that result when a line is divided in one very special and unique way.

In the simplest of terms, The Golden Ratio is Phi squared or Phi plus 1. As can be seen in this picture of the Mona Lisa, Da Vinci appears to have used the Golden Rectangle to bring balance and depth into the painting. The Golden Rectangle was believed by artists to be the most aesthetically pleasing quadrangle. In addition to the Golden Rectangle, Da Vinci, a mathematician as well as an artist, used the Golden Triangle to draw attention to the Mona Lisa's face. The Mona Lisa's body from elbow to elbow to the top of the head forms the Golden Triangle. A triangle, by virtue of its shape, naturally draws the eye up. Da Vinci further incorporated math in art by first placing a Golden Rectangle just above the Mona Lisa's nose. By adding squares to the first rectangle using Fibonacci's series, Da Vinci formed what is termed the Golden Spiral. The large Golden Rectangle is thus formed. The base of the rectangle is formed by a line that extends from the wrist to the elbow. Its sides are formed by extending a line up to the top of the head. While the Golden Rectangle is thought to be aesthetically pleasing, the Golden Spiral is thought to draw the person into a painting. Spirals naturally cause the eye to pull to the center.

There are examples in which the artist's main purpose is to express, even embody mathematics. Several prints by M.C. Escher are the result of his attempts to visually express such mathematical concepts as infinity, duality, dimension, recursion. Perhaps the most striking examples of art illuminating mathematics are provided by the paintings of Crockett Johnson. From 1965 to 1975, Johnson produced over 100 abstract oil paintings, each a representation of a mathematical theorem.

Mathematicians and artists have long been on a quest to understand the physical world they see before them and the abstract objects they know by thought alone. So, Mathematics and Art demonstrates how mathematical ideas are embodied in the visual arts.

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CZECHOSLOVAKIA AS A VICTIM OF ITS OWN DOMESTIC POLITICAL PROJECT

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Summary: The article discusses the ethno-political interaction between the different ethnic groups in the Czechoslovak Republic (1919-1939). The author proves that Czechoslovakia became a victim of its own political project and argues the opinion comparative analysis of the military and human resources of Germany and Czechoslovakia.

Key words: Czechoslovakia, ethnopolitical conflict, political project.

Анотація: У статті розглядається етнополітична взаємодія між різними етнічними групами в Чехословацькій республіці (1919-1939 роки). Автор доводить, що Чехословаччина стала жертвою власного політичного проекту і аргументує свою думку порівнянням військових та людських ресурсів Німеччини і Чехословаччини.

Ключові слова: етнополітичний конфлікт, політичний проект, Чехословаччина.

Аннотация: В статье рассматривается этнополитическое взаимодействие между разными этническими группами в Чехословацкой республике (1919-1939 гг.). Автор доказывает, что Чехословакия стала жертвой собственного политического проекта и аргументирует свое мнение сравнительным анализом военных и человеческих ресурсов Германии и Чехословакии.

Ключевые слова: политический проект, Чехословакия, этнополитический конфликт.

It should be noted that the specific features of the Czech-German relations were always formed according to the ethnographic map of the Czech Republic and Slovakia. For example, on the territory of Bohemia, there were approximately 2.5 million Germans, which in the early twentieth century, was about 52% of the population of the region. According to the population census in the Czechoslovak Republic, conducted in 1921, Germans accounted for almost 33% of population in Bohemia! Most of the Bohemian Germans were the indigenous ethnic group on these territories, having behind them more than thousand-year history of living in the region. The largest German's center in the Czech Republic was Prague, where the percentage of Germans during the first half of XX century, depending on the political situation ranged from 60% to 30%. It is clear that official Czechoslovak population censuses substantially understates the number of Czech Germans, without noting the presence of a huge number of mixed marriages between Germans and Czechs. Besides, taking into account serious historical and cultural heritage of the Habsburg Austria-Hungary, the German language occupied not far the last positions among the Czechs. Thus, in 1939 on the territory of Bohemia the German language was spoken by half of the population. In Carlsbad (today - Karlovy Vary) the German language was spoken by more than 90% of residents [1].

From 750 to 900 thousand Germans historically lived also on the territory of Moravia - the largest Slavic province in the Czech Republic (of course, if such assessment is given on the basis of historical and ethnographic analysis), making in the early twentieth century about 25% of the population of the province. Also, about 200,000 Germans lived in Moravian Silesia, reaching 98% of the population in some areas (on the border with the German province of Silesia - now Lower Silesia and Opole voivodship in Poland). We shouldn't forget about the fate of those 150-200 thousand Carpathian Germans who lived in Slovakia and in Transcarpathia.

One way or another, but in the well-known Sudetenland Germans accounted for 93% of the population (almost 3 million people). Also, according to various estimates, the quantitative potential of the German community in Bratislava (bordered with Austria) reached a quarter of the total number of residents.

We refer to the materials of official population census of Czechoslovakia. They mainly differ from the figures, which operated in the office of National Socialist German Workers Party in late 1938 – early 1939. However, even these underestimated (in Bohemia and Moravia – absolutely without taking into account a huge percentage of mixed marriages) data can give us a clear picture about the extent and nature of terrorist anti-German actions in Czechoslovakia in 1945-1950. Official population censuses in the first Czechoslovak Republic were conducted in 1921 and 1930 respectively.

Government census of Czechoslovakia, which was conducted during 1921 showed the following ethnographic picture: 4 382 788 Czechs and Slovaks, 2 173 239 Germans, 5 476 Magyars, 2 007 “Russians and Ukrainians”, 11 251 Jews, 973 representatives of the Polish ethnic minority, 1 091 Gipsies and others [2] lived in Bohemia. Overall, the first Czechoslovak government census since the time of separation of Bohemia from Austria-Hungary, recorded on this territory in 1921 6 576 825 persons, 2 173 239 among them were Germans. So as a result of the first census after nearly 700 years of German ownership (therefore, it was difficult to suspect pro-German sympathies in this census), the German ethnical minority in Bohemia was 33.04%.

2 616 436 people lived in Moravia in 1921. Among them, “Czechs and Slovaks” accounted for 2 048 426 Germans – 547 604, Magyars – 534, “Russians and Ukrainians” – 976, Jews - 15335, Poles – 2 080, representatives of other ethnic groups – 1 481. So, Germans accounted for 20.9% of the population in Moravia in 1921.

Ethnic composition of the Czech Silesia in 1921 included: “Czechs and Slovaks” – 296 194 Germans – 252 365, Magyars – 94, “Russians and Ukrainians” – 338, Jews – 3681, Poles – 69 967, others – 99. Overall 622 738 persons lived in one small part of German Silesia, which after World War I became the part of Czechoslovakia, and among those persons there were 40.5% Germans.

In Slovakia there were 139 900 Germans out of a total number of population that accounted for 2 958 557 persons, that made 4.7%. In its turn, a small but compact ethnic and demographic group was the German minority in the Carpathian Ukraine (in official government documents, under the terms of The Treaty of Saint-Germain-en-Laye until 1938 it was called as Subcarpathian Rus and was formally given a broad autonomy along with Slovakia). Out of the total number of all residents (599 808) the Czech census registered 10 460 Germans (1.74%) in 1921. They lived, as in Slovakia, mainly in the plain areas of modern Transcarpathian region, but were quite actively involved in the local cultural and economic life. It should be noted that the Carpathian Germans, as opposed to Moravian or Bohemian Germans during the nineteenth century turned into a separate ethnic group and were characterized by sufficiently tight ethnic and socio-cultural contacts with the Ukrainians and Slovaks.

Thus, in 1921 the first Czechoslovak population census reflected the following ethnic and national picture in the republic: overall – 13 374 364 residents, among which – 8 760 937 “Czechs and Slovaks”, 3 123 568 Germans, 745 431 Hungarians, 461 849 “Russians and Ukrainians” (around 450 000 persons were the

Ukrainians), 180 855 Jews, 75 853 Poles, 25 871 Gypsies and others. However, in general, Czechs and Slovaks together accounted for 65.5% and Germans - 23.3% in Czechoslovakia in 1921.

Now, let's pay attention to the second government census in Czechoslovakia, clear political objective of which was "demonstration of strengthening the unified Czechoslovak nation" proclaimed by its President Tomas Masaryk. Famous Czech etnodemograph A. Toth in his book demonstrated well the ratio between the first (1921) and second (1930) population census of Czechoslovak Republic. The census of 1930 increased the percentage amount of the Czech version of "new historical community" – "Czechs" due to ignoring almost 250 000 of Ukrainian community in Slovakia, which in the Slovak part of the census was reflected only by 90 thousand people. Large-scale falsification of the census took place on the territory of Silesia, integrated from Moravia into the single Moravia-Silesian region where about 200 000 Germans were officially registered as "Czechs". Similar, but less organized actions on creating a new Czechoslovak nation also occurred in the central Bohemia (mainly in the Prague district) where the victim of this process was the national identity of about 100 000 Germans.

So, 14 479 565 persons were documented on the territory of Czechoslovakia in 1930, among which: Czechs – 9 688 770, Germans – 3 231 688, Magyars – 691 923, Russians and Ukrainians - 549 169 (Ukrainians accounted for about 520 000 persons), Jews – 186 642, Poles - 81 737, others - 49 636.

In particular, in Bohemia etnostatistic situation was like this: Czechs – 4 713 366 Germans – 2 270 943, Magyars – 7 603, Russians and Ukrainians – 7 612, Jews – 12 735, Poles – 1 195, others – 1 555. Overall: 7 014 559 persons. Among them: Czechs – 67.19% and Germans – 32.37%.

5 501 688 people lived on the territory of Moravia-Silesian region. Among them there were registered: Czechs – 2 595 534, Germans – 799 995, Magyars – 2860, Russians and Ukrainians – 4 012, Jews – 17 267, Poles – 79 450, others – 2 570. Thus, on the territory of newly created Moravia-Silesian region the Czechoslovaks accounted for 47.17%, while Germans accounted for 14.54%. Compared with the figures in 1921 (20.9% of the population in Moravia and 40.5% of the population in Silesia) Germans were in serious statistical minority regarding the so-called "Czechoslovaks" (almost Czechs). To our mind, for this purpose occurred administrative-territorial reorganization of Silesia and Moravia into the single province. Czechs always aspired for statistical dominance, which is especially well reflected by the German and Slovak examples. However, the German national-cultural organizations estimated the number of Germans on the territory of Moravia-Silesian region during 20-30 years at the level of 25-30%. One way or another, but according to the quantitative distribution of the German language it should be stated that about 35% of the population identified themselves as "people of German culture". The German language was especially prevalent as spoken exactly in Silesia. It was spoken by approximately 50% of residents.

In Slovakia, 3 256 468 people lived in 1930, among them Slovaks and Czechs accounted for 2 364 005 people and Germans accounted for 147 505 people. Accordingly, 72.59% and 4.5% of the population. In its turn, in the Carpathian Ukraine, out of 706 850 people of total population Germans accounted for 13 245 people (only 446,780 people that is 63.2% were officially registered as the Ukrainians), or 1.87%.

Methods to conduct the population census in the Czechoslovak Republic are sufficiently known to Ukrainian historiography, mainly through the works of contemporary representatives of Carpatho-Ukrainian movement [3]. They were typical for young, post-imperial countries of the Eastern European area, which differed from other "traditional" states by a syndrome of eternal struggle for independence, even under the conditions of desired achievement of such independence. For example, the term "Czechs and Slovaks" (as well as "Russians and Ukrainians") should be considered initially improper and therefore spoils the true results of etnosociological research. Aggressive Czechization of Slovaks and separate ethnic groups of the Transcarpathian Ukrainians resulted in socio-psychological crisis of awareness and increase of public resentment in response that finally led to the collapse of the first Czechoslovak Republic in 1938-1939.

In our opinion, it should be emphasized that it is quite wrong to consider Czechoslovakia of late 30s of XX century exclusively as the victim of German foreign policy and military expansion. Czechoslovakia, first of all, became the victim of its own domestic political project of united Republican identity creation, which, according to the first president of Czechoslovakia, T. Masaryk would completely replace the existing national identity, and subsequently would reintegrate separate ethnic groups into the single Czech nationality.

Czechoslovakia during 1938-1939 showed complete failure to preserve its statehood through the mechanisms of political mobilization of the people. The rapid growth of Czechization in 1930 was directly proportional to the growth of ratings of centrifugal political forces in Slovakia, Carpathian Ukraine and Sudetenland.

Prague always declared federalistic nature of the Czechoslovak state that was completely borrowed from the organizational system of state power of the Austro-Hungarian Empire of model 1867-1918. However, the attitude of Czech public servants and average Czechs to Slovaks and Ukrainians, in fact, as to third-class

people (Germans were considered to be the second) became a solid basis for the March tragedy in 1939 when any Slovak or Ukrainian did not even think to go out in defense of the republic. Thus, the occupation of Bohemia, Silesia and Moravia by German troops on March 15, 1939, proclamation of independence of the Republic of Slovakia and Carpathian Ukraine, Hungarian aggression against them was already a complex of consequences of domestic political suicide of Prague.

We consider it necessary to emphasize that ethnonym “Sudeten Germans” as well as the name “Sudeten region” has never had a serious historical basis. Their conversion into ethno-cultural ideological concept occurred only in the late 20 - early 30-ies of XX century, in the process of National Socialist power establishment in Germany. For the first time the term “Sudeten Germans” was used by writer Franz Yesser in 1902. However, psychological politicization of this literary “ethnonym” occurred only at the suggestion of political party of Bohemian and Moravia-Silesian Germans – “German Patriotic Front” [4], established on October 1, 1933 Encouraged by the victory of National Socialism in Germany, the German Patriotic Front under the leadership of Konrad Henlein (1898-1945) was the first to unite all German nationalist organizations on the territory of modern Czech Republic and issued a final political demand – broad territorial autonomy for the German-speaking and German-cultural areas of Bohemia, Moravia, Silesia.

In 1935, during the political dialogue between K. Henlein and T. Masaryk, the German Patriotic Front changed its name to SGP (Sudeten German Party) and received national legitimization through legal admission to the parliamentary elections. This was especially promoted by the policy of President Masaryk, who, despite the implementation of the “Czechoslovak” project, continued to see the roots of this project particularly in the Austrian historical and cultural past of Czechs [5]. However, the result of the first German Radical Party in May elections in 1935 affected official Prague. Sudeten German Party won 68% of votes of all Moravia-Silesian and Bohemian Germans (1.249 530 persons voted for it), and as a result finally enshrined its right to represent all Germans in Czechoslovakia. As a result of this victory, lands of the Northern, Western and Southern Czech Republic, covered by mountain range called “Sudety” received a new cultural and political name – “Sudetenland”. It should be also noted that the Sudeten German party in the Czechoslovak parliament won 44 seats out of 300 possible, and was also represented by 23 senators in the upper house, becoming the second-level influential political force in the country.

The dialogue between the German political environment and Czech political center finished rather badly: in March 1938, due to domestic political crisis in Czechoslovakia SGP announced Carlsbad program to the requirements of the broadest autonomy and ideas of further sovereignty of Sudetenland, which finally led to the beginning of the armed anti-czech rebellion on September 13, 1938. As a result, England, France and Italy forced Czechoslovakia to transfer the Sudetenland to Germany under Munich agreement on September 29-30, 1938 [6].

However, it should be emphasized that the Czechoslovak forces were fully capable to beat off the German aggression in 1938 and in 1939. The problem was that most Slovaks, Germans, Ukrainians, who served in the Czechoslovak Army, did not consider the events of 1938-1939 as aggression. The same attitude remained among senior commanders of the Czech nationality. Most of Czechs of middle age and above, taking into account their Austrian military past, treated Germany and especially German culture with a certain piety. Due to a whole complex of psychological and historical and cultural reasons, but not military (!) the Czechoslovak army in March 1939 did not present any resistance to German troops. In support of our thesis, we present information about the ratio between military forces of Czechoslovakia and the German Wehrmacht as of August-September 1938.

Thus, human resource of Wehrmacht accounted for 2 200 000 people, among them Berlin could send immediately 1 825 000 fighters against Czechoslovakia in September 1938. Total number of manpower in the Czechoslovak army – 2 million people, among them 1 645 000 persons could be sent against Germany within one day. Thus, the German army could put 39 divisions out of available 47 against Czechoslovakia, while the Czechoslovak General Staff could operate 37 divisions out of 39. In its turn, the entire tank resource of Germany at that time officially accounted for 720 units, while the Czechoslovak army only on the border with Germany concentrated 400 tanks out of 469 available. The ration in the military aircraft was also relatively similar. For the attack on Czechoslovakia, the German command could use 2 400 aircrafts out of 2500 available, while on the territory of Bohemian and Moravia-Silesian region there was 1500 units of Czech aircraft out of 1582 available aircrafts in Czechoslovakia [7]. Thus, the German and Czechoslovak military machinery even in late 1938 had certain parity in manpower and in modern military technology. However, it was resolved in a different way, in line with military and national spirit. In our opinion, Czechs lost first of all spiritual struggle. The lack of national core called “spiritual resistance” was fully demonstrated during the coexistence of Germans and Czechs within this quasi-public formation as the “Protectorate of Bohemia and Moravia”.

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ETHNIC AND POLITICAL IDENTITY: FACTORS OF FORMATION, CONFLICTS OF MANIFESTATIONS, WAYS OF MEASUREMENTS

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Summary: The present paper views the concept identity in its broad sense and in terms of politics. Special attention is given to the process of political identity formation and its factors. Emphasis is made on political identity which is traditionally formed by a number of external factors.

Keywords: civil community, ethnic identity, political identity, society.

Анотація: Стаття розглядає поняття ідентичності в її широкому сенсі та в термінах політики. Особлива увага приділяється процесу формування політичної ідентичності та його факторам. Окремо розглядається політична ідентичність, яка традиційно формується рядом зовнішніх факторів.

Ключові слова: громадянське суспільство, етнічна ідентичність, політична ідентичність, суспільство.

Аннотация: В статье рассмотрено понятие идентичности в его широком понимании и в терминах политики. Особое внимание уделяется процессу формирования политической идентичности и его факторам. Отдельно рассмотрена политическая идентичность, которая традиционно формируется рядом внешних факторов.

Ключевые слова: гражданское общество, общество, политическая идентичность, этническая идентичность.

Relevance of research of civil and political identity, mechanisms, resources and efficiency of formation of political identity in modern society is caused by the problems of political development facing today in the sphere of national policy a number of the countries, both Europe, and the CIS.

As for the academic consideration of problems of identity, we will note that in the 50th years of the XX century questions of the state identity were generally reduced to a problem of national character. If to speak about domestic sociology, interest in this subject started being shown very fragmentary and only in the 1980th years: first of all issues of identity were touched in works of psychologists, only over time they began to fall within the scope of scientific interest of sociologists. In publications of that time only the mention of some social models of identity, first of all, about feeling of unity meets a positive reference group. In the early nineties the situation to some extent changes. We will speak about sociological aspect in detail below; as for a merit of social psychologists, it is that they developed the concept "I am society" which considered the social relations through a relationship prism "I" with "the group" and "the group" with "others". The special attention was paid also to the category "social distance" [3], gradually psychologists address to consideration of a problem of identity and a subject of identification of political values.

Any communities are constituted through designation of the external borders, as creates a community between members of group or, at least, its visibility. Proceeding from it, we will try to remove working definition of the concept "identity". We will note that the definition offered by the author does not apply for exhaustive character, and represents some kind of compilation of the existing interpretations of the considered concept. So, identity, on the one hand, can be considered by us as understanding by the individual of belonging to community, making special significant sense for the individual, and with another – as feature of general consciousness, the sign (the qualitative characteristic) of a civil community characterizing it as the collective subject. Two described points of view aren't mutually exclusive, and focus attention on various aspects rather.

Belonging to a civil community is defined generally by will of circumstances (for example, the birth, accommodation in a certain territory, etc.), that is a certain reality, but not the individual conscious decision. It also defines perception of this social group as set from the outside, and, respectively, the social role of the citizen not always unambiguously positively is accepted by the individual. And this fact gives the chance to say that there are prerequisites for any formation of discrimination which can often develop into the full-scale conflicts. And about their interrelation with political identity we will speak about the conflicts below.

Coming back to a question of conceptualization of concepts, we will note that there are some difficulties with differentiation of civil and political identity. There is a question: whether the considered phenomena are identical and if isn't present, then in what fundamental difference. Political identity is defined by N. I. Timofeev as the self-determination of the state reflected in key normative and doctrinal documents of the country, implanted in public consciousness of her citizens. Thus identity is considered by the researcher as a collective, but not individual image [5, p. 151].

Analyzing structure of civil identity, E.A. Grishina writes: "Civil identity has objective (ordered both is formal – the state and the right, and is informal – the dominating cultural and social standards and norms) and subjective (rather randomly designed by the individual) components" [1]. According to her, the ratio of objective and subjective components of civil identity defines degree of its integrity and functionality for ensuring social reproduction through implementation corresponding social the practises. For example, in stable society the objective component dominates. And in that case when there is a radical transformation of sociocultural values and norms in society, the subjective component of civil identity prevails. But there is a problem of that we can consider as an objective component and how empirically to track transition from objectivity to subjective judgments. Therefore we believe that within this work there is no need to carry out a watershed between concepts of civil and political identity, though it should be noted that in our opinion the concept of civil identity is wider and includes a number of "identities". And this distinction is essential in that case when we speak about methodological features of studying of problems of identity. It is caused by that fact that civil identity represents the system which is formed on the basis of steady sociocultural characteristics of society, economic, national and cultural socio-political, religious and other features. Basic consider cultural, economic and political components. Often civil identity is considered in a uniform sheaf with the nation. Such interrelation is a necessary condition for carrying out effective ideological work; in other words, the ideology of identity which is spread by the state promotion, serves as the most powerful means against emergence of discontent and revolutionary moods in masses.

Political identity can be guided by various political positions, parties, political leaders, etc. Formation of situational political identity happens under the influence of the factors of external influence which are often connected with a manipulation. Designing of identity is often connected with need of a choice of this or that political position, the leader for a concrete situation. Situational political identity is a basis for further formation of basic political identity. It is directed on judgment of the political positions built taking into account political experience and an assessment of a political situation. Acceptance of these or those political installations conducts to formation of nadsituativny political identity.

One of the directions of formation of identity is forming of model of political and public relationship which assimilation you come assimilation of certain roles by society. Other direction is the conclusion of the personality from a crisis state. Political identity promotes definition of norms, values and allows the individual to orient in society and in the political environment.

In general we will note that process of formation of political identity is extremely difficult, it is characterized by complex influence of many interconnected factors. In it the personal choice of the individual and his psychological motivation, group measurement of political interaction, public level (national identity, civil identity) and measurement of civilization identity are combined.

But anyway you shouldn't forget that identity formation in many respects has psychological character, i.e. we can study individual subjective judgments and estimates, but we won't find out, under the influence of what factors there was an identity formation. It is explained by that the individual included in concrete system of identity isn't capable to assess a situation as the external observer. Though there is a new difficulty. The researcher, in turn, is also the carrier of a set of certain identity that can have considerable impact on result of interpretation of research.

As the summary we will note that research of identity, its contents, mechanisms of formation, functions attracted and continues to attract a number of scientific various directions from psychologists to political scientists. In the course of comprehensive study of essence of concept identity is formed a number of ideas of its structure, factors of manifestation and possibility of designing. Though it is necessary to recognize that today conceptual and comprehensive determination of identity do not exist. There are various approaches which consider identity problems under different corners, and only their synthesis will allow the researcher to create

rather complete picture. But it is important that in any of approaches designing of symbolical space plays a significant role in identity formation, the difference exists only in extent of influence.

Identity formation process often has contradictory and rather difficult character. And divergences in the identities can become the reason for conflict expansion, and it can be characteristic both for micro, and for macro-level. But at the same time the concept of identity is a rod element in ideology of a number of the countries. At the beginning of this work we spoke about the European identity, in many respects it allows to avoid fragmentation and different conflicts, promoting achievement of unity, solidarity and cooperation, helping to avoid a number of the conflicts. But at the same time Europe faces a serious problem which consists first of all in an obvious contradiction between the theoretical description of this phenomenon and its empirical testing. The discourse of the European identity is too multidirectional and, as a result, it is understood enough differently. There are absolutely different historical, political, social and standard ideas of the European identity therefore we have to recognize existence of various contexts, theoretical bases and political realities of the use of this concept. "The European identity never represented a uniform concept" [6], this fact gives us the chance to claim that concepts of identity is entirely designed. It happens so that theoretical construct, being imposed on concrete historical circumstances, becomes impractical, or, at least, does not cope with a number of the functions which are urged to maintain a certain balance of system.

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JARGON AS AN INTEGRAL PART OF MODERN VOCABULARY

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Summary: The article deals with the question of application of jargon in modern language. The terms "*jargon*", "*argot*", "*slang*" are studied from the diachronic point of view. Some borrowed forms of the concepts are analyzed

Key words: argot, borrowing, jargon, lexicon, specific vocabulary.

Анотація: У статті розглядається питання про застосування жаргону в сучасній мові. Терміни "*жаргон*", "*арго*", "*сленг*" вивчаються з діахронічної точки зору. Аналізуються деякі запозичені форми цих понять.

Ключові слова: арго, жаргон, запозичення, конкретний словник, лексикон.

Аннотация: В статье рассматривается вопрос о применении жаргона в современном языке. Термины "*жаргон*", "*арго*", "*сленг*" изучаются с диахронической точки зрения. Анализируются некоторые заимствованные формы этих понятий. **Ключевые слова:** арго, жаргон, заимствование, конкретный словарь, лексикон.

Every day we produce thousands of words that have become so familiar to us in our everyday life that an ordinary person does not think about their origins, and, even more, about which group of vocabulary they belong to. Among them you may hear terms, jargons, slangs (a so-called specific vocabulary). In modern world we are not surprised at the words "*jargon*", "*argot*", "*slang*". People use dozens of jargons in their every day speech.

The question is what the slang is and how it came into our vocabulary. The research of the etymology of the word "*jargon*" was not made by any scholar. The results of the research vary. For example, R. Robben proves that this word comes from the French word "*jargon*" that means the language of crime [4]. There are many jargons in every community or profession. The history of jargons is the following. According to the dictionary of a Russian researcher Dal', jargon is the secret language of Bagmans. The alternative name of jargon is Fenia.

The merchants were a separate caste, and in order to protect themselves and their goods, they needed a secret language that could not be understood by ordinary citizens.

According to another theory, jargon goes back to an ancient nation of the Athenians. Ethnically the people consisted of many tribes, each of which had its own secret language that was understood by the residents of the other communities. Their features were passed on from ancestors to descendants for centuries [1, p. 10-13]. It was only used by thieves and other criminals who created the language. People did not communicate. Gradually it became the language that infiltrated street gangs, migrating eventually to prisons and places of detention, where over time it became a common language of communication. Thus, the most popular and extensive branch of jargon became Fenia.

About a hundred years ago Fenia vocabulary consisted of three or four thousand words. Over time some of them went out of a frequent use and formed a so-called passive layer of Fenia, but most of them, on the contrary, became actively used. The reason for the proliferation of jargon in the Soviet Union was Stalin mass repressions. Often, the intelligentsia and cultural figures were imprisoned, thus, jargon began to be enriched with new words, which turned Fenia into something different. The jargon continues to develop nowadays, though in a slightly different direction, getting more and more popular in the youth jargons and slangs. According to linguists, it is the future of the spoken language [2, p. 20].

The concept "*slang*" is increasingly gaining attention of modern Philology. At this stage of its development the concept has a lot of controversial ideals, mostly related to its interpretation. The linguists ponder on the question whether to refer the concept "*slang*" as ironic expression to the literary language, or non-standard vocabulary, the use of which is condemned by all educated people.

Slang and jargon are heterogeneous terms and they cover almost all spheres of life. Jargon focuses on the human aspects of life and activity. The slang of young people is reflected in the language of the educated people. The appearance of familiar slangs in the spoken language is affected by the development of nanotechnologies (*мыло* — e-mail; *fleas* — bugs in the program), as well as the development of modern musical culture. The jargon that has arisen due to the development of music is a mostly used style of names (*nonca* — pop; *трэк* — musical composition). A separate group of Fenia includes the words from the drug and alcohol industry (*торчок* — person, who was drug addict and round; *alcoholic* — the wheels on pills, drunk, bruise) [3].

Many slangs came into the speech of the youth from computer games. These words are sufficiently specific in use. They are operated mainly by the young people for whom computer games became a hobby. Most of them are borrowed from English (*noob* — novice player; *раснуть* — revive). Today, a computer language is very common among young people (*Привет! Медвед!* — a traditional greeting; *ужас* — the horror; *я тя лаф* means I love you).

The most interesting fact is that most of the words of the youth slang are borrowed from English. The reason is that English is very popular and "fashionable" among young people. As a rule, the words borrowed from English are not translated into Russian. But the loans are understood even by those who never used these words in their life (*лав стори* — love story; *крэйзи* — crazy). Such slangs are produced by Cyrillic and Latin alphabet. The reason for the proliferation of jargon among the youth is a decisive psychological factor. Trying to look older than they really are, to emphasize their coolness, or to increase the credibility in the company young people put Argo into their habitual speech.

Penetrating into modern Russian literary language and having a big influence on it, the youth slang is of considerable interest among linguists and philologists. They study its interaction with other dialects, its conceptual thematic composition and stylistic expression, analyze sources of revenue. While studying slangs much attention is paid to such problem as language environment. The study of this matter concerns such scholars as N. L. Samne, L. P. Krysin, V. Mironov, L. V. Raciborska, etc. Over the last decade changes in the modern Russian literary language are related to sociological factors. This resulted in the indifference to correctness, lexical precision of speech and loss of a sense of proportion in the use of elements of colloquial speech.

Thus, the youth slang as a means of everyday communication is a kind of an indicator of the level of the development of young people, their interests, tastes and needs. The youth slang is a dynamic phenomenon. This is due to the fact that its users are constantly replenished with younger generation.

A specific feature of jargon is that it is being imposed on everybody because different sectors of society use slangs on their own. Jargons and slangs have become very popular at today's stage of the development of vocabulary. Even the older generation, who at all times find them rude and vulgar, "inject" them into their everyday life more and more and use them as a standard language.

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POLYCUltURE OF UKRAINIAN SOCIETY IN THE CONTEXT OF THE ROMA DIASPORA

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Summary: The article studies polyculturalism in the context of social state of the Roma national minority in Ukrainian society. Sociocultural analysis of contemporary Ukrainian society is conducted concerning cultural heterogeneity. Policy of multiculturalism is criticized due to the formalism of its current state in Ukraine.

Key words: cultural heterogeneity, national minority, multiculturalism, polyculture

Анотація: У статті розглядається концепція полікультурності на прикладі вивчення становища ромської національної меншини в українському суспільстві. Проводиться соціокультурний аналіз сучасного українського суспільства з урахуванням його культурної неоднорідності. Критикується політика мультикультуралізму, котра на даному етапі реалізується в Україні лише на формальному рівні.

Ключові слова: культурна неоднорідність, національні меншини, мультикультуралізм, полікультурність.

Аннотация: В статье рассматривается концепция поликультурности на примере изучения положения ромского национального меньшинства в украинском обществе. Проводится социокультурный анализ современного украинского общества с учетом его культурной неоднородности. Критикуется политика мультикультурализма, которая на данном этапе в Украине реализуется только на формальном уровне.

Ключевые слова: культурная неоднородность, национальные меньшинства, мультикультурализм, поликультурность.

Nowadays plurality is one of the main characteristics of social space and it can be found, above all, in social stratification. Globalization, growth of social mobility, increase of migration make national composition of every country more diverse. There is a variety of basic interpretations of the term “culture” and in the context of studying polyculture we rely on understanding a culture as a specific way of existence and life organization of a society in a specific historical period [1].

Polyculture exists in the context of cultural fragmentation and its functioning in the global space. Culture is not limited to a single territory: cultural representatives disperse on different territories, yet keeping their identity. Studying a society of numerous cultures means sociocultural analysis, search for cultural factors which frame social reality. Hence, culture becomes a focus of interest [2].

In Ukraine, except for the titular national group there are nearly 130 cultural representatives [3]. Hence, the issues of social adaptation, opportunities and equality are not considered in terms of one culture, but in the context of diverse social characteristics, one of which is nationality. By referring to a nationality as a cultural representation of a particular community, we get a mosaic view of the society in which every culture is a tessera [4]. Diversity, plurality of the element perfects the mosaic where every piece creates uniqueness of the whole. Concerning plurality of social positions in contemporary society and in cultural diversity there rises the issue of polyculture. This idea tells us that contemporary society is a society of cultural heterogeneity. Heterogeneity means that in all multiplicity of social positions every particular one is unique. While pluralization of culture forms leads to autonomation of each culture in society. The Roma representation in Europe is an example of polyculture: as a nomadic nationality with its own, specific cultural peculiarities, the Roma remain particularly ethnocentric, amplify their dominant culture with inner resources. One of the most important issues of integration process is solving problems in a social sphere.

The Roma minority has formed due to historical movements and nowadays it exists as compact, cohesive settlements, demonstrating cultural peculiarities of the nationality. That is why we can consider it as a diaspora [5]. In addition, the Roma is a nomadic nationality which explains its temporal presence on a specific territory and dispersion among Europe. Mala claims that the Roma are transnationals who risk becoming the target for intolerance. Media actively create a stereotype of the Roma which makes interaction unattractive.

Except for discrimination practices against the Roma found primarily in a social sphere, antagonistic relations between the Roma and the dominant culture are cultivated [5]. Along with the recognition of polyculture and cultural heterogeneity, the right of each culture for diversities requires acknowledgement. Living in a collage requires controlling certain ethnocentrism to prevent cultural merger assimilation of minorities into the society of dominant culture [4]. The analysis of the Roma integration can help highlight the potential for coexistence of the plurality of cultures.

1. The policy of multiculturalism in Ukrainian polycultural society: data analysis

Sociocultural analysis employs qualitative methods since they allow recognizing a deeper context. Studying polyculture as a phenomenon, we are interested in various cultural diversities which are not actual and objective but which are constructed by the meanings attached to these factors [6].

Multiculturalism is a policy of integration of national minorities in a society and a strategy of management of international and cross-cultural relationships [7]. Democratization tendency spreading around the world becomes a principle of modern policy. Multiculturalism becomes a dogma and it is necessary to follow it: unacceptance or judgment of it may result in social discontent [8]. Consequently, countries intent to implement programs for integration of minorities in the society that is not ready for acceptance of the "Other" at a cultural level.

Nowadays in Ukraine the issues for the Roma are covered by organizations which work for realization of multiculturalism for the Roma ("The Roma women fund "Chiricli", "Roma Ukraine", "Transcarpathian Roma Community "Roma", "The Roma community "Ame-Roma", etc.). The idea of polyculture reflects cultural heterogeneity of a society as a sociocultural reality. The policy of multiculturalism is a policy of acknowledgement that other nationality representative should be identified and acknowledged as diverse, different. This policy consists of approaches of identifying an individual among similar others in social space and an individual as the "self" [9].

Non-recognition or incorrect recognition forms frames of perception of minority existence and this may become a form of oppression [10]. Identity embeds into social bounds through the language, as far as identity construction takes place in the language sphere [9]. The policy of multiculturalism forms opposition between different cultural communities because coexistence of these communities is mediated by acknowledgement, recognition and requires organization. Hence, realization of this policy implies that it is something problematic and unnatural.

Multiculturalism identifies nationality as a culture. This fact neutralizes the possibility of being a representative of a different nationality along with being a representative of one culture. Concerning nationality and culture in terms of polyculture, it means that cultural peculiarities are believed to be independent from racial and ethnical inherence. In such conditions coexistence with the "Other" is realized through understanding, trust and sharing one space on equal terms.

Recognition of an individual as the "Other" occurs, among other reasons, on the basis of appearance and racial inherence. Perception of the "Other" conducts through a stereotype: it is simplified and holds the typification based on the pattern opinion about a representative of another nationality. Multiculturalism discourse is based on the acknowledgment of diversities between individuals, but these diversities appear to be more constructed than real [7]. Such a discourse of distances, to a large extent, promotes the establishment of these distances. The division into the ones who are weak, helpless and require protection and the ones who are major and stronger is established through the discussion of policy of multiculturalism that aims at integration of minorities in a society. Talking about plurality in terms of multiculturalism and representatives of proclaimed minorities has got out of the society and has become marginalized [11].

The discourse of multiculturalism itself contributes to postponing of realization of the values it proclaims because of actualization of the issues of the foreignness.

Therefore, the discourse of the oppressed according to the Roma diaspora is practiced in the media, sociological research and laws. In such a manner the Roma perception as adverse and foreign to Ukrainian society is actualized. Specificity of the culture is emphasized which forms a particular attitude toward the Roma diaspora representatives. For instance, the methods of research are explained with such special things about the research object as the closeness of the group, compactness of their living, reluctance to communication with others, etc. Moreover, qualitative methods are being chosen because they give an opportunity to get over the language barrier and the Roma's low level of education [12]. Difficulties of studying the Roma's integration in Ukrainian society are linked to the lack of statistic data about them and implausibility to calculate the sampling.

Consequently, subjective contribution of a researcher is a prerequisite to the Roma diaspora research. In this context, close collaboration with the informant and the researcher's interpretation encourage the necessary pursuance of the research and assure the validity of the data.

The empiric data analysis has shown that the Roma integration as a part of the policy of multiculturalism, aims primarily at the legal and social spheres. The research was pursued by Kharkiv Institution for social research with the support from the International foundation “Renaissance” in 2012. Throughout the research, 100 Roma representatives were chosen as respondents in Transcarpathian and Cherkasy regions. The number of the Roma inhabitants in these regions is one of the biggest in Ukraine [3].

Interviewing of the Roma has shown the following relevant social issues:

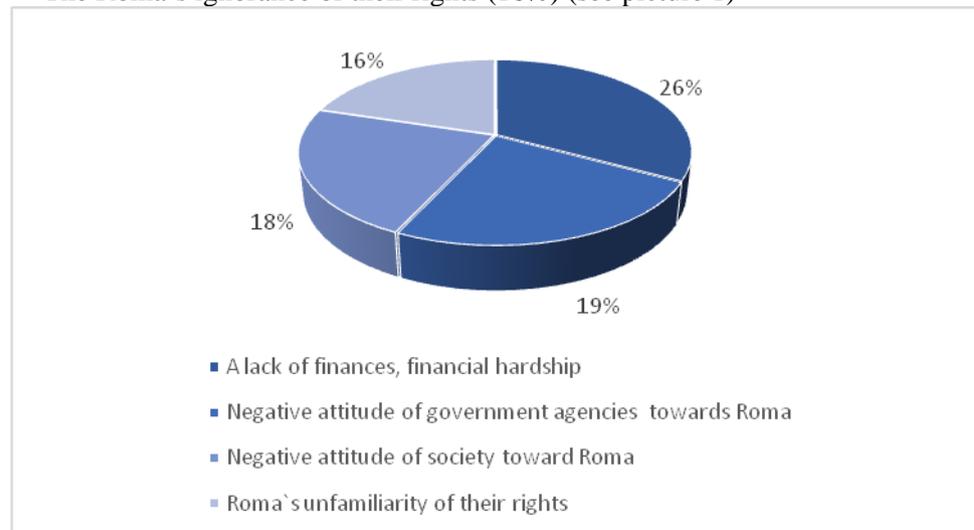
- employment assistance
- documents execution
- educational sphere
- housing and municipal issues
- medical care
- demesnlal property
- prejudiced attitude towards the Roma by the law enforcement officials
- general discrimination [12].

The data were taken through an unstructured interview in which the following question was asked: “Tell about the main problems, which are relevant to you at the moment”. During the interview, the interviewers specified particular topics (how informant deals with these problems, to whom they referred, why these problems occurred, etc.).

All the problems, mentioned by the informants, refer to the legal sphere and poor living conditions. Discriminatory practices towards the Roma were last to mention. This attitude from the Roma towards Ukrainian might proclaim less social distance than vice versa. On the other hand, discrimination as a corollary of “incorrect recognition” may form frames for the Roma existence in social, legal and sociocultural sphere of Ukraine. Media and organizations which strive for the Roma rights project an incorrect vision of the Roma that acts as an imperative and forces them to acquire and adopt to this vision [10].

The Roma respondents singled out the following reasons to their problems:

- A lack of finances, financial hardship (26%)
- Negative attitude of government agencies (19%)
- General negative attitude of society (18%)
- The Roma`s ignorance of their rights (16%) (see picture 1)



Picture 1. The main reasons of problems of the Roma residents of Transcarpathian and Cherkasy regions

The reasons, named by the Roma rather concern intolerant attitudes towards them than the policy of multiculturalism. The attitude is the main factor here but not the formal organizations of measures and governmental projects. Hence, the policy of multiculturalism is realized only at a formal level and this may prohibit the achievement of the set aims.

2. The Roma`s status in the sociocultural space of Ukraine

The polyculture of society may be understood through the concepts of subculture, polystylistic culture and axiological field [13].

The Roma`s culture is understood in terms of a subculture concerning actions, values, norms, traditions of the diaspora which differ from those nationwide. A credible characteristic of a subcultural analysis is

acknowledgement of legitimacy of existence of the other culture, it is not treated as a deviation from the dominant culture, but as an autonomous formation. While in the dominant culture meanings, senses and symbols exist for the establishment of a united, dominant culture in a subculture these factors are the way for the establishment of an autonomous identity that is diverse from the widely considered. Autonomation minorities and plurality are the consequences of polyculture [13].

On the one hand, we define subculture in terms of cultural pluralism, as legitimate and, on the other hand, as dependable on the national culture which support stratification [14]. It is reflected in national governmental programs where the Roma are deputized as the others, alien, incomprehensible, the ones whose identity requires tolerance and acceptance.

The concept of polystylistic culture implicates the social space as a set of positions, which are expressed with the help of different cultural forms. The lifestyle characterizes the forms and ways of actions in a society, this is the unity of “form and content” of social practice. The content here means the individual’s norms and values, due to their choice, and the latter brings about the cultural differentiation of society [15].

Culture is monostylistic when all members of a society share a certain cultural form which means that the same symbols are used for communication and similar beliefs and ideologies are shared. An opportunity to choose cultural forms makes it possible for polystylism to exist in a society. It can be expressed at the level of decision-making and a way of actions, living conditions, and preferences in clothes, entertainment and consumption.

Remedies for social and legacy problems can be considered as one of the demonstrations of the lifestyle. Comparing results of the survey of the Roma and the mass survey of the Ukrainians (the mass survey in Ukraine, Kherson, Lugansk, Chernigov, Khmelnytskyi and Kiev regions with the survey sample of 2463 questionnaires, 2010), we see that the remedies for social and legacy problems of the Roma and the Ukrainians differ.

Since social and legacy problems are considered as the most relevant the Roma named the following remedies [12].

Table 1

The Roma`s remedies for social and legacy problems

What do you usually do for solving immediate problems?	Rate to the responses, N=100
Ask my friend and relatives for advice	63%
Refer to an authoritative community member	41%
Try to come to an agreement with another side	37%
Refer to public organizations	33%

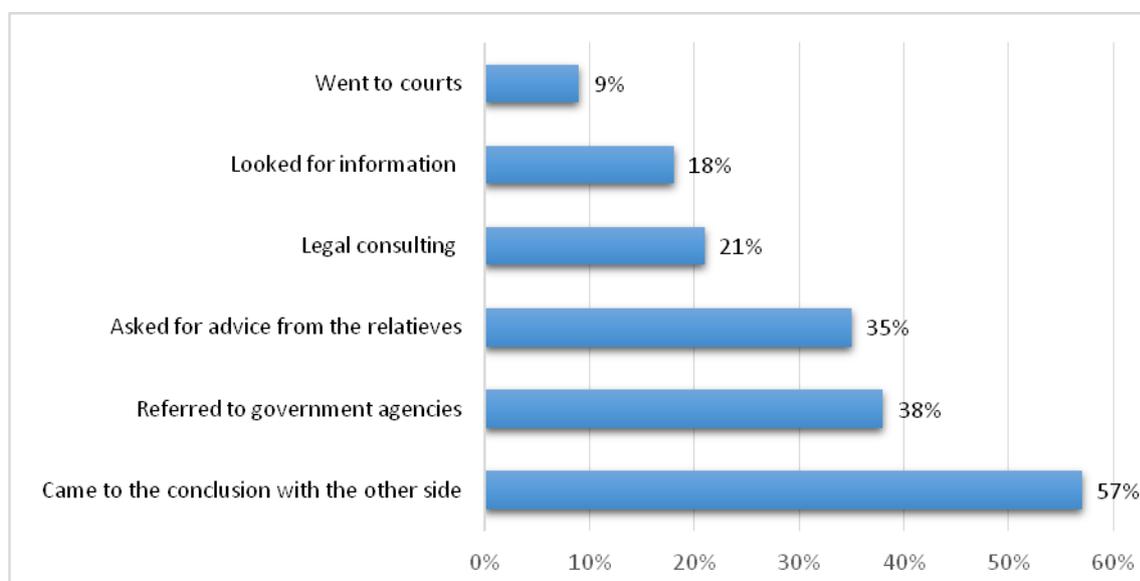
Table 1

The Roma`s remedies for social and legacy problems

Refer to a lawyer	26%
Address complaints, claims	16%
Take part in court trials	13%
Do nothing	2%

Based on the data from Table 1 we can make a conclusion that the Roma gravitate toward closeness, whereas the majority of the Roma strain after solving their problems with the aid of advice of relatives, friends and authoritative community members (41%). On the contrary, solving a problem by referring to public organizations accounts for 33% and referring to a lawyer as a problem-solving strategy is chosen by 26% of respondents.

The Ukrainians tend to choose interactional strategies in their problem solving (“Came to an agreement” – 57%) and solution to an issue with the help of government agencies (38%) (see picture 2) [16].



Picture 1. The Ukrainians` practices for solving social and legal problems, %

In the USSR period the unified cultural form explained all cultural forms different from the nationwide. Presence of multiple cultural forms made inhabitants of the post-Soviet territory feel ambivalence. The latter turned out to be the concept of an axiological field.

The axiological field concept concerns a cultural measurement of an individual as an atomized system of values. The axiological field is believed to be a dissonant characteristic of social actors, whereas values are understood as regulators of human practices. The characteristic is dissonant due to the possibility for an axiological field to include incompatible, antagonistic values without discomfort for the carrier [17]. A capability to be a carrier of axiological antagonisms emerges in a period of anomia and society transformation.

Surveys of nationality and social distance show that the Ukrainians aim at a close collaboration with representatives of their national group or with the Russian. Among preferred contacts with the other national group representatives the Roma take one of the last positions by the Ukrainians. Therefore, this illustrates discrimination suggestions toward the Roma national minority [18, 19]. Along with this fact, surveys of the state form of Ukrainian government demonstrate suggestions to democracy and civil society which implicate equality [20].

The Roma diaspora as a subculture possesses its own cultural peculiarities which form a specific lifestyle that, in the context of polyculture, is diverse but legitimate. Concepts which concern the state of polyculture in a society are established with the principle of binary oppositions. And this is their substantial defect as long as they try to depict the carrier of other cultural forms as governable, hard up for integration and a special perception.

3. National integration of the Roma diaspora in Ukrainian society

In 2013, the President's "Action Plan for Protection and Integration of the Roma Minority in the Ukrainian society" was adopted and its realization was planned for 2013-2020. Realization of the Action plan provides a number of action items following such themes as:

- Juridical protection of the Roma
- Social protection and employment of the Roma
- Education in the Roma community
- Medical care for the Roma
- Refining of living conditions of the Roma
- Satisfying the cultural and informational requirement of the Roma [21].

This document aims at the national integration and expresses multiculturalism principles since it focuses on the formal prerequisites of living conditions for one national group on the territory of another. For effective realization of remedies for social and legal problems, they should be based not only on the legal framework but also on the knowledge of culture of minorities. Reproducing the discourse of inequality and domination, counting only the formal side of the issue makes a peaceful coexistence of minorities more complicated.

Legal acts form an official source of the discourse of multiculturalism aimed at producing conditions for peaceful coexistence of different national groups on one territory. "Action Plan for Protection and Integration of the Roma Minority in the Ukrainian Society" explains the increase of the Roma discrimination and slowing

down of the Roma integration by the absence of the Roma state. Here matching some national groups to a specific territory forms boundaries for its existence. The nation association with the state informs about closeness and possibility of peaceful coexistence of diverse cultures within cultural pluralism.

The Action adoption of is, in fact, the acknowledgement of problems of the Roma inhabitants, and more precisely, it is acknowledgement that the Roma are problematic inhabitants. The aim of the Action is not arrangement of conditions for comfortable coexistence of diverse cultures on one common territory, but at “implementing”, “interaction activation”, “the Roma inclusion” and their “protection”. For instance, the Action presumes arrangement of “expository works”, “stimulating the Roma to work” which attributes the Roma the pursuit to avoid official employment. The usage of such lexical items represents the Roma as passive participants of integration process, inert, weak, and destitute of protection. A low educational level and unemployment are the basic problems. Nevertheless, in the Roma culture, education is not considered to be a necessary: women may not get it at all and for men it is optional. Concerning unemployment, the Roma point out that the main reason there is discrimination and implausibility to get a job due to unfriendliness toward the Roma. The surveys of the Roma diaspora have revealed that the main reasons for employment in access, as the Roma suggest, are hostility to their nationality. Although they understand that their illiteracy and absence of documents complicates the situation. The Roma are not accessed to employment even in case of hand-labor and a day-to-day job which do not require a job formalization and special skills.

The document “Action Plan for Protection and Integration of the Roma Minority in the Ukrainian Society” is a part of policy of multiculturalism since it aims at promoting integration of the Romanational minority in Ukrainian society. This document reproduces the multiculturalism discourse and has the same problems: it produces and encourages those problems to which it should create the ways of solving. For example, the usage of such a statement “The Roma organization inclusion to solving the Roma problems” divides the Roma and the other inhabitants emphasizing that the Roma is a particular ‘other group’ (although it should be noticed that the Roma`s problems are also relevant for the whole Ukraine) .

Practices described in the Action plan act as retaliatory measures towards the Roma since the Roma are not a subject of actions, but an object. The basis of the Action plan is a legal acts and is created without accounting the surveys of the Roma and the speciality of their culture. As a part of policy of multiculturalism, this document has a rather formal format. Its realization will not be effective if it does not consider equality of the Roma culture in terms of Ukrainian culture and other cultures on the territory of Ukraine. This discourse of dominating is reproduced at the official legacy level and forms corresponding discrimination patterns towards the Roma.

To conclude, nowadays the polyculture of Ukrainian society is an objective reality. Coexistence of multiple cultures at one territory is a consequence of cultural heterogeneity. Peaceful coexistence of diverse cultures is possible if tolerance is a basic value system. The idea of tolerance presumes admission of the fact that people are different and should not be fought against, but tolerated, not to be extirpated, but to be achieved cooperation with [22].

Adaptation to multiplicity of cultures implies their legitimation. A passage of legal acts on the Romanational minority in Ukrainian society is just one of the practices of realization of multiculturalism principles in a society. The Roma diaspora integration in Ukrainian society should start at an ideological level. Legacy acts will be only formally legitimized or will fail to legitimized if people do not accept ideology [11]. The discourse of multiculturalism substitutes ideas of liberal democracy and polyculture by a collectivity of autonomous and competitive cultural communities. To increase the toleration level it is necessary to promote the discourse of polyculture that concerns all cultural multiplicity as a value and acknowledges the importance of the contribution of each culture to the country`s social development.

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WOMEN'S SUFFRAGE MOVEMENT IN THE UNITED STATES OF AMERICA

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Summary: The paper deals with women's suffrage movement in the United States of America as one of the major inseparable foundations of feminism. A comprehensive analysis of the suffragettes in the United States is made. The ideas and methods of the struggle of American women for achieving their electoral rights are analyzed and systematized. The article provides better understanding of the changing of the women's role in American society during the second half of the XIX century – early XX century, tracing the connection of the suffragette movement with other social and political organizations of the country. The conclusion is made that a high level of modern feminist movement underlines the need to apply to the period of the origin of this activity.

Key words: feminism, right to vote, women's suffrage movement

Анотація: Стаття присвячена жіночому руху за виборче право в Сполучених Штатах Америки як невід'ємної частини фемінізму. Зроблений комплексний аналіз діяльності суфражисток в США. Проаналізовані і систематизовані ідеї та методи боротьби американськими жінками за здобуття своїх виборчих прав. Стаття дає змогу краще зрозуміти зміни участі жінок в американському суспільстві в другій частині XIX століття – початку XX століття, простежити зв'язок суфражистського руху з іншими суспільно-політичними організаціями країни. Робиться висновок про те, що високий сучасний рівень феміністичного руху підкреслює необхідність звертатися до періоду зародження цієї діяльності.

Ключові слова: жіночий суфражистський рух, право голосу, фемінізм

Аннотация: Статья посвящена женскому движению за избирательное право в США как неотъемлемой части феминизма. В статье сделан комплексный анализ деятельности суфражисток в США. Проанализированы и систематизированы идеи и методы борьбы американских женщин за достижение своих избирательских прав. Статья позволяет лучше понять изменения роли женщин в американском обществе во второй половине XIX века – начале XX века, проследить связь суфражистского движения с другими общественно-политическими организациями страны. Делается вывод о том, что высокий современный уровень феминистского движения подчеркивает необходимость обращаться к периоду зарождения этой деятельности.

Ключевые слова: женское суфражистское движение, право голоса, феминизм

On Election Day in 1920, millions of American women exercised their right to vote for the first time. It took activists and reformers nearly 100 years to win that right, and the campaign was not easy. Disagreements

over strategy threatened to cripple the movement more than once. But on August 26, 1920, the 19th Amendment to the Constitution was finally ratified, enfranchising all American women and declaring for the first time that they, like men, deserve all the rights and responsibilities of citizenship.

The campaign for women's suffrage began before the Civil War. During the 20s-30s, of the XIX-th century the most states had extended the franchise to all white men, regardless how much money or property they had. At the same time, all sorts of reform groups were proliferating across the United States – temperance clubs, religious movements and moral-reform societies, anti-slavery organizations, and in many of them, women played a prominent role. Meanwhile, many American women were beginning to chafe against the so-called “Cult of True Womanhood”, that is, the idea that the only “true” woman was a pious, submissive wife and mother concerned exclusively with home and family. Putting together all of these ideas contributed to a new way of thinking about what it meant to be a woman and a citizen in the United States [2, p.147].

In 1848, a group of abolitionist activists – mostly women, but some men gathered in Seneca Falls, New York to discuss the problem of women's rights. (They were invited there by the reformers Elizabeth Cady Stanton and Lucretia Mott.) Most of the delegates agreed that American women were autonomous individuals who deserved their own political identities. “We hold the truth to be self-evident. Men and women are created equal, that they are endowed by their creator with certain inalienable rights, among which are life, liberty, and the pursuit of happiness” [4, p.28]. It meant, among other things, that they believed women should have the right to vote.

During the 1850s, the movement for women's rights developed greatly, but lost momentum when the Civil War began. Almost immediately after the war had ended, the 14-th and 15-th Amendments to the Constitution raised the familiar questions of suffrage and citizenship. (The 14-th Amendment, ratified in 1868, extends the Constitution's protection to all citizens, and defines “citizens” as “male”; the 15-th, ratified in 1870, guarantees black men the right to vote.)

Some woman-suffrage advocates, Stanton and Susan B. Anthony believed that this was their chance to push lawmakers for truly universal suffrage [1, p.43]. As a result, they refused to support the 15th Amendment and even allied with racist Southerners who argued that white women's votes could be used to neutralize those cast by African-Americans. In 1869, this faction formed a group called the National Woman Suffrage Association and began to fight for a universal-suffrage amendment to the federal Constitution.

Others argued that it was unfair to endanger black enfranchisement by tying it to the markedly less popular campaign for female suffrage. This pro-15th-Amendment faction formed a group called the American Woman Suffrage Association and fought for the franchise on a state-by-state basis.

In 1890 the two above-mentioned groups merged to form the National American Woman Suffrage Association. (Elizabeth Cady Stanton was both the leader of the organization and the first president.) By then, the suffragists' approach to the movement had changed. Instead of arguing that women deserved the same rights and responsibilities as men because women and men were “created equal,” the new generation of activists argued that women deserved the vote because they were different from men. They could make their domesticity into a political virtue, using the franchise to create a purer, more moral “maternal commonwealth” [3, p.68].

This argument served many political agendas. Temperance advocates, for instance, wanted women to have the vote because they thought it would mobilize an enormous voting bloc on behalf of their cause, and many middle-class white people were swayed once again by the argument that the enfranchisement of white women would “ensure immediate and durable white supremacy, honestly attained” [3, p. 81].

Since in 1910, some states in the West began to extend the vote to women for the first time after almost 20 years had passed. (Idaho and Utah had given women the right to vote at the end of the 19th century.) Still, Southern and Eastern states resisted. In 1916, NAWSA president Carrie Chapman Catt unveiled what she called a “Winning Plan” to get the vote at last: a blitz campaign that mobilized the state and local suffrage organizations all over the country, with special focus on those recalcitrant regions. Meanwhile, a splinter group called the National Women's Party focused on more radical, militant tactics – hunger strikes and White House pickets at winning dramatic publicity.

World War I slowed the suffragists' campaign. The important consequence of the participation of women in the general mobilization of the country was the decision of Woodrow Wilson to support the adoption of electoral rights for women. Before the vote, Wilson asked the House to support the amendment. At the end of voting the bill collected more than one vote than was needed. The next question was put to a vote in the Senate, where Wilson appealed to the senators with the request to adopt the law.

During the voting, which took place on February 10, 1919, the bill did not have a single vote. This caused some concern in the circles of both parties about the fact whether it will be ratified or not. As a result, the president gathered an extraordinary session of Congress. A bill on making amendments to the US

Constitution was presented again. The House of Representatives supported Amendment 19, and in June it was adopted. The Ratification of the Action of the Congress was achieved by 36 states.

The struggle for the ratification of the amendment of the Constitution took relatively little time. After a couple of days Wisconsin, Michigan and Illinois ratified the decisions of the Congress. The remained states followed their example. In the summer of 1920 the last state that adopted the amendment was Tennessee. The presidential election in 1920 was the first choice where American had the opportunity to use their right to vote.

Thus, the suffragette movement has gone through a long way during its seventy years history of the existence. The activists created a large number of organizations, strategies and tactics. The most important success of the women's suffragette movement is achieving their right to vote. This is the basis for further organization of women's political participation, as is it introduces citizens into the atmosphere of social and political relationships.

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THE ENDOWMENT FUND AS A SOURCE TO FINANCE EDUCATIONAL ACTIVITIES IN UKRAINE

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Summary: Higher education institutions are interested in the opportunity to develop in their walls scientific and research activities, but under the current funding money is sorely lacking. Therefore it is necessary to find innovative models for additional funding for social development. The article analyzes potential of endowment funds as a source of additional funding.

Key-words: additional funding, charity, endowment, higher education.

Анотація: Вищі навчальні заклади зацікавлені у можливості розвивати у своїх стінах наукову та дослідницьку діяльність, коштів на яку при нинішньому фінансуванні катастрофічно не вистачає. Недостатність асигнувань спонукає до пошуку іноваційних моделей додаткового фінансування соціального розвитку. У статті проаналізовано потенціал ендавмент фондів у якості джерела додаткового фінансування.

Ключові слова: благодійність, вища освіта, додаткове фінансування, ендавмент-фонд.

Аннотация: Высшие учебные заведения заинтересованы в возможности развивать в своих стенах научную и исследовательскую деятельность, средств на которую при нынешнем финансировании катастрофически не хватает. Недостаточность ассигнований побуждает к поиску инновационных моделей дополнительного финансирования социального развития. В статье анализируется потенциал ендаумент-фондов в качестве источника дополнительного финансирования.

Ключевые слова: благотворительность, высшее образование, дополнительное финансирование, эндаумент-фонд.

Problem and topicality of the chosen topic. The devastating effects of the global economic crisis, conducting anti-terrorist operations, uncontrolled budget spending in the past have led to the difficult economic, political and social situation in the country. Today, in front of all economic agents are challenged not only by tight financial resources and effective spending, but also to find new sources of funding. The scope of education for many years has been characterized by a limited amount of funding from the state and private founders. That is why universities are interested in finding innovative models of additional funding. They often ask benefactors (businesses, charities, civic organizations) to contribute to the intellectual development of society. Given the fact that the subject shall not have unlimited financial resources and unlimited financial capacity to charity, research of endowments in higher education as an alternative way to use charitable contributions and funding of higher education is growing topical. Endowments in high school have recently become widespread in Ukraine. The driving force that encouraged the emergence of endowments in higher education was the adoption of the new Law of Ukraine «On Higher Education» [3]. Certain questions of using such funds have been studied by

various researchers, in particular, the legal definition of state capacity through the use of endowments [6], the essence and benefits of endowments in higher school [7], an alternative source of funding higher education [8], features of motivating economic actors during the endowment creation and operation [10]. However, many problems still have not found a solution.

Target and research methods. The article is to study the merits of endowments in universities and, by the methods of comparison, analogy, abstraction and generalization, study their strengths, weaknesses and the role in higher education.

Results. Endowments are a common tool to measure superpower funding of nonprofit institutions – such as universities, museums, theaters, medical facilities and more. In other words, endowment is the capital provided by non-profit organizations to finance its statutory needs (or the needs of their statute). Usually it takes the form of property assets (real estate, securities or cash) invested in securities investment projects or other real estate [7]. Any endowment is formed from fees irreversible by benefactors. The scheme of the organization of the fund is simple: philanthropists transfer funds to fund of targeted capital, creating in this way a target capital, afterwards fund transfers capital to trust respective structure (body which created by the fund) under the coordination and supervision of the relevant authorities and of organizations, for whose support it was created. Income from management of target capital is transferred fully to those organizations for whose support it was created, and the target capital remains intact [6, p. 23].

Actually, the first endowments emerged in the USA as a means to support non-state educational institutions, i.e., universities. One of the largest funds, whose assets exceed \$25 billion., was established at Harvard University in 1649. It was founded by graduates of Harvard. The total amount of university endowments in the USA exceeds \$200 billion. That ensures stability of research programs and ability to attract the best teachers to teach students. Sources of endowments are different. For example, Harvard endowment is annually replenished mainly by donations of university students who are expelled with the release of small amounts. The average return on investment endowment fund is about 10-11% per annum, the amount of payments on the main objectives of the fund – about 5% (from the amount of its assets), so about half income is reinvested [1]. Worldwide endowment funds today represent a powerful tool to finance innovative educational programs and research. In 80 universities the amount of endowments capital exceeds \$1 billion. Often it is not even a single fund, but an entire system of funds, each of which has its own purpose: payment of scholarships and grants to teachers, organization of sports events, research funding and so on. Means generated via endowment are used to fund the broadest range of projects: the construction of new buildings, support of library funds, infrastructure development, formation bonus for staff and students [14].

In Ukraine endowments are long in charitable activities. In particular, the Tax Code of Ukraine defines the term «endowment» as the amount of money or securities that are made by a benefactor to a bank or a non-bank financial institution, so charity care receives the right to use the interest or dividends in the amount of the endowment. In this case a purchaser is not entitled to spend or dispose of the principal amount of the endowment without the consent of the benefactor [11]. The Law of Ukraine «On charity and charitable organizations» determines the need for using interest and dividends from managing charitable endowments for: providing charitable help to beneficiaries; implementation of charitable programs; joint charitable activities [2]. In higher education the right to create and use endowment fund in higher education institutions is provided by the Law of Ukraine «On Higher Education». In particular, this legal act defines the content of sustainable fund (endowment) of a higher education institute as the amount of money or value of other assets intended for investment or capitalization for at least 36 months, passive income from which is used by a higher education institution to implement its statutory activity in the manner specified by the benefactor or his authorized representative [3]. Expanding the autonomy of higher education institutions, declared the state provides them with the right for establishment and sustainable use of the fund. We can see different names of endowment in different sources: the actual «endowment» proper, «endowment fund», «sustainability fund». In the context of our study, namely the use of endowments in higher education, we believe these concepts are identical. The Law of Ukraine «On Higher Education» expanded autonomy of higher educational institutions and introduced new, important for higher education changes [5].

However, experts say that the new law is still making little changes in the financial sector. The ability to dispose of their income does not mean that universities will have money to invest in their development: upgrade the resource base, construction, investment in research and development and so on. The fact is that a state university is a «non-profit institution». Contracted students' payments or scientific research revenues under the law should have zero profitability and only offset college costs for providing educational services. To fix this problem, an endowment fund may be created when the University can intercept from patrons a large amounts of money for its development, but use only dividends. According to experts, this mechanism for raising funds for development will stimulate improvement of the quality of education and help fight corruption. To

attract attention of potential donors, universities have to compete with each other to prove why they should be chosen. Moreover, as international experience shows, most graduates are benefactors. Charity in higher education has been around a long time. Educationalists often ask philanthropists to develop a higher education institution and implement innovative projects there for banal lack of funds for basic things. Besides, donations are often used as forced charity. The main difference of endowment and conventional charitable contribution is security of funds. The University has no right to spend the money collected, it uses only investment income. Institutions are legally entitled only to spend this money on the measures that are clearly and unambiguously listed in the relevant documents. In Ukraine endowment in higher education is still a new phenomenon. There is still no complete legal framework to regulate the use of sustainable features of the funds in higher education. However, according to the draft strategy for reform of higher education in Ukraine until 2020, developed by a working group at the Ministry of Education and Science of Ukraine, there is need for normalization mechanisms for creating and managing endowments, as well as conversion of existing funds in the institutions of higher education transparent endowments with fixed objectives and strategic use of Plan dividend [12]. That is, you can conclude that at the government level, the idea of endowments develops. But achieving the goals indicated should be the funding of higher education institutions through dividends from endowments at 1% [4]. The advantage of endowments can be considered in the investment nature of their financial resources. One can cite many arguments for choosing to increase funding for higher education.

After all, development is impossible without adequate financial support. Many institutions of higher education in Ukraine possess heavily worn material and technical base, need updating library funds, purchase of modern equipment, computer hardware and other equipment for research. The quality of educational services, vocational training, research activities also depend largely on employees' salary and the working conditions, which often require profound upgrading. However, public funding is limited, and educational institutions are not interested in setting high prices for educational services because it can cause the outflow of students who are not willing or not able to pay extra. There is a need to develop a new economic model of higher education institutions based on solidarity participation of the state, businesses and private persons. It is worth mentioning that endowments allow not «to consume» nested resources, but accumulate them. Endowments are intact, it is an important advantage. And even if the institutions of higher education cannot instantly attract significant amounts of their sustainable fund, over time they will grow. With the increase of the fund size the revenues will grow, and, consequently, the financial capacity of higher education will grow too. Moreover, resource endowment investment is financial instrument stimulating the economy, regardless of whether it is invested in the banking system, or securities entities. Today the issue of rational use of financial resources of higher education institutions (both budgetary and not budgetary) is often raised. The advantage of endowment in this context prevents theft and wastage of resources. The ability to use not very charitable contributions, but only dividends, gives confidence to the institution as a body. In addition, no financial transactions can be transparent without effective control, transparency and justice. When you create an endowment, a higher education institution relies first on its successful graduates, potentially able and willing to financially support their alma-mater. Endowment funds are not only an additional source of funds but also a unique way of communication between the university and its alumni. And it encourages administration and teaching staff of a higher educational institution to take care of the student today, because tomorrow he will be interested in investing in the development of the institution. Efficient operations of higher education institutions endowment helps create a positive image among the target audience of students and graduates for their further involvement in the production sector, and from the standpoint of research needs for their own development [6]. One of pioneers of introduction endowment funds in Ukraine was Taras Shevchenko National University of Kyiv, and its constituent Institute of International Relations. The institute endowment fund managed to accumulate around 250 thousand hryvnas from more than 20 donors. The purpose of this fund is to provide financial stability of the institution, successful implementation of its educational and research programs and projects, infrastructure development and independence from economic and social fluctuations. The board of Directors sends the collected funds to the specially created closed unit investment fund. Assets of mutual fund manages an experienced asset manager, investing in classic financial instruments: bank deposits, stocks, bonds and real estate. Importantly, capital fund itself remains intact, ensuring its constant increase and to work for many years. Interest is received through the work of the target capital, according to the charter fund, increases the welfare scientists, professors, researchers, graduate students of the Institute; promotion of the Institute of scientific and educational programs; assist talented and creative young people in connection with the activities of the Institute; assists in the development of publishing, the media, the information infrastructure of the Institute; provides any other assistance and facilitates the activities of the Institute which do not contradict the requirements of the law. The endowment fund of the Institute of International Relations of Kyiv National Taras Shevchenko University encourages graduates, teachers, students, business structures to join the benefactors of the endowment.

Depending on the size of the contribution, a benefactor receives various rewards mentioned in the list of benefactors: souvenirs, personalized boards, free parking, nominal opening audience, planting trees right on the Walk of Fame of the Institute of International Relations and more. The next task of the endowment fund of the Institute of International Relations included encouraging appropriate infrastructure that will ensure effective communication with alumni, system interaction with businesses and charitable foundations, employers and associates, all those who care and can contribute to the full and comprehensive development of the institution [13]. Of course, this accumulated endowment fund of financial resources available cannot ensure implementation of large-volume financing projects and results seen. However, interest in the activities of endowment funds in higher educational institutions is growing. Therefore, the benefits of the establishment of endowment funds in higher education institutions can be considered:

1. Endowments allow to attract additional financial resources for the development of the institution.
2. The Fund received donations are intact, directed to investments and generating revenue.
3. Via revenues a fund of a higher education institution will be able to realize innovative projects to which funding was not available from other sources.
4. Creating endowments, higher education institution has reason to expect revenue growth of it in the future by attracting new donations and their effective investment (including through professional asset managers of the company).
5. Investing endowment has a positive impact on the economy through infusions of additional financial resources in the banking and business sector.
6. Endowments in higher education institutions motivate economic agents to improve their image and rating as a legal entity which provides for the development of education in Ukraine.
7. Graduates and college students starting their own funds for the development of the university will reduce the outflow of qualified personnel abroad, for creating communication and involvement to his alma-mater, even after graduation. However, endowments existence can not solve all the current problems of higher education. Irrational or criminal management of fund investments may lead to unreliable resources collected, or even deliberately unpromising financial instruments, and thereby stealing endowment. Therefore, in order to rank high endowment in the process of formation of financial resources of the university, they have to go the hard way, however, it is what the Ukrainian people do today.

Conclusions. Summarizing the above mentioned, we can see that with the adoption of the new Law of Ukraine «On Higher Education», universities received new opportunities to attract and diversify their funding sources. Endowments as sustainable funds of higher education institution – a real opportunity not only to accumulate the necessary funding to implement innovative ideas, as well as the way of the state’s economy through investments. It seems that the effectiveness of each newly created endowment will depend on effective management and financial capacity of benefactors. Objectively, at the same time, the school that will create a sustainable fund will not be able to count on significant dividends. However, effective use of experience of foreign universities in conjunction with features of Ukrainian education can lead to a new and progressive level of financial security of national universities.

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THE GLOBAL FOOD PROBLEM PHENOMENON AT THE PRESENT STAGE OF INTERNATIONAL RELATIONS DEVELOPMENT

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Summary: According to the latest data there are about 870 million starving people in the world, it means that every eighth inhabitant of the planet is hungry. An important target today is to avoid increasing the scale of the food crisis, which at this stage of human development emerges as a pressing problem and to reduce its volume in the short term, and to finally overcome it in the long term in the future.

Key words: agricultural land, development, food, global food problem, hunger, population, water.

Анотація: За останніми даними, у світі голодують близько 870 млн. людей, що означає, що кожний восьмий мешканець нашої планети голодує. Важливим завданням сьогодні є недопущення розгортання масштабів продовольчої кризи, яка на даному етапі розвитку людства постає як нагальна проблема, та зменшення її обсягів у короткостроковій перспективі, а надалі і повного її подолання у довгостроковій перспективі.

Ключові слова: вода, глобальна продовольча проблема, голод, їжа, населення, розвиток, сільськогосподарські угіддя.

Аннотация: Согласно последним данным, в мире голодает около 870 млн. человек, что значит, что каждый восьмой житель нашей планеты голодает. Важной задачей сегодня является недопущение увеличения масштабов продовольственного кризиса, который на данном этапе развития человечества возникает как насущная проблема, а также уменьшение его объемов в краткосрочной перспективе, а в дальнейшем и полного его преодоления в долгосрочной перспективе.

Ключевые слова: вода, глобальная продовольственная проблема, голод, еда, население, развитие, сельскохозяйственные угодья.

According to Professor V. Maksakovskiy, "Global problems are the problems which cover the whole world, all the humanity, create a threat to the present and the future, and require combined efforts of the joint action of all states and nations for their solution " [2].

Among the main and interrelated global problems (environmental, energy and raw materials, the problem of the world ocean, demographic and other) the food problem occupies a special place. Firstly, physical existence and health of billions of people depend on the availability and quality of food. Since T. Malthus, who argued that the growing population of the Earth is immeasurably ahead of the increase in food production, demography and food insecurity are closely linked in the minds of the scientific world as the two variables in one equation. In this sense, the growth of the population of the Earth can be called a problem analysis factor. This seems to be true, but only eventually. Otherwise, it would be hard to explain the fact that in Africa, where food production is stagnant, population is increasing rapidly and the period of doubling its population is a little over 20 years. And, consequently, by 2020 we can expect a new doubling of the population of the continent.

The population of the planet increases very quickly – though not exponentially, as Malthus believed, but nevertheless increasing. History shows that it took humanity 4 million years to surpass 2 billion, 46 years – to gain another 2 billion and a total of 22 year – to add the following 2 billion. But still food on Earth grew faster than the number of people, which led to the increase in the quantity of food per capita. Meanwhile, the technological changes in the agricultural economy (transition to mechanical processing fields, the introduction of a machines system, the "green revolution", a revolution in biotechnology) allowed farmers not only to increase production but also to reduce its costs, and that meant lower prices for agricultural commodities. Although food prices in major world markets are at or near a historical low, there is increasing concern about food security – the ability of the world to provide healthy and environmentally sustainable diets for its whole population. One of the features of this problem is that finding a solution to one problem causes creating a new task or facing new problems without achieving integrated and long-term solutions. Most clearly this tendency

appears in the issue of development choices, because intensification of agricultural production in comparison with its extensive development after reaching (or overcoming) some absolute limit, which is determined by the ability of nature to restore itself, gradually loses its advantages.

Currently practically used all or almost all cultivable land is used. Plowing new, less convenient areas may lead to higher prices for agricultural products and have negative consequences for the environment, as it has already happened in the unstable areas of agriculture, for example in some African countries. Although agricultural area is still expanding, this is a slower pace, with the growth of arable land lagging far behind the expansion of agricultural land. According to the Food and Agriculture Organization of the United Nations (FAO), the share of agricultural land over the last 30 years has increased from 33,13 % to 35,71 % of the total land area, and the share of arable land – from 10,41% to 11,03 %. The area cultivated for the period 1961-1990 increased from 1,3 billion ha to 1,4 billion ha.

In terms of stabilization of the arable land, the population growth rate to a great extent determines the number of people living in countries where there is less than 0,07 ha of arable land (minimum availability of cultivated land) per capita. In 2050 the population of these countries will range from 1,6 billion minimum (version of the U.N.'s forecast) to 5.5 billion maximum.

Stagnation in increasing or stabilization of crop areas shapes the main direction of growth of agricultural production, its intensification on the basis of modern high-tech farming systems. But strength and power of these systems require to use them with caution, so as not to cross that elusive boundary beyond which begins serious violation or even undermining of the natural conditions of agricultural production. In November 1992, a proclamation was published, which was signed by more than 1500 scientists from different countries of the world. It sounded like a vigorous warning to mankind about ongoing environmental degradation that undermines the foundations of human civilization.

The use of intensive technologies in agriculture has exacerbated the problem of water and wind erosion and led to the fall of fertility in the vast areas of earth's surface. There is exhaustion of topsoil caused by the use of powerful machines and leading to falling yields in many places. According to a report by the American Institute of world resources, soil degradation and water availability covers 16% of the world's agricultural areas [3]. The increase in production is largely achieved at the expense of causing harm or even destruction of agricultural resources. This means that the current population of the Earth in the ecological sense is increasing its food consumption at the expense of future generations.

In the above-mentioned scientists' proclamation about environmental degradation it was observed that the reduction of soil fertility, which leads to its exclusion from treatment is a common by-product of existing methods of farming. Since 1945 11% of the vegetation cover of the Earth (over the area of India and China combined) has degraded, as a result food production in some areas of the world per capita is in decline.

In 2015 nearly half of the world population lived in countries with tight water balance (mainly in Africa, the Middle East, South Asia and Northern China), then there was less than 1,7 thousand cubic meters of water per person per year. Due to the intensive use of water of rivers and inland water bodies for irrigation shallow even large rivers get shallow. For example, the Huanhe remains dry for several months of the year. It is mentioned in the proclamation that in 80 countries, representing 40% of the total population, there is a serious shortage of surface water. Pollution of rivers, lakes and groundwater significantly hampers their use [1].

The growing problem of water poses a political threat as it can lead to conflict within and between states. As you know, half of the earth's surface rivers basins belong to more than one country and more than 30 countries receive a third surface waters from abroad. Hence we witness "river" conflicts between Turkey on the one hand, Syria and Iraq on the other, for the water of the Tigris and the Euphrates; between Egypt, Ethiopia and Sudan over the Nile water. The shortage of water both for direct human consumption and for use in industry and agriculture itself has become a problem, close to global [2].

Intensification of agricultural production and excretion of a number of high-yielding varieties of wheat, rice, corn, soybeans and other crops, fees are in the "green revolution" when the entire technology package (fertilizers, pesticides, modern processing systems, and so on) have 2-3 times increased, which led to replacement of a number of traditional local varieties of high-yielding crops. This fact significantly reduced the number of varieties used in agriculture and, ultimately, led to the decline of biodiversity in agriculture. But the arrival of industrial cities, deforestation, expansion of agricultural lands, and especially the use of high-tech farming systems, including the use of a large number of pesticides and genetically modified varieties, is the result of the general decline of biodiversity in nature. Eventually they lose the biodiversity needed for medicine and other needs, there is no contribution that genetic diversity of life forms contributes to the stability of global biological systems and to the blooming beauty of the Earth[1].

The deterioration of natural conditions, water pollution and land for industrial and agricultural enterprises, the widespread use of mineral fertilizers and pesticides contribute to development of food

substances that are detrimental to people's health. By some estimates, 60-80% of all cancer is a direct result of the presence of chemicals in air, water and food. A number of signs of poor health, fatigue, slow response, depression, headaches, allergies, chronic incidence of various infections, colds, nervousness, anger, excessive sensitivity to smells and aromas, memory loss, etc. that people tend to explain with a variety of reasons, in fact, caused by the toxicity of the environment, including consumption of contaminated food.

The World Health Organization believes that 70% of cases of diarrhea are caused by poor quality food. The real number of such diseases is significantly higher than the official figures because, according to WHO estimates, in developed countries, people report less than about 10% of such accidents, in developing countries – less than 1%. The process of globalization, despite the improvement of transport and freezer equipment, even increased the threat of food poisoning, because now a large amount of food from a single source is widely sold around the world. In many developed countries there is a very strict system of checks on the content of toxins in food at all levels of the agro-industrial chain, which cannot be said about most developing countries [3].

It is difficult to say whether there is in the world at least one fairly large country, which has not made its contribution to environmental degradation in any manner or form. The growing population at the current technological level inevitably causes damage to the environment and, consequently, leads to irreversible changes in nature. Humanity is in some sense living beyond its means, figuratively speaking, not on interest, and exhausting fixed capital. Technological development that throughout recorded history has been driven by the desire to optimize production, i.e. to increase the number and improve the quality of products while reducing costs, now must consider the environmental feasibility (and security, of course). This factor is becoming increasingly important and is becoming crucial for humanity, if it has the desire and the will to survive in the face of continued population growth and limited natural resources. The combined efforts of all countries and the creation of a single system and a single discipline of natural resources on the planet becomes an important condition for preservation and improvement of our civilization. And this can only be achieved by creating a single global mechanism for the conservation and protection of natural resources, possibly under the auspices of the UN. At national and international forums we can insistently hear calls for stabilization of production, primarily agricultural, and population at the current or close to it. In the proclamation of to the world public scientists emphasize the idea that the earth is finite.

It is very difficult to withstand the objective tendencies of economic and social development, if not impossible. Encouraging is the fact that the population growth rates in developing countries are beginning to fall slightly due to industrialization, urbanization and modernization, which gives hope for stabilization of its population by the middle or second half of the century. So the population growth rate in the Third world was 1,7% in 1985 to 1,3% in 2000 and is expected to decline to 1% in 2015. For most developed countries the decrease in the birth rate and aging population. In some countries of Eastern Europe there expected to be even overall decline in its population. It mostly applies to Russia, where projected population decline is from the current 146 million to 130-135 million in 2015. In the USA, Canada, Australia and New Zealand will remain the highest among developed countries population growth, partly due to immigration - an average of 0,7-1%. In some African countries, population growth rates will decline because of the high incidence of AIDS [1].

Differences in the rate of population growth, globalization of labor markets, political instability and conflicts in a number of developing countries will contribute to the intensification of migration processes. Now legal and illegal migrants constitute more than 15% of the population in more than 50 countries. Their number will increase, leading to increasing social and political tensions, creating new pockets of poverty and hunger, as well as to the changing ethnic and cultural appearance of the host countries because of the higher fertility of immigrants and their integration in the sphere of economic activity.

The reduction of population growth and stabilization of the valid (with respect to the used resources of the planet) level become imperative. The regulation should clearly be exposed and the number of a person – cats and dogs which are now fed, especially in industrialized countries on, a large number of high-protein foods – meat and fish. And at the same time, in developing countries, millions of children die from chronic hunger and related diseases. Humanity is going to need to find a direction of its development and improvement, which would be sharply reduced or eliminated by further numerical expansion. Fortunately, objective development trends coincide with this strategic target [2].

Unlimited optimism is rooted in the past. As the productive forces become more powerful, our planet seems to be reducing in size. The time has come when people in their daily production activities found or find Earth scarcity, and the exhaustion of natural resources. It is time of reasonable, prudent economic management, sober not only economic, but also ecological calculation of time maintaining a stable ratio between the population and the amount of natural resources. The presence of two poles in food consumption – chronic hunger at one extreme and chronic overeating on the other, numerically approximately equal creates an opportunity, so far, apparently, only theoretical, of development and implementation of some optimal medical

information, healthy diet, active and energetic lifestyle. Moreover, the agricultural sector still has great potential for increasing food security without increasing pressure on the natural environment. This includes the ability to reduce the still high losses at all levels of the agro-industrial chain, to further improve the productive forces of agriculture through the creation and use of energy-saving technologies, including biotechnology advances and organic farming, measures of socio-economic updates, including improving the regulatory role of states and international intergovernmental, public and religious organizations.

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THEORY OF MORPHOLOGY AND MORPHOLOGY IN ACTION: MAIN ASPECTS

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Summary: The article deals with the problems of morphology. Morphological facts of everyday life are studied from the point of view of its use in a human speech. The conclusion is made that morphology is connected not only with scientific approaches to the language, but with every day use of it.

Key words: generative grammar, lexicon, linguistics level, morphology, phonology, syntax.

Анотація: У статті розглядаються проблеми морфології. Морфологічні факти повсякденного життя вивчаються з точки зору її використання в мовленні людей. Зроблено висновок про те, що морфологія пов'язана не тільки з науковими підходами до мови, але і з повсякденним її використанням.

Ключові слова: генеративна граматика, лексика, лінгвістичний рівень, морфологія, синтаксис, фонологія.

Аннотация: В статье рассматриваются проблемы морфологии. Морфологические факты повседневной жизни изучаются с точки зрения использования ее в речи людей. Делается вывод о том, что морфология связана не только с научными подходами к языку, но и с повседневным ее использованием.

Ключевые слова: генеративная грамматика, лексика, лингвистический уровень, морфология, синтаксис, фонология.

Morphology in modern linguistics is the study of the forms of words, and the ways in which words are related to other words of the same language. Formal differences among words serve a variety of purposes, from the creation of new lexical items to the indication of grammatical structure [6, p. 4].

Morphology stands at the interface between the lexicon, phonology and syntax, and many of the most significant questions concern the way that morphological representations interact with representations at other linguistic levels. At the same time, important questions have been raised about the nature of morphological units and morphological processes.

Generative grammar seeks to provide an explicit, formal theory of language structure. Originally this meant constructing sets of rules, which are ultimately formalizable as mathematical expressions, but which in practice are usually stated in a relatively informal notation.

In linguistics morphology refers to the mental system involved in word formation or to the branch of linguistics that deals with words, their internal structure, and how they are formed [5, p. 6]. The subject of morphology is the study of changes in the rules of words, in other words, it is ways of the formation of different forms of the same word [2, p. 14-15].

The objective of the morphology is the study of the basic concepts of grammar, word distribution of the parts of speech, and the semantic-grammatical classes, the consideration of grammatical categories and the shaping of individual parts of speech, it is also the study of the main grammatical forms in the context [1, p. 5].

The word «morphology» has two different meanings in linguistics: in the first case under the morphology scientists understand some branches of linguistics, and in the second case – some aspects of the language system. When we say, for example, about the features of the Korean verb, we refer to a specific set of rules of the Korean language or of the Korean grammar. But when we use such wording as «the concept was transferred

to the morphology of phonetics», we mean, of course, morphology «as a science» that means a set of information about all private morphologies of the world.

In morphology two distinct areas are sometimes distinguished: morphemics describing the morphological means of natural language, and especially the organization of the outside word forms, and grammar describing morphological values, internal side of word forms. The close association of concepts makes the existence of the morphology dependent on the existence of words in a particular language. Meanwhile, this concept is one of the most controversial in linguistics and, most likely, not universal.

A word is an object that exists apart from all languages, and therefore it does not exist in all languages and morphology as a separate section of the grammar. In languages that have no written language, the morphology can not be separated from the syntax: it does not remain an independent object. A word is a syntactically independent set of morphemes forming tightly bound structure.

A word can be combination of words that can not be used in an isolated position. In addition, the elements within a word are connected with each other much more rigid and stronger bonds than the elements of the proposal. These «verbal» languages include, for example, the classic Indo-European languages (Latin, Greek, Lithuanian, Russian). The words may not syntactically behave in the same way as words in this languages [3, p. 13-15]. It is only theoretical knowledge and material that refers to the morphology. As for its reflection in people's lives, it is better to study it directly – in action.

Consider now the following phrases, taken from a Toni Braxton song: *Unbreak My Heart, Uncry These Tears*. We have never seen anyone unbreak something, and you certainly can't uncry tears, but every English speaker can understand these words. We all know what it means to unbreak somebody's heart or to wish that one's heart were unbroken. If we asked somebody, "*unbreak my heart*," we would be asking them to reverse the process of having our heart broken. We can visualize "*uncry these tears*," too – we just think of a film running backwards. We can understand these words because we know the meaning of the prefix *un-*, which basically reverses or undoes an action.

The fact that these particular actions, breaking a heart and crying tears, cannot be reversed only adds poignancy to the song. All human beings have this capacity for generating and understanding novel words. Sometimes someone will create an entirely new word, as J. R. R. Tolkien [7]. Did when he coined the now-familiar term *hobbit* (which, despite its popularity, is still not listed in the 2000 edition of the American Heritage Dictionary).

But more often than not, we build new words from pre-existing pieces, as with *unbreak* and *uncry*. We could easily go on to create more words on this pattern. Novel words are all around us. Jerry Seinfeld has talked about the *shushers*, the *shushees*, and the *unshushables* in a movie theater. Morley Safer was dubbed *quirkologist* – expert on quirky people – on a special episode of *60 Minutes*. For those who hate buffets, the TV character *Frasier Crane* came up with the term *smorgsaphobia*. Finally, the longest novel morphologically complex word we have been able to find on our own in the daily press is *deinstitutionalization*, from the *New York Times*. [4, p. 4-5].

These are everyday morphological facts, the kind you run across every day as a literate speaker of English. What these words – *unbreak*, *uncry*, *hobbit*, *quirkologist*, *smorgsaphobia*, and *deinstitutionalization* – have in common is their newness. When we see or hear them, they leap out at us, for the simple reason that we have probably never seen or heard them before. It is interesting that novel words do this for us, but novel sentences do not. When we hear a new sentence, we generally do not realize that this is the first time that we heard it.

Thus, it is reasonable to study morphology in everyday use, that is in action. Moreover, it is necessary to consider two sides: both theoretical aspects and its application. Morphology differs from syntax in this way, because morphology is considered as a dynamic process of forming and creating new words and using the same words in a new meaning of the same objects in everyday life.

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THE FORMATION OF THE UKRAINIAN COSSACKS

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Summary: The article concerns the origin of the Ukrainian Cossacks. The formation of Zaporizhya Sich is considered from the point of view of the origin of the Cossacks. The conclusion is made that Cossacks as a new social class take a special place in the history of Ukraine. They contributed greatly to the world history of Ukraine.

Key words: aristos, Cossacks, duky, Kish, uhodnykamy, Zaporizhya Sich.

Анотація: У статті розглядається походження українського козацтва. Формування Запорізької Січі розглядається з точки зору походження козацтва. Зроблено висновок, що козаки як новий соціальний клас займають особливе місце в історії України. Вони внесли великий вклад у світову історію України.

Ключові слова: аристос, дуки, Запорізька Січ, Кіш, козаки, уходники.

Аннотация: В статье рассматривается происхождение украинского казачества. Формирование Запорожской Сечи рассматривается с точки зрения происхождения казачества. Сделан вывод, что казаки как новый социальный класс занимают особое место в истории Украины. Они внесли большой вклад в мировую историю Украины.

Ключевые слова: аристос, дуки, Запорожская Сечь, казаки, Кош, уходники.

Special place in the history of Ukraine in XVI-th – XVIII-th centuries, in the historical memory of Ukrainian people is known to belong to the Cossacks and its advance guard, Zaporizhya Sich.

At the end of the XVI-th century, the center of political life of Ukraine again moves to the east, Naddnipyrianshina, which was under-populated for a long time. For several centuries the population of Ukraine tried to own the southern steppe. During the times of Kyiv Rus a number of fortifications were built to the south of Kyiv to rein nomads, but they were destroyed by Mongol-Tatars. During the reign of the great Lithuanian princes the southern borders increased again to the shores of the Black Sea. However, after the formation of the Crimean Khanate Tatars seized the Black Sea. They were the greatest source of danger for the Ukrainian population. The Tatars destroyed the city, killed the old, and the young were captured and sold into slavery. Only during 1450 – 1586 eighty-six attacks of Tatars in Ukraine were documented and during 1600 – 1647 seventy attacks were fixed. Therefore, in late XV – early XVI century. The Eastern Ukraine was spoiled. Kyiv became a border city and to the south of it there was almost no population.

With the accession of Ukraine to Poland the territory of south of Kyiv began to settle again quickly. The large landowners in Naddnipyrianshina become polish Ukrainian dynasty of Vyshnevetskiy, Ostrog, Koretsky and Polish magnates Zamoyski, Kalinowski, Potocki and others.

Polish king gave land to magnates to the east. For their development magnates and gentry called to their peasants, offering them the right to use the land without dues for 10-30 years. At that time southeastern limit of Ukrainian settlement reached so-called Wild Field – settled population uninhabited steppes between the Don, Oka and upper left tributaries of the Dnieper and Desna. It was a great array of free land, which actually did not belong to any state. Natural Wild Field conditions were extremely favorable for commercial activity. Here, on the border with the Wild Field, armed with guns placed border castles with military garrisons, Oster, Kanev, Cherkassy, Bratslav, Vinnitsa, Zhitomir.

As a result of social oppression in Ukraine at the end of the XVI-th century spreading Cossacks caused the appearance considerable part of peasants and townspeople. Single people and their families fled from the landed gentry, and settle on the southern and south-eastern regions. They declared themselves Cossacks, trying to completely avoid dependence on lords and through freehold start free management. Others joined the Host associations. At the same time another source of the growing of this condition was traced. Thus, as Shcherbak V.O. says, most officers had become from the gentry, as evidenced by the Cossack register in 1581, by the way, the document can clearly show the ethnic composition of those in public service [1, p. 134]. Except Ukrainians there are the Poles, Tatars, Belarusians, Russians, Moldovans. Most Cossacks had no permanent residence and went to the desert to serve in trades or wealthy burghers. This phenomenon became so widespread that in 1499 Kyiv governor issued charters compulsory payment of duty on profits Cossacks and generally have to give tithes warlord.

Numerous conflicts between Tatars and uhodnykamy aggravated relations between them. In 1475 the Crimean Khanate became Christian states. The local population was forced to self-unite in front of the Tatar danger.

Over time, those who in gangs went to the Wild Fields made campaign against the Tatars in plain or protected them from their homes, were called Cossacks. The church hierarchy wrote about Ukrainian Cossacks in the memorial to Polish government in 1621.

By the middle of the XVI century, most of them behave like Cossacks only a certain time and then returned to their main occupation, but gradually began to settle in the steppe for permanent residence. Already in the middle of the XVI century in the fertile plains of Southern steppes Cossack villages had arisen.

Cossacks living conditions, prevailing in the plains of the Wild Fields, were strict and simple, they require physical endurance, ability to withstand cold and heat, the hardships of military life. Cossacks lived in makeshift huts woven from reeds and covered with horsehide. Cossack life was very intense, because they do everything with their hands. Those wishing that went to the Wild Fields engage prairie crafts (hunting, fishing, beekeeping). Cossack settlements were richer than peasants from the villages, because, firstly, the Cossacks were free people, and secondly, they had land which size exceeded the tenure of many nobles in the west [2, p. 92].

The life of Naddnipyrianshchina Cossacks was difficult and very dangerous. Even working on the land, they had to carry constantly weapons to protect themselves from the Turks and Tatars. Over the years the Cossacks improved their military skills and organization, produced excellent weapons and gunpowder. The armed Cossacks began not only defend against attacks of Crimean people but also attack, the Tatar ulus.

In areas inhabited by Cossacks gradually there formed a social organization in which there was no coercion, though there was a certain social inequality. Cossack rabble served the wealthy Cossacks, who were called dukamy. They owned farms, lands, etc. There were also urban Cossacks (Chyhyryn, Korsun, Cherkassy). The Cossacks were company – community councils who decided on major issues, elected atamans, captain and judges. Cossacks had the same right to use the land by hunting, fishing.

The Cossacks, who lived in the occupied magnates lands, had to give honey, furs, money, serve in the military units in castles.

The Cossacks were deeply religious people and professed Orthodoxy. They gave stipule people of different nations, but they had to accept the Orthodox faith.

The documents of that time proved that Cossacks were mentioned among Shurovo «company» and the detachment of Kiev governor Putyatych. Over time, their growth was notable for the authorities. In 1524 there was evidence that the Lithuanian prince agreed to take the civil service, two thousand Cossacks and placed garrisons against the Tatars. Cossack population concentrated mostly in southern and eastern skirts of Kyiv region, and from the second half of the XVI century a significant number of Cossacks settled below the Dnieper rapids on the islands and on both sides of Slavutych. The process of concentration with rising temporary fortified «Gorodets» to protect from Tatars and storage and processing products industries. As Cossacks mentioned «Sich is a mother, Big Bug is a father, steppe is a Cossacks' fate». For protection, but «Gorodets», Cossacks did bins or «cross section» of fallen trees. We know there were many fortifications, but each of them could not withstand the onslaught of large enemy forces. Therefore, first siches began to appear. The name «Sich» was derived from the word «cut». They were united with small military units together in a large Cossack alliance with the center, which was named Zaporizhzhya Sich. Due to natural conditions Zaporizhzhya was inaccessible for Lithuanian and Polish forces and for Tatar and Turkish hordes. The system includes all Sich small town - battles. Along with the word «Sich» the word "Kish" was used in Cossacks' documents. They are synonymous. Its interpreted as a rule or place of temporary stay of the Cossacks, a military camp.

Social structure of Cossack Army was democratic. All Cossacks had the same rights. They called themselves «comrades» and his troops – «the company» or «chivalry» Zaporizhzhya Army. Women are not allowed to camp, exclusively male lived there. Written code of laws was not based on life of Cossack, their community customs and traditions.

Zaporizhzhya Sich existed for over 200 years. During this time eight Cossacks' Siches changed: Khortickiy, Bazavluk, Tomakivs'ka, Mykytansku, Chortomlynsku, Oleshkivski, Kam'jankiy and New.

The Cossacks showed that there were such people as Ukrainian - freedom-loving people, with own language, faith, culture and their own traditions. This nation wanted to create own state, it was able to defend it. D. Doroshenko wrote that «Cossack – is not only brilliant, the most effective appearance of Ukrainian history; it is also the largest daily tension forces of the Ukrainian people and their state, social and cultural creativity. In the Cossack Sich Ukrainian people identified themselves as the best, the most active element, formed a kind of aristocracy, when we would assume that the Greek word «aristos» means the best» [3, p. 5].

The basis for the formation of the Cossacks was the existence of a large body of free land gained experience in the preceding period of their development, the natural desire of people to self-preservation, self-assertion and self-realization. Catalysts of this process was large-scale colonization of new lands that took place

in the XV century; strengthening social and economic contradictions and religious and national oppression; growing external threat from the Turks and Tatars.

Thus, during the XV-XVI centuries in society, a new social class was formed, which originated as opposition as a challenge to the current system as the new elite that reasonable, played the role of a political leader and authority. The Connection with the Cossacks gave people the consciousness that they are the defenders of their land, their homeland.

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WAYS OF NEOLOGISM TRANSLATION (based on the material of the modern American mass media discourse)

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Summary: The paper focuses on neologisms in the American mass media discourse. The notion of media-discourse has been studied. The concept of "neologism", its classification principles and methods of translation have been determined. A frequency analysis has been applied to the categories of neologisms and translation transformations.

Key words: cognitive category, concept, neologism, media-text, mediadiscourse, translation transformations.

Анотіція: Робота присвячена неологізмам у дискурсі американських ЗМІ. Розглянуто поняття медіадискурсу. Визначено поняття «неологізм», принципи їхньої класифікації та способи перекладу. Проведено частотний аналіз неологізмів за категоріями і перекладацькими трансформаціями.

Ключові слова: когнітивна категорія, концепт, медіадискурс, медіатекст, неологізм, перекладацькі трансформації.

Аннотация: Работа посвящена неологизмам в дискурсе американских СМИ. Рассмотрено понятие медиадискурса. Определено понятие «неологизм», принципы их классификации и способы перевода. Проведено частотный анализ неологизмов по категориям и переводческим трансформациям.

Ключевые слова: когнитивная категория, концепт, медиадискурс, медиатекст, неологизм, переводческие трансформации.

A great interest in the science of neologisms is conditioned by an important role of neologisms as a mirror of linguistic development. Most neologisms come from the mass communication. The mass media discourse is one of the most common forms of contemporary language existence in the United States. Neologisms relate to almost all aspects of the American society and life.

The significance of our research is determined by the necessity of studying the new vocabulary as it shows changes that occur in modern linguo culture under the influence of computerization, information system development and globalization. During the transitional periods of social and economic development the question of language changes becomes one of the most important problems in scientific research as it objectively measures the dynamics of social and industrial changes.

Nowadays, in the era of globalization it is vital to stay tuned in every aspect of our life. One of the most important sources of receiving the information is the mass media.

The channels of mass media distribution are press, television, radio, the Internet, external advertising, ect. As new technologies appear, mass media become more and more advanced and complicated. They have become the main instrument used to spread information and influence human consciousness.

The mass media in the United States have a powerful impact on the consciousness of the citizens, as most of people's ideas about the world they get from the newspapers, magazines, television and the Internet. The American mass media are intended not only to transfer data and information though they are active participants in socio-political and economic processes. They are the agents that create situations and the mood of the population. In the context of linguistics one can investigate these processes by using media-discourse [4, p. 22].

There are a lot of interpretations of the "discourse" notion. Its most common definition is represented by N.D. Arutiunova who determines the discourse (french. discours – language) as a coherent text together with extralinguistic, pragmatic, socio-cultural, psychological and other factors, the text that is taken in the conceptual aspect; language, regarded as purposeful social action, as a component involved in the interaction between people and their mechanisms of consciousness (cognitive processes) [1, p. 136-137].

Derived from the general concept of discourse is the concept of 'media discourse'. The scientist T.G. Dobrosklonskaya defines 'media-discourse' as a set of processes and products of speaking in mass communication in all the richness and complexity of their 'interaction' [2, p. 152]. Media-discourse as a discrete entity that divides information streams into separate fragments is represented through media texts as a result of psycholinguistic media-discourse participants.

In terms of convergence and dynamic development of the mass media there is a constant genre movement in mass communication. It complicates the selection of media-discourse genre resistant traits and leads to functional and genre diversity of typologies. However, most scientists determine such genres of media-discourse: analytical interviews; conversation or comment, sociological resume, rating, review, confession, essay, ect.

Neologism is a relatively new or isolated term, word, or phrase that may be in the process of entering a common usage, but that has not yet been accepted into mainstream language. Neologism is a historically changeable unit, one of the passive vocabulary categories that is the unit that has not been widely used in the language [5, c. 34]. The examples below show the Ukrainian equivalents of American neologisms: *glamping* – (going camping, but with glamour. It's like regular camping, but with nicer things than usual, being warmer, and more comfortable – UD) – кенпінг зі зручностями; *digital detox* – (avoiding digital activities such as checking your phone and logging into facebook for a meaningful period of time, usually the length of a vacation – UD) – відпочинок від девайсів; *wikiality* – (reality as decided on by majority rule. Based off wikipedia's 'majority rule' fact – UD) – вікіальність.

When neologisms appear in the language they become individual newly created units that have all chances to become social facts and be used by people whenever necessary. Thus in such a way neologisms become codified, standardized and transition into usual terms.

So, from the media-discourse point, neologism is its new product that is objectified by linguistic units due to the development of modern technologies and extensive use of media in everyday life.

The cognitive approach to the study of neologisms helps to define their essence, structure, perceived understanding, decision-smart solutions without which perception would not simply exist. Categorization is of great importance in cognitive science since it is the basis of mental and perceptual processes of man, human activities, actions and speech. Every time a person sees something as a variety of other things, it provides categorization. When a person thinks or talks about something, it means that he uses categories.

From the standpoint of cognitive-discursive paradigms neologisms in the American media-discourse form the following categories: 1) OBJECT; 2) SUBJECT; 3) ACTIVITIES; 4) PHYSICAL AND PSYCHOLOGICAL STATE OF THE PERSON; 5) PHENOMENA; 6) ATTRIBUTES. Each category creates a group of thematically-integrated neologisms that reflect and structure media space of the American society.

Numerous transformations are used to convert the American neologisms into Ukrainian language. A translation transformation is an interlinguistic conversion, alteration of source text's elements or paraphrasing the translation to achieve the equivalent. There are such types of transformations as: grammatical, semantic, syntactic, lexical, lexically-semantic, lexically-grammatical, stylistic [3, p. 279]. As a result of our study we found out that the most frequent transformations that the interpreters use for borrowed neologisms are *lexically-semantic*, namely *transcoding*, *loan translation*, *contextual replacement*, *semantic development* and *descriptive translation*.

The quantitative analysis shows the most common translation transformation which is *loan translation* – 184 neologisms (46%) out of 200 units. Less common method of neologism translation is *contextual replacement* – 108 words (27%). *Transcoding* was applied to 48 neologisms (12%). *Semantic development* was used in translation of 36 new words (9%). The least used method of translation of the neologisms was *descriptive translation*. Only 24 new words were translated in such a way (6%).

Besides, the pattern shows that loan translation – 184 neologisms (46%) – is the most frequently used translation technique in each cognitive category of neologisms.

So, as a result of our investigation into the American media discourse neologisms from the standpoint of cognitive-discursive paradigms we have created an electronic dictionary of these new words which are distributed by the examined categories. The ways of neologism translation into the Ukrainian language were studied with loan translation as the most frequent way of borrowing the American mass media neologism. To

conclude, the American mass media proved to have a considerable impact on variable processes in the modern Ukrainian language and the Ukrainian language speaker's world view and culture as well.

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HISTORICAL PECULIARITIES OF JAPANESE WRITING SYSTEM

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Summary: The article concerns the peculiarities of the Japanese writing system. It is considered from the point of view of the origin and evolution of the Japanese language, as well as its modern state. Syllabaries, some types of hieroglyphs and systems of transliteration are studied. The peculiarities of the structure of Japanese dictionaries and the meaning of the Japanese hieroglyphs are analyzed.

Key words: adstrate, borrowed word, furigana, kanji, onomatopoeia, romanji, roshiaji, substrate, syllabary.

Анотація: Дана стаття стосується особливостей японської системи письма. Вона розглядається з точки зору походження та еволюції японської мови, а також її сучасного стану. У ній вивчаються складові азбуки, деякі види ієрогліфів та системи транслітерації. Аналізуються особливості будови японських словників та значення японських ієрогліфів. **Ключові слова:** адстрат, запозичення, кандзі, ономапопея, романдзі, росіядзі, складові азбуки, субстрат, фуригана.

Аннотация: Данная статья касается особенностей японской системы письма. Она рассматривается с точки зрения происхождения и эволюции японского языка, а также ее современного состояния. В ней рассматриваются слоговые азбуки, некоторые виды иероглифов и системы транслитерации. Проанализированы особенности строения японских словарей и значения японских иероглифов.

Ключевые слова: адстрат, заимствования, кандзи, ономапопея, романдзи, росиядзи, слоговые азбуки, субстрат, фуригана.

Japanese is both a difficult and interesting language. It has always been an important part of the Japanese culture. It is hard to determine the position of the language in the system of other languages. Many scholars tried to reveal the answer, but the position and history of Japanese have remained controversial questions up to this day.

Scholars suggest that there prevails a hypothesis according to which Japanese is referred to the Altai language family, puyo-group with significant Austronesian substrate and Chinese adstrate. The Japanese language has experienced a strong lexical influence from Chinese, but Japanese does not belong to the Sino-Tibetan family of languages, because its influence mainly affected lexicology in contrast to grammar [3].

Scholars who consider the version of the Altai origin of Japanese, refer its formation to the period after the conquest of the Japanese islands by the Altaians. It would be unfair not to mention the fact that it is difficult to specify the exact date of the origin of the Japanese nation since, before the implantation of Chinese characters, Japanese had no written language, and there is almost no evidence of its historical development [3].

In the 6th century AD there occurred an active inculcation of Chinese culture. And with the advent of the government, crafts, art and culture, Buddhism in Japan there appears writing. "*Kojiki*" and "*Nihon Shoki*" are the first major Japanese literary works. In this period, a lot of Chinese words appeared in Japanese. About 40% of Japanese words are Chinese borrowings [3].

Initially, there was "*man'yogana*". It includes particular Chinese hieroglyphs, performing the function of syllabary. When ancient people tried to create a Japanese alphabet, there appeared "*katakana*" and "*hiragana*" — syllabaries. The author of *katakana* is a Buddhist monk, who developed it on the base of Chinese hieroglyphs. In the 8th century a lady of the noble family Heian of the Kyoto created a second syllabary — *hiragana*. She used it to write poems, stories and diaries. Therefore, the second name of *hiragana* is women's writing. In the 11th century on the basis of *katakana*, *hiragana* and *kanji* the Japanese writing system was formed [3].

Japanese had eight vowels, but eventually only five were left. Also morphology and lexicology changed. The syntactic features of the language did not change. Japanese has two names: *Nihongo*, that is used in the context of the other world languages and as a subject, which is taught to foreigners abroad; and *Kokugo*, that is used as a part of the national culture, both as a native language and state language.

The Japanese writing system consists of three main parts: the *kanji* (hieroglyphs borrowed from Chinese) and two syllabaries — *hiragana* and *katakana*. Also, *romanji* are used to write Japanese words by Latin letters, other types of hieroglyphs. And there is a *system of Polivanov*, with the help of which we can write Japanese words and "letters" in Cyrillic. Each of these types of writing has its specific place in the Japanese writing [1].

Hiragana is a syllabary used for words which have no *kanji* to be recorded. Also we use *hiragana* to write particles, suffixes, forms of the verbs and adjectives. This syllabary is used in *lieu kanji* words, in cases when the reader does not know some of hieroglyphs, or these hieroglyphs are unfamiliar to the writer. When children and foreigners are taught the writing system, teachers use *hiragana*. The writing system is taught to children and foreigners with the help of *hiragana* [1].

In addition, *hiragana* is used to record phonetic clues to read hieroglyphics. These clues are called *furigana*. Small *hiragana* letters are written on the top or on the side of the hieroglyph, which is not known to everybody [1].

The following discussion is focused on *katakana*. *Katakana* is a syllabary, which is used to write the borrowed words (without any analogues of the hieroglyphics); also *katakana* is used to write foreign names and onomatopoeia, scientific and technical terms: the names of plants, machinery parts, and so on [1].

Hiragana and *katakana* are ABCs of the same vowels, consonants and syllables, that are just written differently. *Hiragana* consists of forty-six basic characters and one hundred and four basic combinations. *Katakana* consists of forty-seven basic characters and about 100 basic combinations. *Romanji* is a means of transliteration of the Japanese written language, created to record the words of Japanese in Latin, for example, *hiragana*, *Nihongo* [1].

Kanji are Chinese hieroglyphs used in the modern Japanese writing system with syllabaries, *romandji*, Arabic numerals and others. A Japanese term *kanji* literally means "letters (of the dynasty) *Han*". They have several pronunciations. There are two readings of the Japanese hieroglyphs — on-reading (Chinese reading) and kun-reading (Japanese reading). The choice of reading the hieroglyph depends on the context, meaning, combination with other hieroglyphs, and even position in the sentence [2].

Kokuji (national hieroglyphs) are hieroglyphs of the Japanese origin. Most of *kokuji* have only kun-reading. *Kokkun* are hieroglyphs, the meaning of which in Japanese is different from Chinese [2].

The *system of Polivanov* is a means of transliteration of the Japanese written language, created to record the words of Japanese in Cyrillic. It is also named *roshiaji*, *rossiaji* or *kiriji*. This system was created by Evgeny Polivanov in 1917. Examples are the following: "*oxaë*" (Good morning), "*нэко*" (cat). *Romanji* and *roshiaji* have some differences in the pronunciation of several syllables. Thus, *romanji* is more popular and useful than *roshiaji* [4].

Japanese and European dictionaries are not the same. In order to find the right hieroglyph in the Japanese dictionary, you need to know the key (the simplest component of hieroglyph) and the number of lines. Every hieroglyph has its own number of lines, which it consists of. The direction and sequence of inscription of the lines is very important too [2].

The writing direction also plays a significant role in the Japanese writing system. The traditional writing direction is from the top to the bottom, from the right to the left. This method continues to be used in literature and publicism. In scientific literature, most commonly the European way of writing is used. It is due to the fact that the words and phrases in other languages are often inserted in scientific texts, for example, mathematical and chemical formulas. In a vertical text, it is very inconvenient and very hard to read [2].

Thus, the Japanese writing system is a special phenomenon of all writing systems in the world. It consists of different elements, such as two syllabaries (*hiragana* and *katakana*), three basic types of hieroglyphs and two transcriptional systems (*romanji* and *roshiaji*). The history of the formation of Japanese and its development helps us to understand the nature of Japanese and its exclusiveness.

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PROBLEMS OF THE OVER-THE-COUNTER (OTC) MARKET DEVELOPMENT IN UKRAINE

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Summary: The article deals with the development of the OTC market in Ukraine. The features of forex companies' activity and control over the conduct of foreign exchange transactions in Ukraine are determined.

Keywords: financial monitoring, foreign exchange transactions, forex companies, over-the-counter market (OTC), Ukraine.

Анотація: У статті проаналізовано стан розвитку позабіржового ринку в Україні. Визначені особливості діяльності форекс-компаній та контролю за проведенням валютних операцій в Україні.

Ключові слова: валютні операції, позабіржовий ринок, Україна, фінансовий моніторинг, форекс-компанії.

Аннотация: В статье проанализировано состояние развития внебиржевого рынка в Украине. Определены особенности деятельности форекс-компаний и контроля над проведением валютных операций в Украине.

Ключевые слова: валютные операции, внебиржевой рынок, Украина, финансовый мониторинг, форекс-компанияи.

Securities trading on the financial markets is quite effective, due to the increased reliability of the capital investments because of strict control of transactions and detailed inspection of emitter's financial condition.

The over-the-counter (OTC) market exists along with the stock market. The essence of the OTC stock market is expressed by its name – that part of the stock market, which is outside the scope of stock exchanges' activity. Despite the fact that the exchange and the OTC markets compete with each other, they should not be considered as being mutually exclusive, but as being complementary to each other [2].

The *goal* of this research is to analyze the development problem of the OTC market in Ukraine and evaluate its existence level on the basis of such *methods* as description and comparison.

The subject has been investigated by domestic and foreign scientists. Aspects of stock and exchange markets, as well as forex companies activities have been analyzed by Ukrainian and Russian economists, notably S. Borynec, A. Golikov, V. Novytskiy, Y. Lysenko, L. Krasavin, A. Nagovicin, B. Rubcov, D. Gavrikov, A. Elder, S. Wins, G. Soros, B. Stewen, D. Shwager and others.

The problem of the OTC market development is very important for the Ukrainian economy stabilization, owing to the importance of the OTC market functions:

- increase of investment, because it approaches the stock market to retail investors due to its branching, mass character and efficiency;

- operative finding of the most profitable objects of capital investment for investors;

- assistance to the stock market development at the regional levels (provinces, districts, cities);

- useful economic tool for local governments;

- acceleration of the development of the stock market infrastructure in the country, particularly for the development of electronic information channels and networks that provide the transparency of the process of issue and turnover of securities and validity of the decisions about their sale and purchase;

- assistance to the development of services for stock market participants: investment consulting, management of investment portfolio and other types of stock exchanges activities;

- improvement of the work quality of the stock exchanges to stand in competition with the OTC market.

The trends to the increase of the OTC market sales are seen worldwide. But we should not assume that the current role of the stock exchange in securities trading decreases. The exchange continues to play an important role in the accumulation and mobilization of the money capital. This market is provided with quick and qualified information, as well as has a full system of specialized brokerage and consultative firms. The

exchange is a kind of service for maintenance of the capital market and the credit system. That's why there are many individual markets investors on the exchanges.

The OTC market differs from other financial markets by the fact that anyone who has relatively small previous contributions (deposits) can actually become its member. To participate on the market, one is not required to have either special education, or initial capital, or powerful material base [1].

The National Bank of Ukraine (NBU) controls the conducting of foreign exchange operations in Ukraine. The issue of providing services in the area of the arbitrage operations on terms of margin trading to individuals was regulated by the adoption of the Resolution № 327 of 03.08.2012, passed by the Board of the National Bank of Ukraine. This resolution vested the right to conduct the arbitrage operations on terms of margin trading only by authorized banks [5].

Nevertheless, so-called forex companies operate in Ukraine. Unlike banks, most of the forex companies operate as firms that provide information services, while a foreign company that is registered, usually offshore, enters into contract with clients. Such company has no responsibility – either legal or financial – and therefore it can give no guarantees to fulfill its obligations [3].

The offshore activities features of these offshore companies allow them to implement unfair policies that lead to appearance of additional risks for clients. So clients applications are often fulfilled at non-market rates or not fulfilled at all. Clients often suffer from losses due to non-repayment of profits. Besides, such status of these offshore companies allows them to quickly cease their activity without any problems. In this case it would be impossible to return customers' own funds, because these funds would be transferred abroad not as a guarantee fee in order to conduct arbitrage operations, but as payments for services, which would allegedly be provided to the clients by the company. A client of such a company usually has no real possibility to challenge its actions and to get legal protection in conflict situations. Forex companies are attractive for our citizens because of a simplified system of account opening, lack of financial monitoring and lack of necessity for tax payments. These questionable benefits are not commensurable with the risks that forex companies expose to their clients. This causes an urgent need for clear regulation of all the relationships arising in this area on the legislative level [4].

Securing the rights and obligations of this market at the national level will allow to conduct tight control over the activities of such companies. Also, it would be necessary to expand the powers of the National Bank of Ukraine concerning the regulation of operations on Forex market, particularly to establish the relevant executive authorities. Existing examples of the such authorities are the British Office of the Financial Regulation and Observation and the Commission on Futures Trading in the United States. In addition, in the United States much effort is made to design rules of trading, conditions of brokerage services providing and settlement of conflict situations by the non-governmental National Futures organization. Realization of such measures will not only protect the rights of citizens, but will also receive additional funds for the state budget. Besides, it will make the job on such markets more popular which will yield some dividends too.

Conclusion. In summary, it should be noted that the scheme of Forex and its clients activities are not legally regulated. Thus sometimes even entails a violation of the current legislation of Ukraine (in particular, the Civil Code of Ukraine). The result is that individuals – citizens of Ukraine who decide to play on the Forex market, and thus enter the appropriate relationship – in the first place create danger and threat for their own interests of investors, as in case of problems, the person can not seek for protection of their rights. As a rule, such situations become possible because of low legal culture or legal nihilism of the citizens. Therefore, it's necessary to establish the appropriate legal framework that will regulate the activity of such market, or at least rules that would directly regulate relations between a trader and an investor. That, in turn, would give more options for investors to protect their rights in case of certain disputes.

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**POTENTIAL EFFECT OF NBIC-CONVERGENCE ON
EVOLUTION OF CIVILIZATION**

THE

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Summary: The article analyzes the potential influence of NBIC-convergence on the evolution of civilization. The results of the study are as follows: confluence and synergy of nano-, bio-, info- and cognitive technologies concern plenty of aspects of human life, particularly, can modify human mind. Due to this fact moral and ethical issues connected with the consequences of NBIC-convergence for the mankind also were analyzed.

Key words: NBIC-convergence, noosphere, synergy, technological progress.

Анотація: Стаття присвячена розгляду потенційного впливу NBIC-конвергенції на еволюцію цивілізації. У результаті дослідження було встановлено, що злиття та синергія нано-, біо-, інфо- та когнітивних технологій стосується численних аспектів людського життя, зокрема, може модифікувати розум людини. У зв'язку з цим також були проаналізовані моральні та етичні питання, пов'язані з наслідками NBIC-конвергенції для людства.

Ключові слова: ноосфера, синергія, технологічний прогрес, NBIC-конвергенція.

Аннотация: Статья посвящена рассмотрению потенциального влияния NBIC-конвергенции на эволюцию цивилизации. В результате исследования было установлено, что слияние и синергия нано-, био-, инфо- и когнитивных технологий затрагивает многочисленные аспекты человеческой жизни, в частности, может модифицировать разум человека. В связи с этим также были проанализированы моральные и этические вопросы, связанные с последствиями NBIC-конвергенции для человечества.

Ключевые слова: ноосфера, синергия, технологический прогресс, NBIC-конвергенция.

Technologies always develop in conjunction, and breakthroughs in one area have been linked to achievements in other areas. In the distant past findings in the sphere of new materials performed as "catalysts" of technological progress (discovery of bronze, glass, steel, etc.).

Today due to the speeding up of scientific and technological progress we observe intersection of plenty of scientific and technological revolution waves. Particularly, we can witness the revolution in the field of information and communication technologies having started in 1980-s, the biotech revolution, and the recently started revolution of nanotechnology. It is also impossible to ignore the rapid progress of cognitive science during the last decade, which is expected by many researchers to be a trigger to the forthcoming scientific revolution. Each of these areas can yield (and has already yield) a number of new significant theoretical and practical results. At the same time, these results have great impact not only on development of the related field, but also accelerate the development of other technologies and areas of knowledge [1]. In our opinion, mutual influence of information technology, biotechnology, nanotechnology and cognitive science are of special interest and highly probable benefit.

This phenomenon was called NBIC-convergence (according to the first letters of scientific fields: N-nano; B-bio; I-info; C-cogno). M. Roco and W. Bainbridge, authors of the most significant report on this topic entitled "Converging Technologies for Improving Human Performance», 2002, introduced the term NBIC-convergence. The report describes peculiarities of NBIC-convergence, its significance in the general course of technological development of the world civilization, as well as its evolution and culture-forming magnitude.

Convergence means not only mutual influence, but also interpenetration of technologies when boundaries between separate technologies are eliminated, and majority of interesting outcomes are obtained in frames of interdisciplinary work at the junction of areas. With regard to NBIC-convergence we can even talk about the expected partial merger of these areas into a single area of scientific and technological knowledge. This area will include almost all levels of substance organization: from the substance molecular nature (nano) to the nature of life (bio), the nature of the mind (cogno) and processes of information exchange (info). Development of all the NBIC components will affect all the aspects of human life, plenty of them will change radically. So, the distinctive features of NBIC-convergence are:

- intensive interaction between pointed scientific and technological fields;
- significant synergy effect;
- wide scope of related and influenced areas – from the atomic level of substance to reasoning systems;
- perspective of qualitative growth of technological capabilities of individual and social human development owing to NBIC-convergence.

How will the civilization be changed with the development of converging technologies? The development of NBIC-technologies will lead to a significant jump in the capabilities of the productive forces. Due to

nanotechnology, namely, to molecular manufacturing, it will be possible to create extremely low cost material objects. Molecular nanomachines, including nanoassemblers, may be invisible and allocated in space in anticipation of a command to the production process. This situation can be characterized as transformation of nature into productive force, in other words, as elimination of traditional social production relations. This state of affairs could theoretically be associated with the absence of state in the modern sense of this term, lack of commodity-money relations and a high level of personal freedom. Within the new situation, traditional economy and even the theory of evolution in the current form will no longer be applicable [4].

Even before molecular manufacturing radically changes the economic situation, we can observe extra consequences in other areas important for the economy. In the field of cognitive technologies development of artificial intelligence may become a key achievement in relation to economy – it will manage nanorobots in their productive work. In the future information and communication technologies will be integrated into the global production system enabling operation of nanotechnology and artificial intelligence with the greatest efficiency [2].

If the forecasts towards the development of "noosphere" are correct, the relationships connected with creative and cognitive activities will develop. In general, with respect to the development of society through several decades there are more questions than answers.

Nevertheless, part of existing social structures will be saved for a while with insignificant changes only. However, in the long – term outlook the growing autonomy of individuals will lead to emergence of new communities, new social rules within the old systems.

It is difficult to claim how the culture of mankind will change in the process of transformation. This process can be strongly affected by changes of moral and ethical standards which inevitably will occur in reaction to the development of modern technologies. Perhaps ethical guidelines can be controlled. The criterion of pleasure, one of the important ethical criteria since the time of Epicurus, will also be transformed – it will be possible to get pleasure without being dependent on specific actions or events.

How will civilization be developed in terms of the biological level of its organization? People modified and improved by using convergent technologies will make up an increasing part of the population. Steadily the importance of artificial component (created or controlled by bio- and cognitive technologies) will increase.

We can say that biological human evolution will be resumed. In the near future biological human changes are likely to be implemented on a new level by means of direct intervention in the genetic code and in the processes of human life. There are two key areas: the restructuring of human body and reorganization of human mind. Of course, the adjustment mechanisms are similar in many ways – genetic decoding, cellular technologies, modeling of biochemical processes, implantation of electronic devices, use of nanomedical robots, etc.

In the future the issue of the borders of "humanity" can become one of the main political questions. At the same time, we must clearly understand that the improvement of the human mind (and its work) is possible today within the approach called "intelligence augmentation". It includes:

- the use of tools for searching, processing and structuring the information,
- systems of personal productivity,
- searching engines and other online tools,
- nootropics, and
- portable electronic devices [3].

But whatever amazing and even shocking the discussed consequences of NBIC-convergence are, this process is already going on, and the issue of scientific integrity and courage is not a way of suppressing the problem, but rather a way to its impartial and deep analysis.

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CURRENT STATE OF PR INDUSTRY IN UKRAINE

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Summary: Despite Ukraine involvement in global communication processes and the need to implement communicative practices, professional public communications market is not actively developed in this country. This article analyzes the current state of PR industry in Ukraine. The peculiar properties of this field formation and development are discussed. The results of the sociological analysis of PR industry in Ukraine are presented.

Keywords: communications, PR-activities, PR-agencies, PR-services, public relations.

Анотація: Незважаючи на включеність України в глобальні комунікаційні процеси і необхідність реалізовувати комунікативні практики, ринок професійних публічних комунікацій не розвивається в Україні активно. У статті наводиться аналіз сучасного стану піар галузі в Україні, особливостей її становлення і розвитку, наведені результати соціологічного аналізу піар галузі в Україні.

Ключові слова: комунікації, паблік рілейшнз, PR-агентства, PR-діяльність, PR-послуги.

Аннотация: Несмотря на включенность Украины в глобальные коммуникативные процессы и необходимость реализовывать коммуникативные практики, рынок профессиональных публичных коммуникаций не развивается в Украине активно. В статье приводится анализ современного состояния пиар отрасли в Украине, особенностей ее становления и развития, приведены результаты социологического анализа пиар отрасли в Украине.

Ключевые слова: коммуникации, паблик рилейшнз, PR-агенство, PR-деятельность, PR-услуги.

Today PR-activity is represented by a set of practices. PR includes press mediation as well as image management of an organization through the use of technologies of visual communication and corporate communications, and the organization of the so called events (open days, business meetings, exhibitions, public events) and many other technologies aimed at interaction and building trust relationships between the communication subject and customers, employees and other target audiences.

In the light of the identified submissions, the most optimal definition is given by the joint discussion of 65 leading scientists in the field of PR under the direction of R. Harlow. Based on the analysis of existing in 1975 as many as 472 definitions they formulate a definition: "Public relations is a special management function, which contributes to the establishment and maintenance of dialogue, mutual understanding and cooperation between the organization and its public, contributes to the solution of various problems and challenges, helps managers of organization to be informed about public opinion and react to it ... " [1, p. 39]. The key word in this modern definition of public relations overlooked by the authors is "trust", without which communications, understanding and cooperation specified in the definition are impossible.

Thus, analyzing PR-activities in Ukraine, by PR we understand activities aimed at establishing trusting relationships with the target audience of organization and its public.

Despite Ukraine involvement in global communication processes and the need to implement communicative practices, professional public communications market is not actively developed in Ukraine. Ensuring the public dialogue, which is the mission of public relations by its definition, is replaced by political technologies in Ukraine, branding, propaganda, advertising, and greatly differs from operation standards adopted by Western Europe and the United States.

In Ukraine, it was the political sphere where public relations began to develop. The first phase of political PR, which started in 1991, was characterized by a combination of propaganda and manipulative technologies. The main goal consisted simultaneously in agitation for a particular political party (candidate for deputies) and in the fight against competitors using negative technologies. Among PR-tools there were media and printed agitation. The practice of direct propaganda was a legacy from the Soviet era, but it quickly exhausted itself, which urged specialists in political communications to master the tools of public relations.

In the late 1990s, PR appeared within the frameworks of the Supreme Rada of Ukraine, Presidential Administration, Cabinet of Ministers, as well as in the separate structures of individual ministries and agencies, in particular in the Ministry of Foreign Affairs of Ukraine, Ministry of Internal Affairs, the Ministry of Defense and other press services. These departments or units served as performers of public relations. V.G. Korolko, theoretical methodologist of PR in Ukraine, holds this position, noticing significant problems and imbalances in the activities of these structures: "The functions of these services are mainly reduced to informing the public or to the distribution of advertising. Their predominantly press-mediation activity is often sporadic and

unsystematic; it usually differs in small duration of campaigns counted on the instant, one-time effect. They often resemble “fire brigade” rather than “safety service” [2, p. 114].

As for the business sphere, PR-services came to Ukraine in the late 1990s together with major Western companies, which used means of PR mainly to solve their own marketing problems. At that time, communications with the public were involved in the marketing strategy as one means of achieving it [3, p. 40].

In 1999, there were only five PR-agencies in Ukraine, and in 2002 – thirty. According to the study "Analysis of PR-service market of Ukraine" conducted by PR-agency E'COMM in 2008, 61 agencies specializing in providing PR-services were registered in Ukrainian Internet catalogs. More recent data, unfortunately, have not been published. Positions such as PR-manager and PR-director began to appear in 2000. After two years, the PR-services market was completely separated from advertising and became independent. In 2003, Ukrainian public organization "Ukrainian League of Public Relations" was created. Since 2005, Ukraine has had the Ukrainian Association of Public Relations (UAPR) that represents Ukraine in the International Communications Consultancy Organization (ICCO). In 2005, the Code of Professional Ethics UAPR, which meets the requirements of the international PR-industry, developed in Rome and Stockholm conventions, was accepted.

According to the Institute of Vocational and Technical Education, in 2011 professions of "PR Manager" and "Public relations" are referred to as the illegitimate occupations, the introduction of which has been rejected due to the breach of standards in substantive requirements, claims for spelling, conciseness and the use of Ukrainian professional terms, rather than their English-speaking authentic analogues [4, p. 56]. Instead, in 2007 the English version of the profession was introduced under the code 1475.4 – manager of public relations, while the advertising manager was encoded under the number 1476.1. So the two professions differ in the classification of professions. Within the national education system, training in "Advertising and public relations" was carried out during just a few years – from 2006 to 2015. Since September 2015, this specialty has been simplified and transferred to the level of specialization called "Journalism". However, in our opinion, this is a step backwards in the process of formation of qualified communicators.

A special feature of the development of national PR-business in the end of the 20th century was the transfer of foreign experience to the practice of national enterprises. The founders of this activity were companies with foreign investment, after which large Ukrainian companies quickly picked up their experience. At that time, the creation of PR-services market took place.

The first study of PR in Ukraine, the Ukrainian PR-market research, was conducted by the Ukrainian Association of Public Relations in cooperation with the GfK Ukraine company. The results of that study were presented on the 7th of February in 2008 (the Internet-survey method was used, newsletter profiles were e-mailed to TOP-100 companies on the list of "Invest-Gazeta").

According to the results of the study, since 2002 in companies PR tended to become separated from marketing: separate structural units were being created, with the majority reporting directly to the CEO. From a non-systemic approach and sporadic activity, companies were moving towards the formation of PR-strategy, for the implementation of which separate budgets were to be allocated. Companies would not refuse the services of external consultants and agencies certifying the positive prospects for the market of PR-services. The main areas of PR-activities in the companies were named (in order of priority) the following: Media Relations (identified by all the respondents); internal PR, corporate PR; product/brand PR; Communication with government, financial PR and investor relations; crisis communications, sponsorship, CSR (absolute minority).

More recent information on the state of public relations practice in leading companies in 2011-2012 is presented in the study conducted by the Ukrainian Association of Public Relations (UAPR) in partnership with the Ukrainian office of IFAK Institute [6].

The Project organizers set out the aim to estimate the state of public relations industry in Ukraine, to get information about the budgeting system, to analyze the directions of PR-activities, in which Ukrainian companies operate and to identify the main changes in comparison to the previous years. The research findings are supplemented with the data from international studies of ICCO (International Communications Consultancy Organization), and The Holmes Group.

The study lasted from February 15 to April 27, 2012 in the format of telephone interviews and questionnaires. In order to construct the total selection they used the Forbes “TOP-200 Ukrainian companies” October 2011 rating. The financial companies from rating Invest-Gazeta «TOP 100 best companies of Ukraine» supplemented the selection. Compared with 2009-2010, one can see the tendency to allocate the function of PR in a separate direction with structural units.

The top priorities of PR-activities during 2011 were corporate communications (83%), internal communications (80%), corporate social responsibility projects (79%), PR of product / brand (79%) and crisis communications (61%). It is important to note that out of the top-5 areas within the frameworks of PR-activity

such a direction as placement of materials on a paid basis disappeared. PR agencies leaders believe that in their work such areas as crisis communications, corporate communications, PR of product/brand, the organization of special events, corporate social responsibility projects, and others became the customers' highest priority.

Ukrainian Advertising Coalition (WRC) and the Marketing Media Review (MMR) with the support of two PR associations (UAPR and Ukrainian PR-League) introduced a debut rating of Ukrainian PR-agencies, aggregated to the total cash flow, according to which the leader in 2012 was the PR-Service company (41 staff members), which received more than 50 million USD (before the VAT payment). According to the drafters data, the top three with the figure of 30-35 million USD also includes Noblet Media CIS (29 employees) and Mainstream Communication & Consulting (24), followed by PRP Ukraine (40) with an estimated turnover of 15-20 million USD.

The authors of this rating note that they made it up based on the expert evaluation of the total money turnover of PR-agencies, which, in turn, was formed during the activity analysis of the pool of loyal customers of communications companies [5].

Analyzing the state of professional activity development, we must specify the levers that regulate the norms and values of the profession. Speaking of the legal regulation, it is worth noting that today there is no single legal base that supports PR-activity itself. So far, the main piece of legislation that regulates the activity in PR field is the "On information" law of Ukraine.

Another equally important tool of regulation of professional norms and values in the field of public relations is professional associations. As noted above, the two professional public organizations actively operating in PR in Ukraine and influencing the education and activities in the field of public relations are Ukrainian public organization "Ukrainian League of Public Relations" (established in 2003) and Ukrainian Association of Public Relations (UAPR), which has been operating since 2005, representing Ukraine in the International Communications Consultancy Organization (ICCO).

The analysis presented suggests talking about the initial stage of social institution establishment in the PR field in Ukraine. The most important for the institutionalization of public relations in Ukraine, in our opinion, is to create efficient and effective system of rules to govern the interaction within the institution and beyond it. Some steps have already been made for this (though delayed, but legitimization of this profession, training in a relevant subject, the availability of educational institutions). Nevertheless, there are underdeveloped elements of this social institution such as scientific research (we can name no more than a dozen researchers, with a special place being occupied by V. Korolko, G. Pocheptsov); own scientific base; professional communities; norms of self-regulation. There is no system of certification to cover and monitor the quality of PR-services in Ukraine.

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THE GREAT PANATHENAIA – THE MAIN HOLIDAY OF ATHENS

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Summary: The article deals with the analysis of the main holiday of Athens. It includes political and cultural aspects of life of the city-state from the point of view of the emergence of goddess Athena. The conclusion is made that the Great Panathenaia is the celebration of the unity of the whole city, the unity of the present with the past, where the ancient rituals and myths are united.

Key words: agon, amphora, city-state, festival, htonizm, symbol.

Анотація: Стаття присвячена аналізу основного свята в Афінах. Він включає в себе політичні і культурні аспекти життя полісу з точки зору появи богині Афіни. Зроблено висновок, що Великі Панафінеї є святом єднання всього міста, єднання сьогодення з минулим, де об'єднуються стародавні

ритуали і міфи.
поліс, символ, фестиваль, хтонізм.

Ключові слова: агон, амфора, демократичний

Аннотация: Стаття посвящена аналізу основного праздника в Афинах. Он включает в себя политические и культурные аспекты жизни полиса с точки зрения появления богини Афины. Сделано вывод, что Великие Панафинеи является праздником единения всего города, единения настоящего с прошлым, где объединяются древние ритуалы и мифы.

Ключевые слова: агон, амфора, демократический полис, символ, фестиваль, хтонизм.

The analysis of the festival is the best means to understand how society lives and functions. Exactly the study of various cultural events can give a general picture of knowledge of a particular society. The system of spiritual and political views of the people is displayed in the festivities that express both its unique culture and historical past. Ancient Greek festivals display the entire synthesis of cultural and religious character in the national system of values. The study of festivities gives a general picture of the understanding of the historical events and political traditions. Both historical events and mythological analogy are fixed in the structure of festivals that clarify certain government actions of politicians and the situation in the country. For example, it is the celebration of Great Panathenaia that is of great value in Athens. The Great Panathenaia is the greatest feast for the Athenians. Its roots originated from ancient times of the emergence of Pallas Athena, the reign of Erechtheus, the formation of the myth of Erichthonius and Theseus's sinoykizm. First of all, the establishment of the Great Panathenaia is associated with the activities of the goddess Pallas Athena. Pallas Athena is the ancient Greek goddess who belonged to the supreme gods and was revering during the ancient times [3]. She is the personification of Zeus, of his power and wisdom. Her influence extended on all spheres of human activity. Athena can serve as a universal deity, because it is impossible to say with certainty about her clearly marked destination. Athena is the embodiment of wisdom, which controls the intellectual and moral side of being. She is guided by prudence and she is the leader in the Greek pantheon of gods after Zeus. That's why she is the patroness of the city and exactly in her honor the great celebration is alleged. Its origins lead us to such a person as the Erichthonius or Erechtheus. Erechtheus and Erichthonius can be considered as one man, who Athena regarded as her personification on the Earth. The element of the snake passed through the myths about Athena and the Erichthonius (Erechtheus) [1, p. 129-136]. In this myth, the legend reflected the opinions of the Greeks on the approval of the Attic kings' authorities who received the power and authority from the Earth and Athena that combines the htonizm of great goddess. If we dwell on the fact that Erichthonius / Erechtheus is the founder of the Great Panathenaia into great feast for all Athenians. This activity of Theseus leads to the system of the city-state with its democratic ideas and legislation when the state activity of Theseus becomes semi-historical, and also symbolic value [4, p. 46]. The great feast Panathenaia was formed under the influence of mythological notions and it is the holiday primarily of religious and political directions trends.

Ancient Great holiday Panathenaia was known in Homeric times. Exactly at this time the individual elements of the festival were formed: a solemn procession and religious ceremonies as the bloodless sacrifice. During the time of Pisistratus and Pericles holiday acquired political and cultural influence. The celebration in honor of the goddess had a dual form: Great Panathenaia held once in four years and just Panathenaia held between it. The Great Panathenaia consisted of two parts: large and small agony and a solemn procession, that brought a new dress to Athena – peplos. The birthday of the goddess is believed to be the best time for such a gift. In normal Panathenaia (Small Panathenaia) competitions were not held, and the festival was limited by the device of procession and offering to the goddess of luxury apparel [2, p. 52].

For the organization of the Great Panathenaia all the sectors of society, citizens of other policies and foreign states were involved [5, p. 166]. This holiday became a celebration of the unity for the Athenians both in broad and narrow senses. First of all, it was a celebration of the unity of the whole city, and it represented the unity of all people and the unity with its patron goddess – Athena. Secondly, it was a celebration of the unity of the present with the past. Thirdly, it was a celebration of the unity of men and women, where a huge role of women-citizens in all rituals emphasized this unity. Finally, the Great Paanathenaia became a symbol of the unity of all policies where the Athens played a huge role. The Great Paanathenaia radically changed the ideological orientation. Diverse competitions embodied the new behavior of the aristocratic families, struggle defined the entire life of society. Creating a democratic system led not to the destruction of this struggle, but to its reorientation. Democratic policy forced aristocrats to compete in a new field. One aristocrat is now competing with the other, proving that he serves his native policy better. The competition (agon) gradually lost its aristocratic exclusiveness and became the norm of life for all citizens. Agon is the best way to prove their loyalty to the policy. In this case, the competitions were held in honor to Athena, they gave the opportunity to show their patriotism, because the better result you show in the competition, the more the goddess will be pleased, the better she will protect and preserve native policy. The

aim of each became to show individual in his team competition and allow everyone to feel the spirit of unity and security, that embodies the goddess Pallas Athena [6, p. 37].

The main awards of the Great Panathenaia were Panathenaia's amphoras. They were not only a symbol of victory, but they embodied the features of art of that time. With their help, we can find (by the inscriptions) what kinds of competitions were at the festival, how the patroness of the city Pallas Athena was portrayed. The Phidias's frieze of the Parthenon is one of the main material sources for the study of Great Panathenaia. We see the scene with the pump on it. We can not only recreate the solemn procession, but also we can understand the essence of the idea of the superiority of the Athenians [2, p. 143]. One of the ideas is incorporated in the leading state of Athens in the Delian league. The participation in Panathenaia of citizens from other cities and many foreigners who were present at spectators, served a glorification of the Athens throughout the Greek ecumene. This was facilitated by the development of trade, the establishment of military-political alliances and economic recovery of Athens. Therefore, the Great Panathenaia had impact on almost all the spheres in the country. Firstly, this festival had a religious character and united all the citizens: the worship of their patron of the city. Also, the festival contributed to the flourishing of Greek art. Secondly, a few years Panathenaia acquired a great prestige among the other policies and the Greek states. This holiday was primarily in Athens and, therefore, among the members of the Delian League, to some extent, too, which contributed to a sharp rise in the political, social and economic life of Athens.

The Great Panathenaia is the most important holiday in Athens. Its roots went back to the deep times. This festival was formed from VIII BC and it is associated with the appearance of myths about Pallas Athena, Erichthonius and king Theseus. The Great Panathenaia from the mythologically established festival, the foundation of which was purely iconic moment. During the reign of Pericles Pisistrata it acquired the status of a public holiday, in which the cult of Athena became the main feature. With the introduction of small and large agony the feast becomes a symbol of the union in different contexts. The participation of the majority of people, not only Athenian policy, but also the foreign nationals proved the state scale of the festival. This is due to the political history of Athens. A characteristic feature of the Great Panathenaia is that in this festival even citizens of other policies can take part that equated Panathenaia for the Olympic Games. The tremendous influence of Athens on the Greek peripheries are reflected in the Northern Black Sea. It is with the development of trade, the citizens began to visit Athens, where they could see the competition as spectators and participants.

Thus, taking part in the festival was a great honor and even a duty for them. The special status of the Great Panathenaia is accounted for the fact that the Bosphorus kings attended the festival, and brought gifts of gold wreaths to great Athena.

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THE PROBLEM OF WOMEN INDEPENDENCE IN GREAT BRITAIN

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Summary: The article deals with the problem of woman rights in Great Britain. The results of the study are as follows: the suffrage movement changed the attitude to women not only in one country, but in the whole world; the main causes which triggered the movement have been identified; the influence of suffragettes on contemporary society has been defined.

Key words: causes of the movement, suffragettes, women rights.

Анотація: Стаття присвячена розгляду проблеми жіночої незалежності у Великій Британії. У результаті дослідження було виявлено, що суфразжистський рух змінив відношення до жінок не лише в одній країні, але й у всьому світі; виявлено головні причини появи цього руху; визначено вплив суфразжисток на сучасне суспільство.

Ключові слова: права жінок, причини руху, суфражистки.

Аннотация: Стаття посвящена рассмотрению проблемы женской независимости в Великобритании. В результате исследований было выявлено, что суфражистское движение изменило отношение к женщинам не только в одной стране, но и по всему миру; обнаружено причины появления данного движения; определено влияние суфражисток на современное общество.

Ключевые слова: права женщин, причины движения, суфражистки.

In the nineteenth century women had no place in national politics. They could not stand as candidates for the Parliament, nor were they allowed to vote. It was assumed that women did not need the vote because their husbands would take responsibility in political matters. A woman's role was seen to be child-rearing and taking care of the home. For many years women at different parts of the world were suffering from the inequality between them and the assignees of the opposite sex. But once, the bravest and the most determined women in Great Britain opposed the violation of their rights and chose the way of the battle, very hard and very strained. These high-hearted fighters called themselves "suffragettes". As a result of the industrial revolution many women were in full-time employment which meant they had opportunities to meet in large organized groups to discuss political and social issues. They came from different backgrounds, and often had different agendas. But the diversity of the movement allowed more women to become engaged in their own communities. Their experiences empowered them as they gained valuable experience in leadership, politics and civic involvement [1].

In spite of the appearance of a great number of scientific works on the problem there is an urgent need to systematize the existing material.

Harold Smith's examination of the British women's suffrage campaign from its beginnings in 1866 to the passage of the Representation of the People (Equal Franchise) Act in 1928 demonstrates suffragist philosophies and practices were shaped by factors of gender, class, nationalist identity, and party allegiance. Building on the work of historians such as Sandra Holton, Judith Walkowitz, Brian Harrison, David Rubenstein, and Philippa Levine, Smith finds that involvement in various Victorian reform causes gave women a sense of gender consciousness that co-existed with and often overrode their sense of class and party loyalty. Smith considers the publication of Sandra Holton's "Feminism and Democracy: Women's Suffrage and Reform Politics in Britain 1900 - 1918 [Cambridge University Press, 1986]" which focuses on the NUWSS (National Union of Women's Suffrage Societies), an important "turning-point" in the historiography of the movement. Smith concurs with historians such as Brian Harrison that the war years witnessed the removal of "the main obstacles to reform ... the WSPU abandoned militancy; Asquith resigned as the prime minister in 1916; and the formation of a coalition government removed the issue from overt party politics [2]".

Women's suffrage in the United Kingdom became a national movement in the nineteenth century. Women were not explicitly banned from voting in Great Britain until the 1832 Reform Act and the 1835 Municipal Corporations Act. Establishing women's suffrage on some level was a political topic, although it would not be until 1872 that it would become a national movement with the formation of the National Society for Women's Suffrage and later with the more influential NUWSS. The movement shifted sentiments in favour of woman suffrage by 1906. It was at this point that the militant campaign began with the formation of the Women's Social and Political Union (WSPU). Some have argued the militant suffragettes turned to violence and discredited and postponed votes for women [3].

The Chartist Movement, which began in the late 1830s, has been suggested to have included supporters of female suffrage. There is some evidence to suggest William Lovett, one of the authors of the People's Charter wished to include female suffrage as one of the campaign's demands but chose not to on the grounds that this would delay the implementation of the charter. Although there were female Chartists, they largely worked toward universal male suffrage. At this time, most women did not have aspirations to gain the vote [4].

The issue of parliamentary reform declined along with the Chartists after 1848 and only reemerged with the election of John Stuart Mill in 1865. He stood for office showing direct support for female suffrage and was an MP in the run up to the second Reform Act [4].

In local government elections, single women ratepayers received the right to vote in the Municipal Franchise Act 1869. This right was confirmed in the Local Government Act 1894 and extended to include some married women.

Outside pressure for women's suffrage was at this time diluted by feminist issues in general. Women's rights were becoming increasingly prominent in the 1850s as some women in higher social spheres refused to obey the sex roles dictated to them. Feminist goals at this time included the right to sue an ex-husband after divorce (achieved in 1857) and the right for married women to own property (fully achieved in 1882 after some concession by the government in 1870) [5].

Lily Maxwell was the first woman to vote in Britain in 1867 after the Great Reform Act of 1832. The act had explicitly excluded all women from the voting in national elections by using the term “male” rather than “person” in its wording. Maxwell, a shop owner, met the property qualifications that otherwise would have made her eligible to vote had she been male. In error, however, her name had been added to the election register and on that basis she succeeded in voting in a by-election – her vote however was later declared illegal by the Court of Common Pleas. The case, however, gave women’s suffrage campaigners great publicity [6].

The Manchester Suffrage Committee was founded in February 1867. The secretary, Lydia Becker, wrote letters both to Prime Minister Benjamin Disraeli and to *The Spectator*. She was also involved with the London group, and organized the collection of more signatures. Ten years later, in 1928, the Conservative government passed the Representation of the People (Equal Franchise) Act giving the vote to all women over the age of 21. Both before and after the 1832 Reform Act there were some who advocated that women should have the right to vote. After the enactment of the Reform Act argued that any woman who was single, a taxpayer and had sufficient property should be allowed to vote. One such wealthy woman, Mary Smith, was used in this speech as an example [7].

The outbreak of the First World War in 1914 led to a suspension of all politics, including the militant suffragette campaigns. Lobbying did take place quietly. In 1918, a coalition government passed the Representation of the People Act 1918, enfranchising women over the age of 30 who met minimum property qualifications. In the same year that John Stuart Mill was elected, the first Ladies Discussion Society was formed, debating whether women should be involved in public affairs. Although a society for suffrage was proposed, this was turned down on the grounds that it might be taken over by extremists [8].

Harriot Stanton Blatch, daughter of the lifelong suffrage leader Elizabeth Cady Stanton, summarized the movement’s legacy best when she wrote these words: “Perhaps someday men will raise a tablet reading in letters of gold: “All honor to women, the first disenfranchised class in history who unaided by any political party, won enfranchisement by its own effort alone, and achieved the victory without the shedding of a drop of human blood. All honor to the women of the world!” [9].

So, we can make a conclusion that the women’s suffrage movement was the struggle for the right of women to vote and run for office and is part of the overall women’s rights movement. In the mid-19th century, women in several countries – most notably, Britain and the USA – formed organizations to fight for suffrage. In 1888, the first international women’s rights organization was formed – the International Council of Women (ICW). Because the ICW was reluctant to focus on suffrage, in 1904 the International Woman Suffrage Alliance (IWSA) was created by the British women’s rights activist Millicent Fawcett, American activist Carrie Chapman Catt, and other leading women’s rights activists.

The celebration of the suffrage movement victory holds a particular relevance now, as it celebrates a substantial milestone on the road to equal rights for women, and it honors those who helped win the day. It puts women back into the history as active participants. It reminds us of the necessity of progressive leaders, organizers, and visionaries in every local community. Today, the society should be grateful for the work of all contributors that made this historic moment in women’s rights history possible and applauds Woodrow Wilson as a male ally in this momentous movement. Clearly, the wider goal of women’s full equality and freedom has not yet been achieved, but the victorious woman suffrage movement offers a new generation of activists a solid base on which to build for the future.

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LITERATURE AND PHILOSOPHY: AESTHETICISM AND ABSURDISM

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Summary: The article deals with the problem of modern literature and philosophy as the forms of “another art”. Aestheticism is a dominance of aesthetic values over ethical and social; an art as a special kind of social consciousness. Absurdism is a system of philosophical views that developed in the spirit of existentialism. This is the mode of response to the world wars, suffering and death, the rejection of the humanity within the 20th century. These two currents in a synthesis of literature and philosophy as the basis of cultural and axiological existence are being studied thoroughly today.

Key words: aestheticism, absurdism, existentialism, synthesis of literature and philosophy

Анотація: Стаття присвячена розгляду проблеми філософії та літератури модерну як двох форм “інакшого мистецтва”. Естетизм є переважанням естетичних цінностей над етичними і соціальними; мистецтво як особливий вид соціальної свідомості. Абсурдизм є системою філософських поглядів, що розвивались у душі екзистенціалізму. Це є певний спосіб відповіді на світові війни, страждання і смерті людей, відторгнення ідей гуманізму всередині двадцятого століття. Ці дві течії у синтезі літератури і філософії як першооснови культурного і аксіологічного буття досить широко вивчаються сьогодні.

Ключові слова: естетизм, абсурдизм, екзистенціалізм, синтез літератури та філософії.

Аннотация: Статья посвящена рассмотрению проблемы философии и литературы модернизма как двух форм “другого искусства”. Эстетизм заключается в доминировании эстетических ценностей над этическими и социальными; искусство как особый вид социального сознания. Абсурдизм есть система философских взглядов, которые развивались в духе экзистенциализма. Это есть некий способ ответа на мировые войны, страдания и смерти людей, отторжение идей гуманизма внутри двадцатого века. Эти два течения в синтезе литературы и философии как первоосновы культурного и аксиологического бытия довольно широко изучаются сегодня.

Ключевые слова: эстетизм, абсурдизм, экзистенциализм, синтез литературы и философии.

A novel that has been disturbing us 160 years after it first appeared in print, “The Picture of Dorian Gray” by Oscar Wilde, the Manifesto of aestheticism, has so much relevance and resonance even today. Dorian Gray is a strikingly handsome young man whose beauty attracts a debauched aristocrat Sir Henry Wotton. Dorian’s picture has been painted by a talented artist Basil Hallward and Sir Henry becomes desperate to meet Dorian, though Basil himself is against it. Sir Henry persuades Dorian to pose for a picture painted by Basil and during the painting sessions, Henry “educates” young and impressionable Dorian about life. Sir Henry’s vicious nature, his obsession with youth and his cynical, materialistic outlook on everything slowly begin to affect Dorian. Dorian descends into a horrifying world, where he meets the reality of abhorrent deeds and feels its effects. Lives are destroyed, crimes are committed but Dorian’s self-indulgent and depraved life continues. The story takes a bizarre and terrifying twist from here onwards as the picture begins to develop a life of its own. “The Picture of Dorian Gray” was first published as a serial in Lippincott’s Magazine in 1890 with much apprehension by the editors who feared that it was too corrupt and depraved for readers. Wilde’s own scandalous private life was already creating uproar in society. Finally the novel was published in the magazine but with large-scale censorship without Wilde’s permission. As predicted, it caused widespread outrage and condemnation. However, Wilde remained unfazed and proceeded to publish it in book form with a wonderful preface called by him an Apologia, in which he talks about art, philosophy and creativity: “... *There is no such thing as a moral or an immoral book. Books are well written, or badly written. That is all... No artist is ever morbid. The artist can express everything. Thought and language are to the artist instruments of an art. Vice and virtue are to the artist materials for an art... All art is at once surface and symbol. Those who go beneath the surface do so at their peril. Those who read the symbol do so at their peril. It is the spectator, and not life, that art really mirrors... Diversity of opinion about a work of art shows that the work is new, complex, and vital... All art is quite useless* [3, p. 3]”.

Controversy apart, the story is gripping in its Gothic atmosphere, making it a literary masterpiece, with Wilde’s brilliant touches of characterization, emotional sensitivity and understanding of human nature. Today’s modern emphasis on youthfulness, fighting age and obsession with external appearance finds echoes in this richly evocative novel. It has been extensively adapted for film, stage and television, with references to Dorian Gray appearing in a wide variety of works of art. Radio adaptations, plays and musicals have been

continuously appearing right down to the present day. "The Picture of Dorian Gray" has fascinated readers the world over, with its eternal themes of art, youth, beauty, morality and immortality. Dorian Gray creates the symbol of what all mankind seeks even today – the Fountain of Youth – even though it comes with a price tag. This is a story of moral corruption. A gothic melodrama, it is full of subtle impression and epigram. It touches on many of Wilde's recurring themes, such as the nature and spirit of art, aestheticism and the dangers inherent in it.

Summarizing Proust's philosophy is a challenge of absurdism, as his references are extensive, his expression complex and his thought subtle. "In Search of Lost Time" is a source of philosophical commentary, but "Albertan Gone", the sixth volume of "Research", appears to us as the richest in this respect. The main character Albertine tells a suffering love: Albertan, who lives in concubinage with the narrator leaves his home and flees. The narrator does his best to come back her: the springs of love game (indifference, extortion, comedy break ...) are described by Proust here. Later, the narrator learns about the accidental death of Albertan. Albertan at the same time still loves him and wants to return. Then comes the second phase of suffering love: after the immediate pain is the work of forgetting and mourning. Thus, paradoxically, Albertan missing, which seems to relate a leak, is the story of a captive, the narrator, clinging to her memories and love immured in his memory.

What about the subjectivity in Proust? "*So what I believed to be nothing for me, it was just my life. As unaware!*" [4, p. 1]. The incipit of Albertan Gone is a challenge to know thyself according to Socrates, inviting men to live as a man that is to be known as a subject and discover the truth about themselves. On the contrary, the subjectivity of Proust is rather opaque. The ego cogito is a fiction invented by the rationalists to give countenance: the narrator thought not to be in love with Albertan only leaving it learns its commitment. The subject is unaware.

Proust is perhaps the greatest thinker of jealousy. Proustian jealousy is pathological and is manifested as a fear of abandonment. Proust's contribution lies in the fact that jealousy is not related to the beloved, it is a product of the imagination: "*My jealousy was born from images to pain, not by a chance... It was beautiful to live under the equivalent of a pneumatic bell, associations of ideas; memories continue to play*" [4, p. 1]. Is the unknown thought of another, its elusiveness that feeds the imagination and the evil of jealousy: "*Only the pleasure felt by ourselves we can draw knowledge and pain*" [4, p. 1]. Barthe summed up the sign of jealousy in Proust: "*As jealous, I suffer four times, because I'm jealous, because I blame myself to be, because I fear that my jealousy does not hurt the other, because I let myself be subject to a banality. I suffer from being excluded, to be aggressive, to be mad, and to be shared*" [4, p. 1].

Proust time is highly subjective and echoes the concept of time in Bergson (lived time against objective time): the time of the conscience is, in fact, extra-time. "*An hour is not an hour, it is a vase filled with perfumes, projects and climates*" [4, p. 1]. As for the sleep, Proust said: "*the other life, one where you sleep, is not subject to the category of time*" [4, p. 1]. The extra-time in Proust is also known: the famous Madeleine, indicative of emotional awareness, is the co-existence of past and present, memory and perception. This Madeleine also reveals a passive conception of subjectivity, which is affected by weather through this involuntary memory. Albertan needs a life without absences; only the true death can make her free. Time is with him, though again the role of time is twofold: adjuvant and opponent. "*It is the misfortune of being loved for us as very wearable collection of boards in our thinking*" [4, p. 1]. Once in Venice, Albertan arises and disappears at once: the narrator saw Albertan, but in a different form, as a part of himself, his memory is now part of his identity: "*I felt that Albertan of the past, invisible to me, however, was locked up inside me as the "shot" of a Venetian domestic incident which sometimes was hard to slide the cover to give me an opening on the past*" [4, p. 1].

"The Fall" by Camus explores the theme of guilt: we are all responsible for everything. If the "Plague" was focused on the action, "The Fall" was focused for its analysis on the theme of inaction and its consequences. "The Fall" is indeed the story of a confession of a man to another in a bar in Amsterdam, in the form of a monologue. Jean-Baptiste Clamence, the former Parisian lawyer, recounts the events that changed his life. Before this event, Clamence describes himself as a perfect selfish lover of life. Until the evening when returning home he passes over a bridge wherein he intends to leave the girl. He doesn't worry about it. From that time, guilt inflates to become an obsession. This event sheds new light on its entire existence. Camus creates a new cultural hero in the society: selfish, or autism, living in the pure entertainment; a modern man seems to have lost sight of the concepts of justice and accountability. The injunction of Socrates that the unexamined life is not worth living could be that of Camus in this novel. Camus says that we must judge ourselves uncompromisingly with a distancing between me and myself. For one can legitimately make me judge myself. However, the record is heavy philosophical Camus:

whatever our attempts to improve ourselves, we judge, everyone is guilty, nobody will be saved from his conscience. In this, the existentialism of Camus is obvious.

“The Trial” by Franz Kafka can be described as existentialist novel, because even if Sartre and Camus would not have written “The Trial”, most of the themes developed by the existentialist philosophies are represented here: the absurdity of the world, the contingency of existence, the nightmare of intersubjectivity, the political oppression ...

The novel opens with a sudden arrest of Joseph K. suddenly in his room at home in the morning of his birthday. Two guards arrest him without any explanation. Despite his arrest, Joseph is free to go to work at the bank. Then he appears in court, defending his cause by denouncing the conditions of his arrest and official corruption. But the judge notes that his audience is composed only of officials. Next week Joseph returns to court, which is empty because no session is to be held this day. He meets other defendants, including the physical exhaustion shows created by trial. His uncle pushes him to hire a lawyer, Huld. This lawyer proves ineffective. Meanwhile, Joseph manages to seduce his neighbor, Lina. Some time later, he is requested by the bank to take an Italian client on a tour to the local cathedral. When Joseph arrives at the cathedral, the Italian client fails to appear. After watching some of the arts of the cathedral, he is about to leave when a priest called his name. The priest happens to be the prison chaplain, and it punishes Joseph. The chaplain then tells a parable about a local man who seeks access to the law, but is prevented from doing so by a porter. After discussing several possible interpretations of this parable, Joseph asks the chaplain to help him in his case, but the chaplain refuses. Finally the anniversary of the main hero comes again. He is dressed to go out this night, but is surprised by two men dressed formally. The two men guide him to a carrier outside the city, where one of them close to his neck and the other pierced him twice in the heart. At first glance, the case is a review of the judicial system, this machine that grinds anonymous individuals. The entire system, the Judge Advocate through the police, is considered plagued by corruption and bureaucracy. But a closer analysis relates to other themes in Kafka: the absurdity, the inhumanity of the modern world, totalitarianism, alienated subjectivity.

From the opening words, the story is illogical. And this inconsistency is intensified by the events that happen to Joseph K. The absurd is the total trial. The absurd in Franz Kafka seems to denote a gap in the rational world, since everything was swallowed up by the hyper-rationalization (e.g. the judiciary). The Frankfurt School, including Adorno, describes the process of rationalization, as the advent of the totalitarian world. This world has become inhuman, hostile to the subjectivity that has no choice but to blend into the crowd. Joseph K., moreover, has no name. This elusive and enigmatic character tells us that he is another one. This theme will be considered by Sartre and Heidegger. They described the public as a world dictatorship of the “it”, as a form of inauthenticity. Joseph K. is an anti-hero, he lives in inauthenticity. Accused, wrongly perhaps, he eventually abdicates; he is convinced he is guilty. While he could escape, flee his trial, Joseph K., like modern man prefers to be killed, he abandoned all desire to live. He was shot down “like a dog” because he lets himself be dominated by the society, which has fixed, objectified, and riveted him to his guilt. We recognize here the theses developed by Nietzsche.

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APPLICABILITY OF A. TOYNBEE'S CONCEPTS "CHALLENGE / RESPONSE" TO THE CONCEPT OF "EMPIRE"

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Summary: This paper views the concept of "Empire" in the modern sense in terms of politics. Arnold Toynbee applies the concept of "challenges / response" to explain the origin and development of various

empires in different chronological periods of history. Particular attention is paid to the modern empire - as the transformed classical model of empire.

Keywords: empire, global order, globalization, geopolitics, state.

Анотація: У статті розглядається поняття «імперія» в сучасному розумінні з точки зору політики. Арнольд Тойнбі застосовує концепцію "виклики / відповіді", щоб пояснити походження і розвиток імперій в різний хронологічний період історії. Особлива увага приділяється сучасним імперії – як трансформованої моделі класичної імперії.

Ключові слова: імперія, глобалізація, держава, геополітика, глобальний порядок.

Аннотация: В статье рассматривается понятие «империя» в современном понимании с точки зрения политики. Арнольд Тойнби применяет концепцию "вызовы / ответы", чтобы объяснить происхождение и развитие империй в разный хронологический период истории. Особое внимание уделяется современной империи – как трансформированной модели классической империи.

Ключевые слова: империя, глобализация, государство, геополитика, глобальный порядок.

Over time, society is changing, passes certain stages of development and is getting better. There exists necessity in certain thoughts, ideas and doctrines that would help develop this society and contribute to the stable foundation. An important milestone in the development of political ideas, the formation of peoples and nations, their economic and political development is the existence of the state. Now this is republic which is small in comparison, formation, forming one political organization of society which we call the modern state. As for the vertical development of all public entities including the development and civilization in general, it is necessary to take account of the Empire, which played an important part in the world history and had a significant role in the modern society.

Empire is not just a combination of several or more small states, which due to their weakness, political crisis or transformation became an easy prey for stronger states and were in the process of unification and assimilation not only politically but also economically, socially and culturally. Accordingly, all the trends, all models existing in the state monopoly are automatically transferred to the State subject to or dependent.

The issue of Empire is determined primarily by one simple fact: it presupposes certain strict world order. And this procedure is expressed as a legal framework. Therefore, our prime objective is molded devices comprehend the present procedure [1]. If it is true, as it is written by Hardt and Negri, the legal status of the Empire begins its existence from, in essence, formation and emergence of the first empires and to modern times, where the legal framework of each state eliminates the concept of empire, but formally admits its existence as a monopoly in the political or socio-economic space.

Each Empire has its stages from inception to decline, and you can draw a parallel with the work of Arnold Toynbee "Understanding history" [2, p. 88-92], where he writes about civilization and challenges to them, and about their formation and existence, periods of prosperity and decline period. Among the challenges he outlines the following points: the call of nature; the call of emergence and development of new land; the challenge of sudden shocks for "neighbors"; the call of external pressure; the loss of values and shift forces to develop properties that compensate the loss [2, p. 93-98].

An interesting fact lies in the applicability of the "Law of call and response" as an example of various empires in a chronological period of time, including the Roman Empire, First French Empire and modern Russian (Empire) Federation.

Rome was challenged from the outside, which is manifested as the great migration of peoples around the Empire and the formation of quasi-public entities, with the increased frequency of "conquering" borders and testing the stability of Rome. In this situation two factors of the five above-mentioned are relevant: the challenge of sudden shocks for "neighbors"; call of external pressure. The first manifested itself as the increasing power of the tribes that formed their public education and pursued a policy of military expansion. The second call was manifested in the increasing influence of Christianity and Roman paganism crisis. It is the contrast between these two tenets, their collision within the state that entered the political crisis, economic instability and the beginning of the devastation and constant expansion of social activity. That was another reason for the fall of "Colossus", who had feet made of clay.

As we have already told, for France, two of the five typical signs come into force. First, is the challenge of sudden shocks from neighboring communities, based on the so-called coalition wars and concentration, unification of Europe against the "aggressor country", which for them was France and its emperor in particular. Secondly, it is a challenge adversity, when the society lost something vital and direct, e.g. their energies to develop properties that compensate the loss. This became particularly acute after a decade of revolution, and the subsequent Napoleonic wars.

Among the types of call to be characteristic of the climate challenge there are the call the loss of values and shift forces to develop properties that compensate the loss; certain continuous challenge, not external, but internal one that is best manifested in the confrontation: Russian Orthodox civilization and Western civilization of Protestant Democracies; artificially induced or artificially provoked by the challenge of sudden strikes of neighboring communities, which is very important nowadays.

Finally we should note that Empire ceased its existence and transformed in modern globalization. With leverage, credibility and military power in the region, economic, cultural and information superiority modern empires were rather differently named, but their essence remained unchanged, because we can change the name, but cannot change the core principles. At the same time severe and persistent challenges are contributing to the answers to them, speaking the language of Arnold Toynbee. But it also should be noted that this topic requires further analysis and processing of scientific challenges of our time, the calculation of the possible answers and their effects, as well as the creation of a new power structure that is the nature of modern empires.

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PRESSING PROBLEMS OF INVESTIGATING MURDERS COMMITTED BY THE INSANE

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Summary: The paper focuses on pressing problems of prompt and full-scale investigations of murders committed by individuals suffering from different mental disorders. The acute shortage of Ukrainian research dealing with investigations of this type of murders stipulates the necessity of developing criminalistic tools and recommendations as to crimes committed by the insane.

Key words: criminalistics, investigation, mental disorders, methods of investigation, murder.

Анотація: Стаття присвячена розгляду актуальних питань щодо швидкого і повного розслідування вбивств, вчинених особами, які мають явні розлади психіки. У результаті дослідження було виявлено, що у вітчизняній криміналістичній науці не приділяється достатньої уваги питанням розслідування вбивств даної категорії, що обумовлює необхідність у розробці криміналістичного інструментарію та криміналістичних рекомендацій щодо злочинів проти життя особи, вчинених суб'єктами з розладами (дефектами) у психіці.

Ключові слова: вбивство, криміналістика, методика розслідування, розлади психіки, розслідування.

Аннотация: Статья посвящена рассмотрению актуальных вопросов быстрого и полного расследования убийств, совершенных лицами, которые имеют явные расстройства психики. В результате исследования было выявлено, что в отечественной криминалистической науке не уделяется достаточного внимания вопросам расследования убийств данной категории, что обуславливает необходимость разработки криминалистического инструментария и криминалистических рекомендаций касательно преступлений против жизни человека, совершенных субъектами с расстройствами (дефектами) в психике.

Ключевые слова: криминалистика, методика расследования, расследование, расстройства психики, убийство.

The modern period of building legal state with highly developed democratic values in Ukraine is characterized by the dramatic increase of crime rate, which is closely connected with fundamental transformations of economics, politics and social sphere of our society. In this respect, murders hold a specific place among other types of crimes. Latest social transformations in Ukrainian society have considerably affected the crime rate; the murders have dramatically increased in number. Nowadays, there is a steady upward trend of the number of murders committed by the individuals suffering from all kinds of mental disorders.

According to the latest data of the World Health Organization, about 52 million people tend to suffer from serious diseases of the nervous system, such as schizophrenia, 153 million are affected by neurosis, about 120 million suffer from psychic inhibition, 100 million – from different depressions, and 16 million are affected by dementia. A considerable number of people including those whose nervous system was affected suffer from different kinds of psychological disorders. In total, the number of people all over the world suffering from all

kinds of psychological disabilities and mental disorders amounts to 500 million. It is worth mentioning that the numbers above are only official statistics data. According to unverified information from different law enforcement bodies and civil organizations, the number mentioned above should be increased threefold. People suffering from mental disorders often commit different public offenses, even serious crimes including murders.

Law enforcement bodies of Ukraine have a considerable experience in investigating crimes committed by the insane. However, this experience has not been generalized yet by Ukrainian researchers. In contrast, it has been analyzed by foreign scientists, for instance, foreign lawyers, medical professionals, and sociologists have focused on particular characteristics of the murderer, his behavior, connection between the personality of the murderer (whether he suffers from mental diseases or disorders) and consequences of the crime, and certain issues of investigating those crimes. Despite being touched upon, those researches have not been systematized. Ukrainian legal studies have not presented the solution to the problem above either. On the other hand, its particular aspects connected with criminal responsibility have been settled and described in Ukrainian scientific and legal literature. However, criminalistics aspects of the above problem have not received proper criminalists' attention so far.

The problems of investigating the crimes committed by the insane have been of interest for Ukrainian and foreign criminalists. Thus, the group of the scientists concerned with the issues above include T.V. Averiyanova [1, p. 966], Y. M. Antonian [2], P. C. Belkin [1, p. 966], S. V. Borodin [2], R. I. Miheev [3], V. A. Obrazcov [4], V. V. Radayev [5], to name a few. The scientists above have theoretically grounded the particular role of mental defects in the genesis of criminal behavior, have determined prevalence of psychic anomalies among different categories of criminals, they have also revealed the particularities of the individual characteristics of the criminal. However, modern Ukrainian complex methods of investigating murders committed by the insane with due account for International Classification of Diseases have not been developed yet.

According to the data of criminological research, the percentage of the insane constitutes from 20% to 80% of the whole number of convicted offenders. Nevertheless, at present Ukrainian criminalistics science doesn't pay due attention to the investigation of murderers committed by the insane. The lack of theoretical background results in considerable difficulties in practical investigations of murders where the subject is a person suffering from mental disorders. The difficulties arise when choosing tactical approaches as law enforcement bodies do not have profound knowledge of criminalistic characteristics of the insane criminal, they do not know the approaches of having a tactical and psychological impact on the examinee suffering from mental disorders while solving conflict situations. Moreover, the law enforcement officers cannot predict possible behavior of the insane criminal, they are not aware of particularities of interactions with other participants of criminal proceedings in general, with doctors in particular.

The notions of *mental disorders* in contrast with the notion of *insanity* have not been legally defined. People suffering from mental disorders but conscious of their actions are able to run their account for a considerable part of the guilty who have committed crimes, in particular, murders. The notion characterizing kinds of mental disorders and experience of efficient investigating above type of crimes have not been formalized in criminal legislation. Thus, it is necessary to carry out further theoretical research touching upon a range of issues, including but not limited to the particularities of committing murders by the insane and introducing scientifically grounded methods of their detecting and investigating. The methods above should be based on detailed studying empirical data, complex analysis of the regularities revealed, development of criminalistics recommendations as to the forms and means of increasing the efficiency of their investigation.

Specific marking information, specific mechanisms of the crime committed by the insane, the direct connection between the personality of the criminal and the consequences of the crime require modern scientific understanding and implementing into detection and investigation of crimes.

Thus, to ensure prompt and full-scale investigation and optimization of the process of resistance to murders committed by the individual suffering from mental disorders, it is necessary to develop the up-to-date criminalistics tools and criminalistics recommendations including the following:

- improvement of criminalistics characteristics and basic provisions of investigating murders committed by the insane;
- development of specific criminalistics methods of investigating murders committed by individuals with mental disorders;
- tactics of investigatory actions, and planning and organization of particular investigatory actions taking into account mental disorders which a criminal can suffer from.

The criminalistics recommendations above will help law enforcement officers to choose the appropriate analyzing strategies to approach different investigative situations, typical for committing murders by the insane, as well as to develop the appropriate investigative lead and to implement the complex of investigatory actions.

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TREATMENT OF MYASTHENIA GRAVIS

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Summary: The article considers essential drugs, preventive methods and surgical techniques used to treat myasthenia gravis. It presents both positive and negative aspects of the use of such drugs and therapeutic agents as well.

Key words: cholinesterase inhibitors, corticosteroids, immunosuppressants, intravenous immunoglobulin, myasthenia gravis, plasmapheresis.

Анотація: Стаття присвячена розгляду основних лікарських засобів, профілактичних методів, а також хірургічних методик, що використовуються при лікуванні міастенії гравіс. Наводяться як позитивні, так і негативні сторони використання таких препаратів і терапевтичних засобів.

Ключові слова: внутрішньовенний імуноглобулін, імунодепресанти, кортикостероїди, міастенія гравіс, плазмаферез, холінестеразні інгібітори.

Аннотация: Статья рассматривает основные лекарственные препараты, профилактические методы, а также хирургические методики, использующиеся при лечении миастении гравис. В ней также приводятся как позитивные, так и негативные стороны использования таких препаратов и терапевтических средств.

Ключевые слова: внутривенный иммуноглобулин, иммунодепрессанты, кортикостероиды, миастения гравис, плазмаферез, холинэстеразные ингибиторы.

Myasthenia gravis (MG) is a chronic autoimmune neuromuscular disease characterized by different degrees of weakness of the skeletal muscles. Nowadays more and more people suffering myasthenia gravis can live a normal long life due to modern ways of treatment.

Myasthenia gravis is caused by a defect in transmission of nerve impulses to the muscles. It occurs when physiological communication between nerves and muscles is intercepted at the place of the synapse. Normally when nerve impulses reach the synapse, the nerve endings release a neurotransmitter (acetylcholine). Acetylcholine binds to acetylcholine receptors of postsynaptic membrane which are activated and then generates AP (action potential). In myasthenia gravis special antibodies block the receptors for acetylcholine at the postsynaptic membrane. These antibodies are produced by the body's own immune system. Immune system mistakenly attacks own normal body components so myasthenia gravis is an autoimmune disease. Muscle weakness caused by myasthenia gravis worsens as the affected muscle is used repeatedly. Myasthenia gravis can affect any kind of the voluntary muscle.

In most cases, the first symptom of the disease is weakness of the eye muscles. In others – difficulty in swallowing and slurred speech. The degree of muscle weakness involved in myasthenia gravis varies greatly among individuals, ranging from a localized form limited to eye muscles (ocular myasthenia), to a severe or generalized form in which many muscles are affected. Symptoms, which vary in type and severity, may include drooping of one or both eyelids (ptosis), blurred or double vision (diplopia) due to weakness of the muscles that control eye movements, unstable or waddling gait, a change in facial expression, difficulty in swallowing, shortness of breath, impaired speech (dysarthria), and weakness in the arms, hands, fingers, legs, and neck.

There is no cure for myasthenia gravis, but treatment can help people with myasthenia gravis relieve signs and symptoms, such as muscle weakness, double vision, drooping eyelids. Doctors use a variety of treatments, alone or in combination, to relieve symptoms of myasthenia gravis. For example, these can be medications, therapeutic methods or in some cases – surgery. Medications consist mainly of acetylcholinesterase inhibitors to directly improve muscle function, corticosteroids to limit antibody production and immunosuppressant drugs to lower the autoimmune process.

At present treatment with cholinesterase inhibitors is becoming more and more common. Acetylcholinesterase inhibitors are chemicals or drugs that inhibit acetylcholinesterase (enzyme that is located at the synapse) from destroying acetylcholine – the chemical messenger that causes muscle contractions. Cholinesterase inhibitors provide a short term boost to help patients function better. For example, medications such as pyridostigmine bromide (Mestinon) enhance communication between nerves and muscles. Possible side effects may include abdominal cramping, diarrhea, nausea, sweating and bradycardia.

Corticosteroids are the types of steroid hormones. These chemicals are synthesized in the adrenal cortex of vertebrates, but there are synthetic analogues of these hormones. Corticosteroids like prednisone inhibit the immune system, limiting antibody production. The side effects of using these chemicals include elevated

pressure in the eyes (glaucoma), high blood pressure, problems with mood and memory. A long use of corticosteroids, however, can lead to bone thinning, weight gain and diabetes.

Immunosuppressants are drugs that can inhibit or prevent the activity of immune system. They help prevent a patient's own body from producing the antibodies that cause MG weakness. At the same time, they also reduce the production of needed antibodies, which make antigen-antibodies complex. For treatment a doctor may use, for example, prednisone, cyclophosphamide (Cytosan, Neosar), cyclosporine (Sandimmune, Neoral) or tacrolimus. Side effects of using immunosuppressants are nausea, gastrointestinal upset, increased risk of infection, liver and kidney damage.

Besides these powerful drugs doctors can use such therapeutic methods as plasmapheresis and intravenous immunoglobulin. Plasmapheresis is a filtering process that removes "bad" antibodies from the blood. This treatment does not affect the body's ability to make more antibodies. However, the beneficial effects usually lasts only a few weeks. Plasmapheresis is an established treatment for seriously ill patients in the midst of myasthenic crisis (a life-threatening condition, that is characterized by neuromuscular respiratory failure). The risks associated with plasmapheresis include drop in blood pressure, bleeding, heart rhythm problems and muscle cramps. Intravenous immunoglobulin (IVIg) is a pooled immunoglobulin from thousands of donors. The mechanism of action for IVIG in MG is uncertain. This therapy provides a patient's body with normal antibodies, which alter the immune system response. IVIG also offers an alternative to plasmapheresis or multiple immunosuppressive agents in selected patients with MG as a preoperative treatment before thymectomy or as a "bridge" to slowly acting immunotherapies. The side effects which usually are mild may include chills, dizziness, headaches and fluid retention.

The most famous surgical method to treat MG is thymectomy. About 15 percent of the people with myasthenia gravis have a tumor in their thymus gland. This tumor is called thymoma. Generally thymomas are benign, but in rare cases they can become malignant. Doctors recommend thymectomies for individuals with thymomas and as an option for non-thymomatous patients with generalized MG, in particular those with acetylcholine antibodies and younger than 60 years, to increase the likelihood of remission or improvement. A thymectomy may be performed as an open surgery or as a minimally invasive surgery. In an open surgery, surgeon splits the central breast bone to open the chest and remove the thymus gland. Surgeons may perform minimally invasive surgery to remove the thymus gland, using smaller incisions. Minimally invasive thymectomy may include video-assisted thymectomy and robot-assisted thymectomy. In video-assisted thymectomy, surgeons make a small incision in the neck and use a video endoscope and small instruments to visualize and remove the thymus gland through the neck. In the alternative way of video-assisted thymectomy, surgeons may make a few small incisions in the side of the chest. Doctors use a video endoscope and small instruments to conduct the procedure and remove the thymus gland through the small incisions. Using robot-assisted thymectomy, surgeons make several small incisions in the side of the chest. Surgeons can also remove the thymus gland by using a robotic system consisting of a camera arm and mechanical arms. The advantages of these procedures may include less blood loss, less pain, lower mortality rates and shorter hospital stays compared to open surgery.

Though doctors can use a variety of methods to treat myasthenia gravis, from using acetylcholinesterase inhibitors (the most common method of treatment) to surgical operations to remove the thymus, the full convalescence is impossible. However, it is only a matter of time. Perhaps in the nearest future even people with severe course of the disease will be able to fully enjoy life and forget about the illness. After all, technology is constantly evolving, and what seemed impossible yesterday can become quite commonplace today.

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ABO BLOOD AND HUMAN ORIGINS

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Summary: This article describes the different blood groups, both from the point of view of genetics and the origin of man. The process of determining the blood group of a child on the basis of parent’s blood groups has been reviewed.

Key words: ABO blood group, antibodies, antigen, blood type, human origins, protein.

Анотація: У статті описуються різні групи крові, як з точки зору генетики, так із точки зору походження людини. Розглядається процес визначення групи крові дитини, керуючись групами крові батьків.

Ключові слова: АВО-система груп крові, антиген, антитіла, білок, група крові, походження людини.

Аннотация: В статье описываются разные группы крови как с точки зрения генетики, так и с точки зрения происхождения человека. Рассматривается процесс определения группы крови ребенка, исходя из групп крови родителей.

Ключевые слова: АВО-система групп крови, антиген, антитела, белок, группа крови, происхождение человека.

In general, ABO blood types are determined by a cell surface marker that identifies the cell as belonging to “self” or to that individual. These cell surface markers are characterized by a protein or lipid that has an extension of a particular arrangement of sugars. The sugars are identical, except the fact that types A and B have an additional sugar: N-acetylgalactosamine for A, and galactose for B. These sugar arrangements are part of an antigen capable of stimulating an immune response that produces antibodies to identify and destroy foreign antigens. People with blood type A produce an antibody B when exposed to antigen B, and those with blood type B produce an antibody A when exposed to antigen A. Blood type AB, however, produces no antibodies because both antigens present on the cells are recognized as “self.” Blood type O produces antibodies A and B, because neither antigen A nor B is present on the cells of type O individuals (Table 1). Antibodies A and B belong to the “M” class of immunoglobins and are expressed from the immunoglobulin genes of B-cell lymphocytes upon exposure to foreign antigens. Immunoglobulin genes are capable of producing an essentially infinite number of antibodies through a complex editing and selecting process. Consequently, there isn’t a specific “antibody A” gene or “antibody B” gene inherited with a complementary A or B antigen [1].

Table 1. ABO Blood Groups

Parent Alleles	A	B	O
A	AA <i>(A)</i>	AB <i>(AB)</i>	AO <i>(A)</i>
B	AB <i>(AB)</i>	BB <i>(B)</i>	BO <i>(B)</i>
O	AO <i>(A)</i>	BO <i>(B)</i>	OO <i>(O)</i>

The possible ABO alleles for one parent are in the top row and the alleles of the other are in the left column. Offspring genotypes are shown in block. Phenotypes are selected by italic.

Both A and B alleles are dominant over O. As a result, the individuals who have an AO genotype will have an A phenotype. People who are type O have OO genotypes. In other words, they inherited a recessive O allele from both parents. The A and B alleles are codominant. Therefore, if an A is inherited from one parent and a B from the other, the phenotype will be AB. Agglutination tests will show that these individuals have the characteristics of both type A and type B blood. It is important to be cautious in predicting the ABO blood type of children based on the phenotypes of their parents. This is

due to the fact that a third antigen (H) on the surface of red cells can prevent the expected ABO blood type from occurring. Normally, if an A blood type mother has an O type child, the father is expected to be type O or at least to carry the O allele (OO, AO, or BO genotype). The child has inherited an O allele from both parents. However, an O blood type child can also be born by parents who do not have the O allele if a recessive form of the allele for the H antigen also is inherited from both parents. The H antigen is a precursor to the A and B antigens. For instance, the B allele must be present to produce the B enzyme that modifies the H antigen to become the B antigen. It is the same for the A allele. However, if only recessive alleles for the H antigen are inherited (hh), as in the case above, the H antigen will not be produced. Subsequently, the A and B antigens also will not be produced. The result is an O phenotype by default since a lack of A and B antigens is the O type. This seemingly impossible phenotype result has been referred to as a Bombay phenotype. ABO Blood type antigens are not only found on the surface of red cells. They are also normally secreted by some people in their body fluids, including saliva, tears, and urine. Whether someone is able to secrete them is genetically

controlled. Police agencies now routinely use this so-called secretor system data to identify potential victims and criminals when blood samples are not available [2].

In fact, the ABO antigens are developed well before birth and remain throughout life. Children acquire ABO antibodies passively from their mother before birth, but by three months of age infants are making their own; it is believed that the stimulus for such antibody formation is from the contact with ABO-like antigenic substances in nature. ABO incompatibility, in which the antigens of a mother and her fetus are different enough to cause an immune reaction, occurs in a small number of pregnancies. Rarely, ABO incompatibility may give rise to erythroblastosis fetalis (hemolytic disease of the newborn), a type of anemia in which the red blood cells of the fetus are destroyed by the maternal immune system. This situation occurs most often when a mother is type O and her fetus is either type A or type B [4].

Thus, it should be investigated if it was possible for the two people of the Creation account (Adam and Eve) or the eight people on Noah's Ark to give rise to all of the ABO blood types present in humans today? If Adam and Eve were heterozygous for blood types A and B, respectively (one allele for type O and one allele for either type A or B), they could have produced children that had any of the ABO blood types. The Punnett square simply predicts what the possible phenotypes would be for a given couple's children. From the number of children that Adam and Eve likely produced, it is not difficult to envision all of the ABO blood types being passed down to their offspring. If Adam and Eve were heterozygous for the ABO blood type gene locus, then the allele frequency for the type O allele is 50 percent (2 of 4 alleles), the allele frequency for type A is 25 percent (1 of 4 alleles), and the allele frequency for type B is 25 percent. If there are no selective pressures or genetic drift for these alleles, then the allele frequency will remain constant through all of their descendants. The overall allele frequency in the Punnett square is actually the same for the children as it might have been for Adam and Eve. This scenario would also be true for Noah's family and their descendants [1].

Allele frequency is determined as a measure of the relative frequency of an allele on a genetic locus in a population [3]. The shift in frequency (the increase in type O and decrease in type B) can be caused by migration of people groups. It could also result from random genetic drift, or from a mutation that renders glycosyltransferase inactive – which would result in blood type O from type A and is a likely cause for the increase in the frequency of the O allele.

Unfortunately, the origin of the ABO alleles gets more complicated when examining the actual gene for glycosyltransferase. There are DNA differences, or polymorphisms, that determine the function of glycosyltransferase, resulting in different ABO blood types. The glycosyltransferase specific for antigen A synthesis differs from the antigen B-specific enzyme by just four amino acid residues (out of 354), and there are several DNA sequence differences in the alleles that code for the A- and O-specific enzyme. The four differences between the A and B glycosyltransferase are enough to allow the enzyme to specify the characteristic terminal sugar that distinguishes antigens A and B. A single DNA deletion in the A-specific allele results in a truncated version of the glycosyltransferase gene product, eliminating enzymatic activity and effectively resulting in blood type O [1].

It is possible to achieve the current O allele frequency via a mutation if it occurred at the time of Noah's Flood and was passed on by one of Noah's family members. Noah or Mrs. Noah could have had the O allele and passed it on to each one of their sons. The population of the human race at the time of the Flood and immediately afterward certainly qualifies as a population size that would enable a mutated allele to become common as the population grew. With a starting population of only eight people, the O allele could easily have increased in frequency through random genetic drift in the post-Flood population [1].

Hence, if Adam and Eve did not have all three blood type alleles, then there must have been a mutation creating the O allele while the human race was still very small and before humans dispersed across the globe. Whether the origin of blood type O was in Adam and Eve at Creation or whether it arose as a mutational event that took place shortly before or after the Flood, it strongly supports that all humans today are descendants of two individuals or a small group of people that eventually populated the globe.

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ANTIBACTERIAL PROPERTIES OF SILVER NANOPARTICLES

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Summary: The object of the article is an overview of antibacterial properties of silver nanoparticles (AgNPs). The results of the study are as follows: there is a dependence of AgNP structure on their applications in medicine. It has been shown that nanosilver is capable to bond aminoacids and peptides. It was learned that AgNPs have very strong antibacterial properties on an example of E. Coli.

Key words: AgNP, antibacterial, property, silver, silver nanoparticles, structure.

Анотація: Об'єктом дослідження цієї статті є огляд антибактеріальних властивостей наночастинок срібла (НЧС). В результаті дослідження було виявлено, що існує залежність структури НЧС при їх використанні у медицині. Показано, що наносрібло здатно зв'язуватися з амінокислотами та пептидами. На прикладі з E. Coli було вивчено переваги антибактеріальних властивостей наночастинок срібла.

Ключові слова: антибактеріальний, властивість, наночастинок срібла, НЧС, срібло, структура.

Аннотация: Объектом исследования этой статьи является обзор антибактериальных свойств наночастиц серебра (НЧС). В результате исследования было обнаружено, что существует зависимость структуры НЧС при их использовании в медицине. Показано, что наносеребро способно связываться с аминокислотами и пептидами. На примере с E. Coli были изучены сильные антибактериальные свойства наночастиц серебра.

Ключевые слова: антибактериальный, наночастицы серебра, НЧС, свойство, серебро, структура.

Introduction

It is known that silver compounds have long been applied in medicine because of their powerful antimicrobial properties. The antibacterial effect of colloidal silver has been known for a long time. Silver is widely used in different fields of manufacturing, such as cosmetics, detergents and lunchboxes polymer coating.

The typical silver nanoparticles (AgNP) have a size of 3-25 nm. They have a very big specific surface area, which increases the silver contacts with bacteria or viruses, significantly improving its bactericidal effects. Consequently, the application of silver nanoparticles allows to decrease up to hundreds times the silver concentration and, hence, to save all the bactericidal properties. Despite recent achievements in developing of silver nanomaterials, the scientists from all over the world are still disputing, what is the actual mechanism of the antibacterial effect: AgNPs themselves, the size of which is about 3 nm, or the soluble Ag⁺ ions, which are released from AgNP to the solution. Recently, the researchers from Rice University have found out that Ag⁺ ions, which are also presented on a nanoparticle surface, are capable to kill bacteria [1]. They have also established that AgNPs, which are not capable to form the ions, are absolutely harmless for bacteria. In addition, the researchers tried to determine if the size of AgNP influences their bactericidal properties. They studied the particles' nanowork of the size from 3 to 11 nm, they were industrially obtained and also by the scientists themselves at the laboratory. However, this topic still remains under active debates [1]. Moreover, the researchers checked the effects of AgNPs on microorganisms in anaerobic conditions. In a special anaerobic chamber, where there was no chance of particles oxidation, so there was no silver ions demerger from nanoparticles. It has been found out that in this case the antibacterial effect is much weaker. "We found the particles, even up to a concentration of 195 parts per million, were still not toxic to bacteria," Zongming Xiu said [1]. "But for the ionic silver, a concentration of about 15 parts per billion would kill all the present bacteria. It has been told that the particle is 7,665 times less toxic than the silver ions, indicating a negligible toxicity" [1]. However, it has also been established that at weak concentrations the ions are capable to make the converse effect on bacteria, and vice versa to stimulate their evolution. It has also stated that the goal of their work is to determine the silver ions effective concentration, which will be enough to kill bacteria.

The research will help to create effective antibacterial medicaments, which would not adversely affect ecology. In fact Ag⁺ ions are toxic not only for bacteria, but for the environment too. On the Figure 1 the graphic of silver nanoparticles effect on microorganisms is shown. [1].

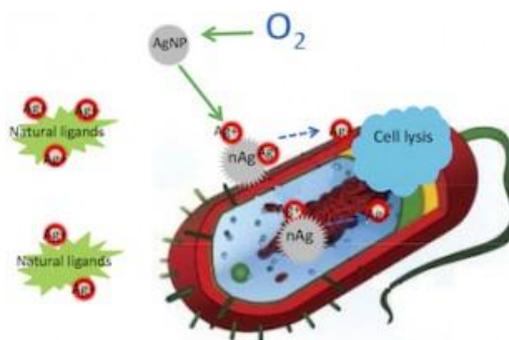


Figure 1. Silver ions delivered by nanoparticles to bacteria promote lysis, the process by which cells break down and ultimately die. These effects make silver nanoparticles a superior and widely used antibacterial agent. Modified from ref [1] by Zongming Xiu.

The mechanism of AgNP interaction into cells

Molecular aspects of how the nanoparticle gets inside the cell are not clear up to now. The bacterial wall includes a big number of sulfur- and phosphorous-bearing molecules, interacting with the nanoparticles and losing their activity [2]. The nanoparticles are capable to interact with DNA, in which case it loses its capacity to replicate and dies. It became evident that AgNP might serve as independent biocidal agents, nevertheless for the silver ions contribution to nanoparticles activity the Ag^+ concentration was determined, which was amounted to ones micromoles per liter. It testifies to some Ag^+ ions deposit into nanoparticles bactericidal property, connected with their little dissolving. However, the bacteria growth inhibition affected by silver nitrate showed the difference in action mechanism of silver ions on cells. [2].

The interaction of AgNPs with biopolymers

Amino acids and peptides binding to AgNP

The interaction of metal ions with biomolecular polymers (amino acids, peptides, or proteins) plays a fundamental role in many biological processes. It participates in electron transfer reactions, oxygen transport, metal transport, as well as in its storage in the cell. This binding process is involved in ligand exchange reactions, where the labile ligand, presented in the drug, is replaced by a targeted enzyme. This principle is used in many metal-based drugs. This is why it is one of the most important processes in bioinorganic chemistry. Although silver ions are not involved in natural systems, their medical properties make them irreplaceable ones. Ag^+ is classified as a soft cation (according to Pearson [3]). However, it is also capable to bind to polarizable, so-called «soft», ligands at the same time. Moreover, Ag^+ is capable to form strong σ - π -bonds through the electrons back-donation, which takes place in its d -orbitals and the ligand's π^* -orbitals. Ag (I) electronic structure is very similar to Cu (I), because both ions consist of the equal outer electronic configuration with filled electronic shell (d^{10}). Copper is a microelement, which plays a fundamental role as an enzyme cofactor in all organisms. The abundance of free copper ions is toxic for cells, therefore, peptides and proteins are involved in its homeostasis. Because of Ag (I) and Cu (I) similar chemical structures, metallic silver is also used for binding to peptides and proteins. Amino acids are the small subunits, which are used to construct peptides and proteins. So, it is necessary to study their interaction with silver ions to answer how Ag (I) binds to their polymeric form.

Theory: Silver binding to amino acids

The silver complexes with 20 naturally occurring α -amino acids have recently been determined on the hybrid density functional theory (DFT), combined with the quantitative structure-property relationship methodology [3]. Because of the different levels of quantum chemical calculations, the comparison of these data is not trivial. Nevertheless, these theoretical studies helped to determine a trend with three basic amino acids: arginine, lysine, and histidine. They are the strongest silver ion binders. While the nonpolar aliphatic amino acids, except methionine, have the weakest capability to be bound with Ag^+ . The naturally occurring amino acids side chains are shown in figure 2.

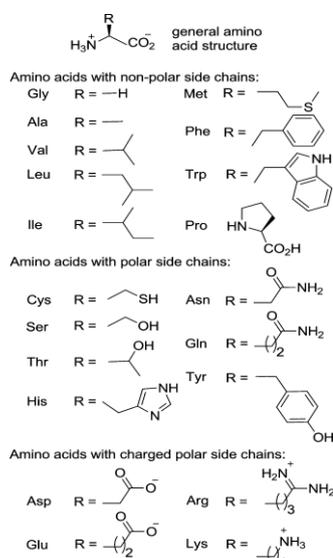


Figure 2. The 20 natural α -amino acids classified according to their side chain R.

It has been shown that the bonding capability is determined as the binding energy at 298 K. The calculated silver ion capability for the 1:1 binding stoichiometry of all 20 natural amino acids, is summarized in Table 1. Adopted from ref [3].

Table 1. Calculated Enthalpies and Free Energies (kJ/mol) for the Amino Acid – Ag(I) Complexes. Adopted from ref [3].

α -amino acid	ΔH°	ΔG°
glycine (Gly)	206.1	170.1
alanine (Ala)	212.8	176.8
valine (Val)	216.1	181.0
leucine (Leu)	219.5	185.6
isoleucine (Ile)	221.1	188.9
serine (Ser)	224.5	190.2
cysteine (Cys)	230.2	194.4
threonine (Thr)	233.2	199.8
aspartic acid (Asp)	232.4	199.0
praline (Pro)	234.5	199.8
phenylalanine (Phe)	236.2	198.6
glutamic acid (Glu)	239.9	203.1
tyrosine (Tyr)	239.9	202.3
asparagine (Asn)	250.8	217.4
tryptophan (Trp)	260.0	221.5
methionine (Met)	262.1	219.9
histidine (His)	284.2	249.1
lysine (Lys)	296.8	260.8
arginine (Arg)	336.5	279.8

There is a great deal of interest in cysteine. It is not present among the calculated binding parameters for amino acid binding for silver, although the sulfur atom is viewed as the softest group, which is in proteins. Therefore, cysteine and methionine are viewed as mainly an active center for silver ions in proteins; this is an assumption that is not confirmed by theory. The total binding energy can be decomposed into two energy terms; the first one is the amino acid previous organization and the second one is an interaction between amino acid and cation. This term is always negative and may compensate the previous organization energy, which is positive, because of the higher energy of the amino acid in the complexed form as compared to their free state.

From chemical point of view, Ag (I) and Cu (I) are very similar, because of their theoretical binding energies for the metal ion-amino acid complex formation. However, both proline and serine have a higher capability or affinity to be bound to silver, than that of copper. Jover et al. [4] also compared this affinity toward

silver. The order of the binding affinities of the amino acids for other monocharged cations for a big amount of the amino acids is: Cu (I) > Li(I)>Ag(I)>Na(I)>K(I). Also it is taken into account possible coordination modes between Ag(I) and the amino acid. Some metal ions are capable to adopt different modes and others tend to create single coordination geometry. In this case, the nature realizes the metal ion selectivity to metal ion-containing enzymes, which is important for their biological function.

An experiment: Silver binding to amino acids

There are only experimental data for Ag (I) binding to 20 naturally occurring amino acids (except cysteine), which were stated by Siu and co-workers [5]. They have also determined the binding energies of silver ion to simple alcohols and amides and predicated the relative silver ion affinities of the amino acids using relative ΔG values, obtained by a kinetic method developed by Cooks and co-workers. This method bases on the comparison of an ion-bound heterodimers group. In the case of the dissociation of silver binding affinities, its general structure can be described by this formula $[Aaa_xAgAaa_y]^+$, where Aaa_x and Aaa_y are presented as two different amino acids. In this case, the obtained experimental data provide the support for the previously described DFT calculations (Table 1).

Silver binding to peptides

Peptides have more coordination sites per molecule as compared to individual amino acids. So, the amide backbone can function as an additional coordination site. Shoeib and co-workers studied the structure and free energy of di- and tripeptides, which was taken by DFT calculations [6]. They found out that there are structures of silver-peptide complexes at the lowest energy with coordination numbers varied between two and four. Based on their research work, dipeptides have tricoordinated systems, and tripeptides have tri- and tetracoordination. As experimental data are based on X-ray crystallography, so in this case they are less riched by silver-peptide complexes than by amino acids. There is the only structure, which was published by Acland and Freeman [7] for Gly-Gly. It is the simplest of all dipeptides. At pH 6, this dipeptide forms a dimeric complex **8**, in which two silver ions connect the dipeptides C-termini through Ag-O bonds, forming an eight-membered ring (Figure 4).

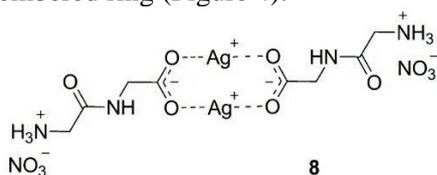


Figure 4. Scheme of the silver-diglycine complex **8** formed at pH = 6 (according to Acland and Freeman) Modified from ref [7].

Silver biomineralization

Peptides play a very important role in silver nanoparticles formation. During this process, peptides can function as a structural template, controlling the size and shape of the formed material. In such a way, the peptides may act not only like a general molecule core, but as a reducing agent too. It was very nontrivial to understand the mechanism of the formation of nanoparticles by microorganisms [8]. It is not usually easy to identify the general active biomolecule for biomineralization, created by microorganisms and plants. These active biomolecules are not always performed in form of peptides. For example, the silver nanoparticles obtained with the presence of coffee or tea extract means that there are polyphenol compounds, such as catechine or xanthine. In 1985 Smith performed a phage display to identify silver binding and settling .

Antibacterial properties of AgNPs

It looks improbable that microorganisms are able to develop silver resistance in the process of mutation (unless it exists a priori). Silver ions attack many different protein objects in the cell. This goodness became very useful and nowadays with the appearance of a big amount of antibiotic-resistant pathogenic bacteria strains, which are dire threat for life and health [2]. AgNPs have a strong antibacterial property thanks to their extended surface, which provides the maximal contact with the environment. Besides that, they are sufficiently small and they are capable to penetrate into cellular membranes, to influence intracellular processes from within, dividing inside. On that ground, it is concluded that only clusters, which are capable to interact with a cell surface, can penetrate into the cytoplasmic space.

The calculations of a size distribution of nanoparticles, which are trapped inside bacteria and on their membranes, show that their diameter is $\sim 2\pm 5$ nm. Consequently, nanoparticles bactericidal effect depends on their size and grows with its decrease. Only nanoparticles, a diameter of which is less than 10 nm, are capable of direct the interaction with bacteria. On the premise that all the particles are spherical, the percent of bioactive clusters in an exciting sample was calculated to be 0,093%. The statistic analysis showed, that in the range of 1-

10 nm ~ 98% of nanoparticles there is decahedron and icosahedron, which are composed by tetrahedral clusters with cojoined planes. The plane {111} has the highest chemical activity in silver crystal. These planes are in a big amount in described polyhedrons. Besides that, nanoparticles size reduction has an impact on increase of the bactericidal sample specific surface and of its total activity too. Perhaps, the high bioactivity of nanoparticles of <10 nm is conditioned by these circumstances.

Henglein and coworkers have showed, that nanosilver is sensitive to ambient oxygen [9]. As a result, the particles with oxidized surface and chemisorbed silver ions arise. The influence of the surface state of AgNPs on their bactericidal activity was studied, based on experiments with E.coli strains [10]. In this case, AgNPs of the size $9,2 \pm 2,8$ nm were synthesized in inert atmosphere. It was found out (by the mass spectroscopy) that equilibrium content of free ions in the solution is less than 0,1% of metal's total amount. It means that practically there is no contribution to biocidal activity. So, nanosilver, which was obtained in inert atmosphere, did not have antibacterial activity. In addition, the decisive contribution in silver nanoparticles antibacterial activity make not metal neutral atoms, but Ag^+ , adsorbed on the surface of nanoparticles. Also large silver nanoparticles (62 ± 18 nm) were synthesized. It was found out, that over equal metal content the nanoparticles dispersions with mean diameter (9,8 nm) exhibited bioactivity by 10 times higher that the activity of large dispersed clusters.

Tuning of antibacterial properties with AgNP morphology

The influence of silver nitrate solution, spherical nanoparticles, nanocores and abridged nanotriangles with an equal metal concentration (1, 6, 12, 12.5, 50 and 100 mcg to 100 ml of nutrient solution) was studied on E.coli cell structure. It was found out that for abridged nanotriangles practically complete inhibition of microorganism growth was achieved with a silver total content 1 mcg, in case of spherical nanoparticles the amount was 12.5 mcg, which depressed the reproduction, and 50-100 mcg fully stopped it. In case of nanocores over silver total content 100 mcg was pointed continued growth of certain colonies. The main cause of different clusters bioactivity is different planes {111} score in summary particles surface. So, in case of abridged nanotriangles their score is maximal, and nanocores contain them only at the ends. Spherical and quasi-spherical particles {111} score is also not very big.

Modern bioapplications of AgNPs

The US researchers have developed AgNPs, based on a paper test for synchronous detection of Dengue, yellow fever and Ebola. It could allow cheap and reliable diagnostics for these diseases, because it is quickly and easy to use. The epidemic of Ebola fever in West Africa highlights the intensive need of fast diagnostics, fast identification and isolation, which could be profitable both for sick and for healthy people. However, Dengue fever, yellow fever and Ebola have the same symptoms on the fist base, such as fever and headache, that's why it is so easy to confuse them.

Today, this big problem has an easy solution based on Lateral Flow test 8×3 centimeters. Lee Gehrke and his team from Massachusetts Institute of Technology and Harvard Medical School had adapted traditional one marker dip stick for diagnosing a range of diseases at once. It costs \$ 2 (£ 1,30), and takes 10 minutes, and there is no need for using expensive equipment for this. This test was made of paper slips with antibodies, which are secured with varisized triangular silver nanoparticles. Those paper slips are capable to identify the disease and to bind to it. Silver nanoparticles are presented by different colors, depending on their size. Therefore, when a patient's serum sample travels through this device, different colored lines appear on the paper to demonstrate positive response on Ebola, Dengue or yellow fever. This line picture can be analyzed by eye. The researchers work on a mobile application to help to determine the diagnosis. This app is very useful for diseases, excitants of which are insects. It determines date and geographic location based on the test results, that's why it is possible to follow up the spread of diseases on a real time basis.



Figure 5. Ebola, Dengue and yellow fever can be checked in one breath. Adopted from ref [11].

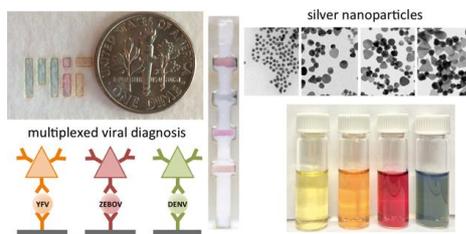


Figure 6. The sensor work depends on silver nanoparticles optical properties. Gehrke's team is testing these devices in different conditions and they are planning to adapt it for the wide range of viruses diagnostics. Adopted from ref [1¹].

Summary and Perspectives

Silver nanoparticles (AgNPs) possess unique physicochemical properties, which are different from those of silver materials on a larger scale. These features open up the opportunity for their use in many promising chemical and biomedical applications. Various applications of AgNPs have played and continue to play key roles in modern silver nanobiotechnology. Here the progress and recent achievements of various applications of AgNPs have been discussed. In particular, a topical issue of synthesis of hydrophilous AgNPs, which are aggregative stable in the wide pH interval, has been considered. It has been pointed out that the hydrophilic property is specifically useful for practical application in analytical chemistry, biology and medicine, because most of their research targets require the presence of aqueous media.

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ANTICANCER DRUGS: CURRENT STATE AND OUTLOOK

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Summary: The article reviews chemotherapeutic drugs as a means of fighting cancer. Being caused by DNA damages, cancerous cells can be treated with several types of anticancer drugs – alkylating agents, platinum-based drugs, antimetabolites, cytotoxic antibiotics, topoisomerase inhibitors and antimicrotubule agents. The biomolecular target of most of these anticancer drugs is DNA. Chemotherapeutic strategies which deal with other molecules as targets (particular enzymes, microRNAs) promise to be more powerful alternatives to the existing ones.

Key words: anticancer drug ,cancer, chemotherapy, DNA targeting.

Анотація: Стаття розглядає хімотерапевтичні препарати як засоби боротьби з раком. На ракові клітини, що виникають через пошкоджену ДНК, можна діяти декількома типами протиракових препаратів – алкилюючими агентами, препаратами на основі платини, антиметаболітами, цитотоксичними антибіотиками, інгібіторами топоізомерази та антимікротрубочковими препаратами. Біомолекулярною мішенню більшості з цих протиракових препаратів є ДНК. Хемотерапевтичні стратегії, що спрямовані на інші молекули-мішені (певні ферменти, мікроРНК) потенційно є більш потужною альтернативою існуючим.

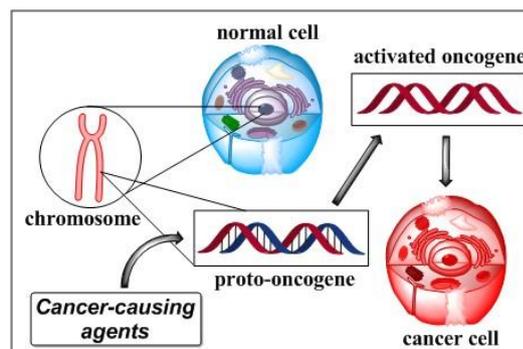
Ключові слова: ДНК таргетинг, протираковий препарат, рак, хіміотерапія.

Аннотация: Статья рассматривает химиотерапевтические препараты как способы борьбы с раком. На раковые клетки, которые возникают из-за поврежденной ДНК, можно действовать несколькими типами противораковых препаратов – алкилирующими агентами, препаратами на основе платины, антиметаболитами, цитотоксическими антибиотиками, ингибиторами топоизомеразы и микротрубочковыми препаратами. Биомолекулярной мишенью большинства из этих противораковых препаратов является ДНК. Химиотерапевтические стратегии, которые направлены на другие молекулы-мишени (конкретные ферменты, микроРНК) потенциально являются более мощной альтернативой существующим.

Ключевые слова: ДНК таргетинг, противораковый препарат, рак, химиотерапия.

The recent Nobel Prize in Chemistry 2015 “for mechanistic studies of DNA repair” is a great landmark of human success in understanding of the molecular nature of life [16]. Every second this enormous but vulnerable DNA molecule (see Box 1) with the lengths up to 8.5 cm suffers from a large number of damages that change the chemical structure of nucleotides. Moreover, lots of mistakes occur during DNA replication. DNA repair system prevents DNA molecules from damages and keeps genetic information unchanged. If the repair system cannot remove the mistake in the genetic code (e.g., if damages are not subject to repair or the repair system works incorrectly), a living cell applies another protective biochemical mechanism – apoptosis which is the programmed cell death. In other words, if damaged gene cannot be repaired, the cell must die [1].

Box 1. DNA, its functions and cancer. DNA (deoxyribonucleic acid) is a long sequence of linked units that are called nucleotides. Each nucleotide consists of sugar deoxyribose which is linked to nucleobase (adenine, guanine, cytosine or thymine) and phosphate group that plays the role of linker. DNA has two strands (sequences of nucleotides) which are coiled around each other forming together a double helix. There are two main functions of DNA: 1) storage and reproduction of genetic information; 2) serving as a template for production of proteins that each living cell needs. The process when DNA duplicate itself is called *replication*. Each sequence of three nucleotides codes one amino acid, and several dozens and even hundreds of amino acids are needed to form one molecule of protein. The region of DNA that codes the whole sequence of amino acids to produce one protein is called a *gene*. Genes which after some extent of damage are responsible for conversion of a normal cell into cancerous one are called *oncogenes*. *Tumor suppressor genes* correspond to proteins which protect the cell from becoming cancerous. If these genes are damaged and not repaired, it can also cause cancer [19].



When DNA repair system and/or apoptotic mechanisms function incorrectly, some irreversible and dangerous processes may begin, for instance, cancer [2, 19]. The most common feature of cancerous cells is uncontrolled division [19]. Normal cells cannot divide infinitely and they die when genetic material inside them is damaged. Yet cancer cells become literally crazy dividing endlessly and producing a large number of faulty proteins. At some point, the influence of cancer cells on human organism is so dramatic that a human dies.

The problem of cancer treatment lies in a great number of possible gene mutations that can lead to cancer and in the existence of different types of cells which can become cancerous. In each case there is a special set of features at the molecular level that accompany the disease. It means that even if several people have the same stomach cancer, they may have cancer cells with different features because the disease could be caused by different gene mutations. This fact significantly complicates cancer treatment [19]. Finding a good remedy against cancer is impossible in contrast to treatments for many other diseases because every particular case of cancer is unique. Nevertheless, due to the existence of general features of cancer cells, cancer can be partially and sometimes even fully cured. There are three main ways to fight cancer: 1) surgical operation; 2) radiotherapy; 3) chemotherapy [1]. The first two methods are quite straightforward and had been used before the cancer chemotherapy was introduced into the cancer treatment in the first half of 20th century [5, 17]. Unfortunately, these methods often fail to cure metastatic cancer and some forms of cancer where there are no solid tumors (e.g., leukemia). The discovery [5] and the application of anticancer drugs allowed to solve these problems partially, and nowadays cancer chemotherapy is a necessary step on the way to a patient’s recovery.

The overwhelming majority of anticancer drugs is cytotoxic [4, 9]: they aim at killing as many cancer cells as possible. However, the mechanism of action of each drug depends on its chemical structure and, consequently, its chemical properties. Nowadays, there are several major categories of anticancer drugs regarding their structure and the mode of action inside the cells: 1) alkylating agents; 2) platinum-based drugs; 3) antimetabolites; 4) cytotoxic antibiotics; 5) topoisomerase inhibitors; 6) antimicrotubule agents [9].

Alkylating agents (Fig.1) which were among the first anticancer drugs [5] can react virtually with each molecule that has nucleophilic sites (e.g., hydroxy –OH or amino –NH₂ groups). DNA molecule is not an exception, so its nucleobases can be alkylated (Fig.1, B) [15].

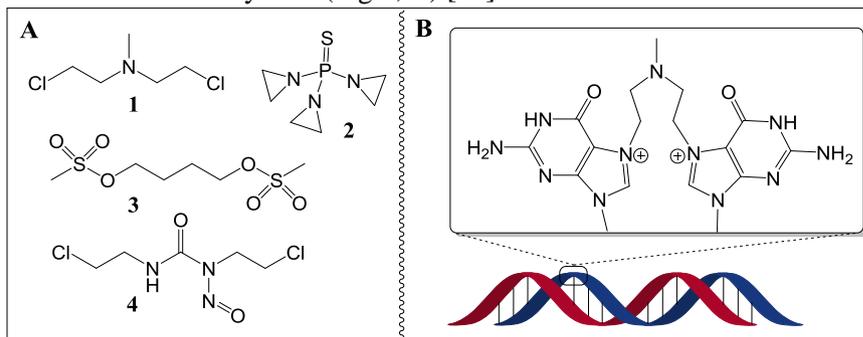


Figure 1. A) Alkylating agents (1– chlormethine, 2 – thiotepa, 3 – busulfan, 4 – carmustine). B) Cross-link between guanine nucleobases of the same DNA strand after alkylation by chlormethine.

In most cases alkylating agents have two reactive sites inside one molecule. It allows them to make cross-links between neighboring DNA strands, thus, preventing successful DNA replication. Besides, cross-links can be formed between different nucleobases of the same DNA strand that should be considered as a dramatic DNA damage. If DNA repair system of cancerous cell is unable to replace alkylated region of DNA by normal nucleotides, such a cell loses the ability to divide. Moreover, this cell will definitely die due to incompatibility of a cross-linked DNA molecule with the cell's life. The main types of alkylating agents are nitrogen mustards, aziridines, alkyl sulphonates and nitrozoureas [9, 15].

Platinum-based drugs have quite similar to alkylating agents mode of action. The most famous representative of this class of drugs is cisplatin – platinum complex with two types of ligands: chloride ions and ammonia (Fig.2). This and analogous compounds like alkylating agents form two covalent bonds with nucleobases of DNA, cross-linking preferentially the same DNA strand. Usually, platinum atom binds to one of the nitrogen atoms of guanine moieties (similarly to alkylating agents, see Fig.1,B) [7, 15]. Cross-linked DNA often cannot be repaired, so the cancer cell dies.

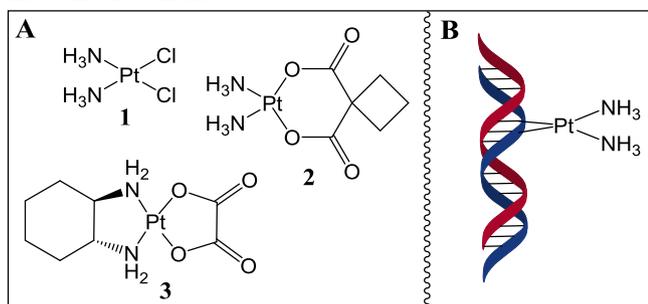


Figure 2. A) Platinum-based anticancer drugs that are widely used: 1– cisplatin, 2 – carboplatin, 3 – oxaliplatin. B) Chlorine atoms of cisplatin are being replaced by nitrogen atoms of nucleobases. Cross-linking of DNA strand occurs.

Another class of anticancer drugs is so-called *antimetabolites*. Generally, these compounds interfere directly or indirectly with the synthesis of DNA during replication and synthesis of RNA [6]. Antipurines and antipyrimidines are structurally related to purines and pyrimidines respectively (Fig. 3a). Inside the cell they are converted to corresponding nucleosides and nucleotides and in this form can bind to enzymes which are involved in the synthesis of normal nucleotides. As far as nucleotides are the building blocks for DNA and RNA molecules, the inhibition of their synthesis will prevent the synthesis of nucleic acids, especially during cell division. The incorporation of nucleotides derived from antipurines or antipyrimidines into the growing DNA strand may cause dramatic changes in DNA spatial structure and, thus, may provoke a cell death. Molecules of arabinosides, such as cytarabine, look like natural nucleosides (the only difference is in the structure of sugar moiety) and after conversion to triphosphate form they are incorporated into growing DNA strands and suppress the activity of DNA polymerases (Fig. 3b). Antifolates structurally resemble folic acid which is a substrate of enzyme called dihydrofolate reductase (DHFR) (Fig. 3c). Folic acid and DHFR are involved in the synthesis of nucleoside thymidine, so antifolates competing with folic acid for binding to DHFR efficiently inhibit this enzyme. This results in the suppressed synthesis of thymidine and some other nucleosides which are essential for DNA replication [9].

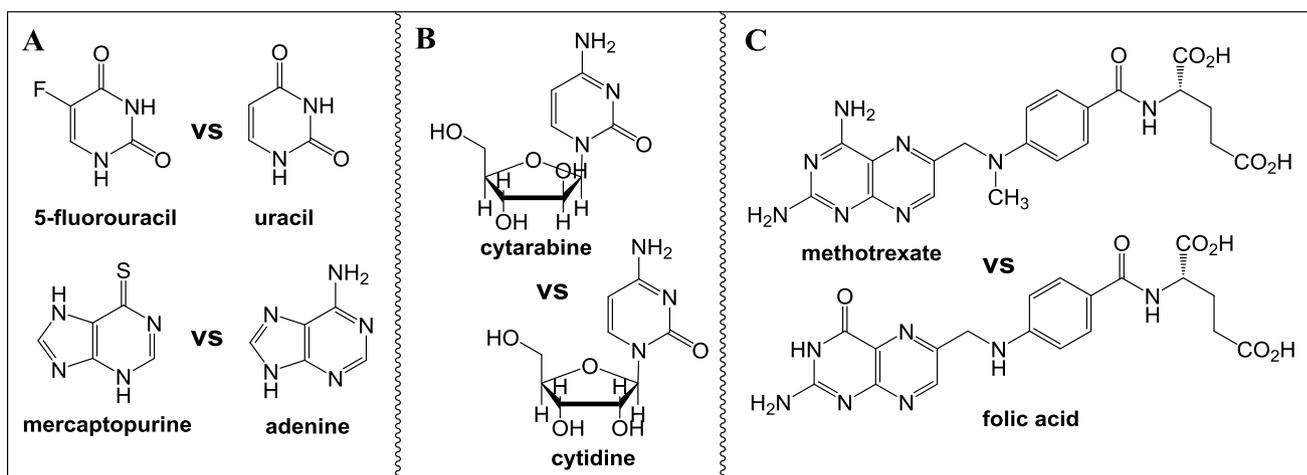


Figure 3. Structure of some antimetabolite representatives compared to the natural metabolites: A – antipyrimidines and antipurines, B – arabinosides, C – antifolates.

Cytotoxic antibiotics are represented by various families of compounds but the most important one is the anthracycline family [8, 9]. The representatives of anthracyclines such as doxorubicin and mitoxantrone have a typical fused tetra- or tricyclic system with quinone and hydroquinone moieties (Fig. 4). A planar structure of these antibiotics allows them to intercalate between base pairs of DNA thus interfering with the process of replication. Furthermore, anthracyclines and other cytotoxic antibiotics can generate highly reactive free radicals that damage important compartments of the living cell including DNA [8]. The inhibition of topoisomerases (see below) by anthracyclines has also been reported [13].

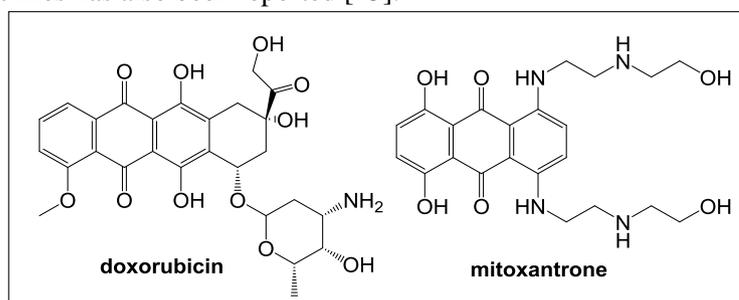


Figure 4. Two representatives of the anthracycline family

The majority of chemotherapeutic agents cause damage to DNA or interfere with its synthesis. The next two classes of anticancer drugs are notable for their unusual molecular targets.

Topoisomerase inhibitors. DNA is present in chromosomes in a highly compact, supercoiled state. More importantly, during replication or transcription DNA also suffers from excessive supercoiling. In order to unwind this extremely curved structure, special proteins should be involved. These proteins are called topoisomerases (TOP). While working, they cleave one (TOP1) or both (TOP2) DNA strands, unwind or relax supercoiled DNA and then religate strands [14]. Some anticancer drugs (e.g., doxorubicin and mitoxantrone), which are known as TOP poisons [13,14], can stabilize covalent complexes of topoisomerases with DNA at the point when one or two DNA strands are cleaved. This results in stoppage of replication or transcription at this particular region of DNA (Fig. 5). The interaction of other drugs such as ICRF-187 and merbarone with topoisomerases only inhibits the activity of these proteins, but the consequences are similar to those in the case of TOP poisons.

Antimicrotubule agents. Microtubules are important constituents of the cell cytoskeleton. Maintaining the cell's shape, they are involved in a variety of cellular processes including mitosis. Microtubules consist of two types of proteins: α - and β -tubulin. So-called vinca alkaloids (e.g., vincristine) can bind to tubulin molecules preventing their assembly into microtubules [9], thus affecting the process of cell division. On the other hand, taxanes impede disassembly of microtubules that results in the loss of their normal functions [9, 17]. A famous representative of the taxane family is paclitaxel (also known as Taxol).

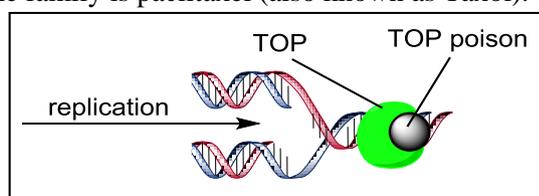


Figure 5. The process of replication stops at the point where TOP covalent complex with DNA is stabilized by the TOP poison

There are also anticancer drugs which have other molecular targets such as DNA methyltransferase [18] and tyrosine kinase [9]. Their aim is still the same: to interfere with crucial intracellular processes inducing cell death. Unfortunately, all drugs mentioned above have a serious drawback. They hardly distinguish between cancerous and normal cells and kill all highly proliferative cells including epidermal and bone marrow cells [1, 4]. This causes unpleasant and even life-threatening side effects such as hair loss, anaemia and immunodeficiency. Therefore, the development of novel anticancer drugs which would attack cancer cells selectively is of great importance. One example of such drugs is a family of aminoferrocene-based prodrugs which become activated under cancer-specific conditions [12]. More promising ruthenium alternatives to platinum-based drugs are also currently being explored [3].

In the very end of 20th century, scientists were able to discover cellular processes that may be interfered by new classes of drugs. These processes include too low or too high expression of some micro-RNAs specifically in cancerous cells. Thus, molecules which will target these micro-RNAs or proteins that are involved in their synthesis should be promising alternatives to the existing anticancer drugs [10]. The involvement of immunotherapy in cancer treatment is also considered as a possible improvement of current chemotherapy [18].

Cancer is an extremely dangerous disease and nobody has found an efficient treatment yet. Most of chemotherapeutic drugs kill cancer cells damaging their DNA, but DNA damage is also a primary cause of cancer. Hence, there is the evidence that several anticancer drugs may be also carcinogenic [11]. Furthermore, the range of side effects connected with poor selectivity of anticancer drugs is quite large, so the goal of scientists in the 21st century is to find new ways of fighting cancer. Switching from DNA to other molecular targets and cellular mechanisms must provide successful solutions for current problems of chemotherapy.

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ALCOHOLISM: MEDICAL PROBLEM WITH SOCIAL AFTER-EFFECT

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Summary: The article deals with the issue of alcoholism, its causes, both external and internal in their nature. The influence on the general health status and individual organs and systems of the person suffering from alcohol addiction is under consideration. The paper also reveals the impact of alcohol on the mental health of the patient.

Key words: Alcoholism, cardiovascular diseases, digestive system, mental disorders, social factors.

Аннотация: В статье затрагивается тема алкоголизма, его причины, как внешнего, так и внутреннего характера. Раскрывается влияние на общее состояние здоровья и отдельные органы и системы человека, страдающего от алкогольной зависимости. Также в статье представлены последствия употребления алкоголя для психического состояния пациента.

Ключевые слова: алкоголизм, нарушения ментальной сферы, сердечно-сосудистые заболевания, система пищеварения, социальные факторы.

Анотація: У статті розглянута тема алкоголізму, його причини, як зовнішнього, так і внутрішнього характеру. Розкривається вплив на загальний стан здоров'я та окремі органи та системи людини, яка страждає на залежність від алкоголю. Також у статті наводяться наслідки вживання алкоголю для психічного стану пацієнта.

Ключові слова: алкоголізм, порушення ментальної сфери, серцево-судинні захворювання, система травлення, соціальні чинники.

The modern society faces numerous problems related to different types of addiction among them the alcohol abuse which represents a major social and medical issue requiring a comprehensive approach. The alcohol addiction is able to exert a negative influence not only on drinkers but also on everyone who cares about them.

The most serious cases of alcoholism are those of people bearing predisposition to the disorder in their genes. The possibility of developing addiction for these people is much higher. Though inclination to alcohol abuse can spare generations, it remains a serious risk factor. At the same time many people do not realize that alcohol addiction begins from just "having a good time". Numerous cultures have a long history of alcohol consumption during different rituals and festivities which, unfortunately, is able to lead to addiction as well. Other cultural and social reasons for alcohol abuse include poverty, unemployment, loneliness etc. Emotional and psychological factors also play their part in forming alcohol addiction. For some people drinking is a way of forgetting about their problems for a certain time. Nevertheless, under stress the organism produces a greater number of hormones that make the person more susceptible to the influence of alcohol and more easily subject to addiction forming. The risk of alcoholism is increasing for individuals suffering from depression or neurosis. A fertile ground for addiction development is represented by low self-esteem, psychological issues that remained unresolved from childhood, immaturity etc.

From a medical point of view alcoholism is a chronic, progressive disease caused by the influence of alcohol as a substance leading to addiction. The disease is characterized by its own specific syndromes (symptoms), particularly in terms of its development and course, as well as certain consequences, which are defined by persistent somatoneurological disorders (diseases of the internal organs and the nervous system) and mental degradation (intelligence deterioration, dementia) [1].

It would be wrong to say that people suffering from alcohol addiction cannot overcome the disease, nevertheless, it requires their willingness to admit that they are in need of assistance and readiness to put all their efforts in the recovery. Most people do not realize that the addiction can lead to both from the medical and social point of view.

The alcohol affects various organs and, consequently, functions of the human body. The negative effects of alcohol on the brain are associated with insufficient access of oxygen to neurons as a result of alcohol intoxication. Alcoholic dementia that develops in the event of a long-term use of alcohol is caused by the death of brain cells.

An autopsy of alcohol addicts, even in a relatively young age often shows a significant level of the brain tissue destruction, particularly in the area of the cerebral cortex which is mainly responsible for thinking

that is why the mental functions of the person suffering from a prolonged alcohol abuse are subject to irreversible damage. Persistent use of alcohol affects nerve centers responsible for memory and attention; therefore, the destruction of cells leads to memory and concentration impairment resulting in disturbance of cognitive functions and perception. Moral degradation is taking place as well due to the destruction of cells controlling the person's behavior [2].

Currently the scientists have proved the fatal role of alcohol in the development of both acute and chronic diseases including those of the cardiovascular system.

Cardiovascular diseases occupy a leading place among the mortality factors. The alcohol use increases the blood pressure and thus can lead to such diseases as atherosclerosis, arrhythmia, ischemia and in the long run cause infarctions, strokes or even death. It is crucial to note that X-ray examinations reveal pathological changes in the heart of patients with relatively little experience of alcohol use, those with no history of chronic addiction. After large doses of alcohol even healthy people may be subject to an accelerated heart rhythm, but gradually it disappears. The alcohol intake has an impact similar to that of stress; it requires an additional supply of nutrients for the organism to function normally. If the body is unable to provide them, the cardiovascular system may not have the ability to cope with the load. Alcohol abuse also contributes to the development and progression of hypertension leading to coronary heart disease which is often a direct cause of heart attacks.

Another process vital for life is breathing involving inhalation and exhalation, which regularly alternate. Breathing consists of four stages, and the disruption of any of them leads to severe respiratory distress. At primary stages of alcoholism its use stimulates the respiratory function of the patient: increasing the respiratory minute volume, quickening the breathing rate. The disease contributes to gradual deterioration of the breathing functions which results in a variety of diseases (chronic bronchitis, tracheobronchitis, emphysema, tuberculosis). Often alcohol and tobacco addiction are combined leading to more severe consequences for the respiratory system. Tobacco smoke damages the structure of alveolar macrophages - cells that protect lung tissue from organic and mineral dust, detoxifying bacteria and viruses that destroy dead cells. Therefore, the joint abuse of tobacco and alcohol poses a serious threat to health [3].

Patients with chronic alcoholism often complain of disorders of the gastrointestinal tract, as the gastric mucosa is the first to experience toxic effects of alcohol. The available studies reveal a frequent incidence of gastritis, gastric ulcer and duodenal ulcer in the addicts resulting from impaired circulation and microflora. Prolonged alcohol addiction disturbs the functioning of salivary glands and develops other pathological changes affecting, inter alia, the pancreatic gland and preventing it from proper generation of enzymes necessary for digestion processes. In addition, alcohol destroys the cells responsible for insulin production which threatens with diabetes.

Another organ affected by alcohol is liver which takes a unique place in the digestive system playing the role of a "chemical laboratory" of the body that performs the antitoxic function, participates in the metabolism of various substances such as protein, fat, carbohydrate, water. A widespread phenomenon found in the alcohol addicts is hepatic steatosis as the cytoplasm is filled with fat while the cell nucleus changes its position [4]. Thus, hepatocytes cannot perform their functions as they should. The disruption of liver function under the influence of alcohol can also lead to cirrhosis of the liver.

The majority of patients subject to alcoholism also complain of renal excretory function. Malfunctions occur throughout the hypothalamic-pituitary-adrenal system, therefore, the regulation of the kidneys is violated. Detrimental effect of alcohol is seen primarily in vulnerable renal epithelium (protective tissue lining the inner surface of hollow organs). Alcohol addiction also contributes to pathologies of suprarenal capsules, tissue intoxication, formation of calculi.

Alcoholism may result in a wide variety of mental disorders or those related to brain function such as hallucinations, numbness of body parts, muscle cramps, sometimes severe weakness in the limbs ("wadded legs"). Often alcohol abuse is able to lead even to paralysis of individual muscle groups, mainly in the lower extremities. However, if the person abstains from alcohol intake, these symptoms can go away.

Human immune system also suffers the effects of the alcohol as it reduces the production of lymphocytes, promotes the development of allergies. The lymphocytes are generated in order to fight foreign proteins that is why a decrease in their number can induce various illnesses including TB and hepatitis [5]. Affecting muscular system chronic alcoholism often leads to muscle weakening and wasting. Alcohol can damage the muscles both directly and through poor nutrition which is another possible cause of muscular dystrophy.

In 30-50% of cases of alcohol abuse patients develop skin diseases. Skin lesions prove to be the result of direct action of alcohol, disorders of the liver and poor nutrition [6].

Alcohol addiction provokes premature ageing of the organism, sometimes causing disabilities. Moreover, according to the statistics, life expectancy of people who abuse alcohol is 15-20 years lower than that

of an average person with no addiction. Reduced performance at work or even exclusion from the labor market, inability to contribute to the economic development of the country [7] and, consequently, need for financial support from the state – all of these are negative effects of alcoholism on the economic environment. Rise in crime, lack of integration in the society, erosion of moral standards represent the social aspect of the problem.

Alcohol leaves a significant imprint on the work of all internal organs, on our personal life, career, and family. Doesn't that mean that we should give up glasses of dry wine, replacing them with a glass of juice or a few fruit?

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EUTHANASIA: DIGNIFIED DEATH OR MURDER

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Summary: This article deals with the term 'euthanasia' and its types and highlights the problem of its application. The author has analyzed medical, psychological, social, legal, ethical and religious aspects of implementation of euthanasia. The article defines the legality of the use of euthanasia in Ukraine, governed by different legal acts. the conclusions regarding the usefulness of euthanasia in the world.

Key words: active euthanasia, direct euthanasia, euthanasia, indirect euthanasia, involuntary euthanasia, passive euthanasia, voluntary euthanasia.

Анотація: У даній статті наводиться і характеризується поняття «евтаназії» та її видів, висвітлюється проблема її застосування. Проаналізовано медичні, психологічні, соціальні, юридичні, морально-етичні та релігійні аспекти застосування евтаназії. У статті визначено правомірність застосування евтаназії в Україні, що регулюється різним нормативно-правовими актами. Зроблено висновки щодо доцільності використання евтаназії в сучасному світі.

Ключові слова: активна евтаназія, евтаназія, добровільна евтаназія, недобровільна евтаназія, непрямая евтаназія, пасивна евтаназія, пряма евтаназія.

Аннотация: В данной статье характеризуется понятие «эвтаназии» и ее видов, освещается проблема ее применения. Проанализировано медицинские, психологические, социальные, юридические, морально-этические и религиозные аспекты использования эвтаназии. В статье определено правомерность применения эвтаназии в Украине, что регулируется различными нормативно-правовыми актами. Сделаны выводы о целесообразности использования эвтаназии в современном мире.

Ключевые слова: активная эвтаназия, добровольная эвтаназия, недобровольная эвтаназия, непрямая эвтаназия, пассивная эвтаназия, прямая эвтаназия, эвтаназия.

The problem of euthanasia originated in ancient times, and even then it caused many disputes among physicians, philosophers and lawyers. In the course of the history views on the essence of voluntary death substantially changed. It depended on the corresponding stage of society development. Even in the Hippocrates' time traditional medical ethics included prohibition 'With regard to healing the sick ... I will take care that they suffer no hurt or damage. Nor shall any man's entreaty prevail upon me to administer poison to anyone...' However, nowadays the doctors more and more often show a willingness to resort to such practice, at least when the patient himself asks about the death.

The relevance of this topic is difficult to overstate as it is associated with the very meaning of human's life. So, how should this aspect be treated?

Euthanasia is the practice of termination or reduction of a human's life, suffering from an incurable disease; it is the practice to satisfy the request of the patient to end the suffering in a painless form. For the first time the term 'euthanasia' was used by Francis Bacon to refer to easy death. The scientist wrote: '... the duty of any physician is not only to restore the health of a patient, but also to mitigate the suffering caused by the disease. And if the disease is recognized as incurable, the physician should provide the patient for easy and peaceful death, because there is no good in the world more than similar voluntary euthanasia ...' Later a lawyer Binding and a psychiatrist Gohe offered to call euthanasia as the destruction of an 'inferior' life. This interpretation was widely spread in Nazi Germany to kill the newborns with "wrong development", the mentally ill, the elderly and the disabled [6, p. 7].

The 39th World Medical Assembly (Madrid, Spain, October 1987) adopted the Declaration on Euthanasia, which states 'Euthanasia as an act of intentional deprivation of life of the patient at his request or at the request of his family is unacceptable, including the passive form of euthanasia' [2, p. 4]. The physician is obliged to alleviate the suffering of a dying by all available legal means.

A Short Oxford Dictionary gives three meanings of the word 'euthanasia':

- 1) 'quiet and easy death';
- 2) 'means for this';
- 3) 'action for its implementation'.

In modern scientific literature there is a distinction between active and passive euthanasia (criterion – the position of the doctor) and voluntary and involuntary euthanasia (criterion – the position of the patient). But the meaning content of various forms of euthanasia has no definitive statements in contemporary literature.

Active euthanasia involves direct actions aimed at killing the patient – the introduction of lethal doses of medication which can be done by the patient himself or by another person [3, p. 17]. It can occur in the following forms:

- 1) 'mercy killing' that occurs in cases when seeing the great suffering of an incurable and being unable to remove it, a doctor introduces him an overdose of analgesic medication;
- 2) 'a suicide assisted by a doctor' that occurs when a doctor only helps an incurable to commit a suicide;
- 3) and the actual active euthanasia that can take place without any help of a doctor. The patient himself turns on an appropriate device in order to do away with himself.

Passive euthanasia or 'pen-syringe method' entails the withholding of common treatments necessary for the continuance of life in order to accelerate the natural death [3, p. 21].

Voluntary euthanasia provides unambiguous informed consent of the patient ('will, expressed during life). It is signed by the author in the presence of two witnesses, none of them should be associated with the author of kinship and friendly relations, should not be his heir, nor his doctor or person who depends on any hospital. Such order is recorded on a special form and may be canceled in the case of a pregnant patient. Validity of this order is five years [3, p. 27].

Involuntary euthanasia is carried out without the direct consent of the patient on the assumption that his will would not contradict the decision taken and is based on the Trustees' decision (e.g. of relatives) without the direct consent of the patient, who is in a comatose state, and when resolving the fate of newborns with certain physical disabilities [3, p. 29].

In the literal sense euthanasia is a deliberate murder by the method that provokes the least pain and suffering committed "out of pity" to put an end to unbearable suffering or in order to avoid the difficulties of life which is considered 'inhuman', not 'worthy of the human.'

In legal literature, the problem of euthanasia is seen primarily through the prism of human rights and the prevailing view that active euthanasia is criminal. If the right to life is recognized at the international legal level, the human right to die is not supported at the international legal level and at the level of an absolute majority of civilized countries. Despite this, the opinions to make euthanasia legal are considered to be of need in the Ukrainian society and throughout the world as well. Supporters of this theory use a large number of the arguments based on liberal values, especially the freedom of choice, as well as the opinions that a person has the right to a decent life and a decent death. However, there is no term 'euthanasia' in Ukrainian legislation. Article 27 of the Constitution of Ukraine proclaims: 'Everyone has the inherent right to life. No one shall be arbitrarily deprived of life. The duty of the state is to protect human life. Everyone has the right to protect his life and health, life and health of others from unlawful encroachments' [6, p. 8]. Therefore, euthanasia is considered a murder and is punishable by law in Ukraine. This principle is found in many constitutions of CIS countries.

According to Article 115 of the Criminal Code of Ukraine euthanasia is defined as intentional killing or intentional wrongful infliction of death to another person [5, p. 51]. According to Article 52 of 'Basic Laws of Ukraine on Health Care' medical workers are prohibited to perform euthanasia, i.e. the deliberate acceleration of death or killing of an incurable with the purpose to relief him from suffering [4, p. 11].

Opponents of the legalization of euthanasia in the national legislation argue thus: ‘Although euthanasia is not wrong in all cases, it should not be authorized by law’ [1, p. 37] The main option argument is that euthanasia is permissible only in certain cases, but even there it should be banned because this practice is easy to abuse and legalization of euthanasia will do more harm than good. On the other hand, proponents of euthanasia argue that it is based on the fundamental human right to die, if death is the only deliverance from suffering. The main arguments to recognize euthanasia is compassion for others and the recognition of human rights to determine the time of one’s own death.

The problem of euthanasia has been widely discussed in the West since the late 50s of the previous century. The conditions of its implementation are quite thoroughly developed and tested in a number of countries where euthanasia is permitted by law. The Netherlands became the first country in the world that legislated for the terminally ill patients the right to active euthanasia. In 1993 a special list of 12 mandatory items was issued which became the basis of the Law on Euthanasia [1, p. 64]. Under the law, deadly procedure can be applied to patients at least 12 years old and made only at the request of the patient, if it is proven that his suffering is unbearable, the disease is incurable, and the doctors are not able to help. This necessarily requires repeated consent of the patient. Another country which officially legalized euthanasia became Belgium. It happened in 2002. In 2005 there were already registered 400 cases of ‘mercy killings’. By law, a person subjected to euthanasia is to be over 18 years old, suffering from incurable diseases. In California, after many years of long discussions and voting in referendums in 1977, the Law ‘On the Human Right to Death’ according was adopted to which the terminally ill can issue a document wishing to disable resuscitation equipment. There were some attempts to legalize euthanasia in Australia. In August 2002, some euthanasia supporters handed out special ‘suicide kits’ for free. To avoid problems with the authorities, 150 ‘suicide kits’ were distributed without instructions for use. Despite the absence of a law, euthanasia is already operating in the UK. In 2004 the media published the first evidence of death caused by doctors. It was done due to the necessary precedent that allowed everybody to achieve their own aims. The Supreme Court of the United Kingdom satisfied the demand of the 43-year-old woman to disconnect devices of artificial respiration that supported her life for a year. So, taking into consideration all the above, it is impossible to speak of unanimity of the international community.

Therefore, it is necessary to stress that the problem of euthanasia is rather ambiguous. The convincing evidence of this problem is the diversity of views on the various aspects. This question requires careful, thoughtful, balanced approach and clearly developed laws. Adoption of legislative decisions should be preceded by a comprehensive study of public opinion, attitudes of different social strata and groups.

Legalizing euthanasia could have a negative impact on public health care, facilitate misuse by some medical professionals, and increase the distrust of the population in the quality of health care and health system as a whole. In my opinion, euthanasia cannot justify a reference to the natural human right to dispose of one’s lives. This right shall be legally indisputable, and it cannot be delegated to any doctor or close relatives or other persons. What will happen to euthanasia in future? I hope that it will have no triumphant progress around the world. I believe that in terms of humanity it is necessary to look for other methods to help people who are experiencing intensive pain. Euthanasia is not a way out.

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BOTULINUM TOXIN IN MEDICAL TREATMENT

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Summary: The article discusses the principle of action of botulinum toxin on the human body, a wide range of its application in various fields of medicine and possible side effects.

Key words: blepharospasm, botulinum toxin, chronic migraines, dystonia, movement disorders, strabismus.

Анотація: У статті розглядається принцип дії ботулінічного токсину на організм людини, широкий спектр його застосування в різних областях медицини і можливі побічні ефекти.

Ключові слова: блефароспазм, ботулінічний токсин, дистонія, розлади руху, страбізм, хронічна мігрень.

Аннотація: В статті розглядається принцип дії ботулінічного токсину на організм людини, широкий спектр його застосування в різних областях медицини та можливі побічні ефекти.

Ключевые слова: блефароспазм, ботулинический токсин, двигательные расстройства, дистония, страбизм, хроническая мигрень.

Botulinum toxin injections are the best known of a group of medications that use various forms of botox to temporarily paralyze muscle activity. It is one of the most poisonous biological substances known, a neurotoxin produced by the bacterium *Clostridium botulinum*, an anaerobic, gram-positive, spore-forming rod commonly found on plants, in soil, water and the intestinal tracts of animals. A. B. Scott was the first to demonstrate the effectiveness of botulinum toxin type A for the management of strabismus in humans [3]. Subsequently, botulinum toxin was approved for the treatment of numerous disorders of spasticity and other conditions. Currently it is used in almost every sub-specialty of medicine. In 2002, the FDA approved the use of Botulinum toxin-A for the cosmetic purpose of temporarily reducing glabellar forehead frown lines.

Botulinum toxin elaborates eight antigenically distinguishable exotoxins (A, B, C1, C2, D, E, F and G). All the serotypes interfere with neural transmission by blocking the release of acetylcholine, which is the principal neurotransmitter at the neuromuscular junction. Intramuscular administration of botulinum toxin acts at the neuromuscular junction to cause muscle paralysis by inhibiting the release of acetylcholine from presynaptic motor neurons. Botulinum toxins act at four different sites in the body: neuromuscular junction, autonomic ganglia, postganglionic parasympathetic nerve endings and postganglionic sympathetic nerve endings that release acetylcholine. The heavy chain of the toxin binds selectively and irreversibly to high affinity receptors at the presynaptic surface of cholinergic neurones, and the toxin-receptor complex is taken up into the cell by endocytosis. The disulphide bond between the two chains is cleaved and the toxin escapes into the cytoplasm. The light chain interacts with different proteins (synaptosomal associated protein (SNAP) 25, vesicle associated membrane protein and syntaxin) in the nerve terminals to prevent the fusion of acetylcholine vesicles with the cell membrane [2]. The peak of the paralytic effect occurs within four to seven days after injection. Doses of all commercially available botulinum toxins are expressed in terms of the units of biologic activity. One unit of botulinum toxin corresponds to the calculated median intraperitoneal lethal dose (LD₅₀) in female Swiss-Webster mice. The affected nerve terminals do not degenerate, but the blockage of neurotransmitter release is irreversible. Function can be recovered by the sprouting of nerve terminals and by the formation of new synaptic contacts; this usually takes two to three months.

Over the past 15 years botulinum toxin has been shown to be useful in many conditions, especially strabismus and various movement disorders. Encouraging clinical reports have generated an abundance of ideas for other uses, but many of these observations are anecdotal. Nevertheless, it is potency, relative safety, and the reversibility of its effects that have made botulinum toxin an attractive option for some chronic conditions that respond only partially to medical treatment. Sometimes it can be used as an alternative to surgical intervention.

Injections with botulinum toxin are generally well tolerated. After injection the toxin diffuses into the muscles and other tissues. Its effect diminishes with an increasing distance from the injection site, but spreading to nearby muscles is possible, particularly when high volumes are injected. Patients receiving injections into the neck muscles for torticollis may therefore develop dysphagia because of the diffusion of the toxin into the oropharynx [1]. Distant effects shown by specialised electromyographic tests can also occur, but the weakness of distant muscles or generalised weakness, possibly due to the toxin spreading in the blood, is very rare. However, botulinum toxin should be used only under close supervision in patients with disturbed neuromuscular transmission – for example, in myasthenia gravis or Lambert-Eaton myasthenic syndrome or during the treatment with aminoglycosides. Other systemic side effects include an influenza-like illness and, rarely, brachial plexopathy, which may be immune-mediated. No severe allergic reactions have been reported. Botulinum toxin is contraindicated in pregnancy and while breast feeding. Careful monitoring is important when the toxin is used in children as it might alter cell functions such as axonal growth.

Botulinum toxin has proven to be useful in the treatment of many forms of dystonia, including the following: blepharospasm, hemifacial spasm, spasmodic torticollis, or cervical dystonia, and sometimes forward or backward, oromandibular dystonia – continuous spasms of the face, jaw, neck, tongue, larynx, and in severe cases, the respiratory system, urinary retention, spasmodic dysphonia. Neurons generate new nerve endings that reactivate the dystonia, so improvement is not long lasting, and treatment is usually repeated every 3 to 4 months. Physical or occupational therapy usually is undertaken to stretch and restore normal muscle function. Some patients develop antibodies to the toxin over time, rendering the treatment ineffective [4].

Botulinum toxin is also the treatment of choice for primary blepharospasm (involuntary eye closure). Injections are given bilaterally into the overactive orbicularis oculi muscle. A variant of blepharospasm in which eyelid opening is inhibited sometimes improves after injections into the pretarsal portion of the orbicularis oculi [5].

Botulinum toxin injections have been shown to provide effective relief for writer's cramp, with pain being generally more improved than motor function. The muscles to be injected are usually identified on clinical grounds, but electromyography is used to inject the toxin accurately. The improvement of the function is almost invariably associated with some weakness. Other occupational cramps, such as musician's cramp, respond less well to injections as they require very sophisticated neuromuscular performance.

Botulinum toxin is also an effective treatment for hemifacial spasm. Before treatment patients should have magnetic resonance imaging of the brain to rule out structural lesions in the cerebello-pontine angle. Nearly all injected patients improve, and the effect can last longer than in patients with dystonia (about five months), possibly because of pre-existing facial weakness. The treatment can be individualised by injecting only those muscles whose contractions are most disturbing to the patient – for example, the orbicularis oculi for involuntary eye closure. Excessive facial weakness is the most common side effect.

Botulinum toxin has been used in several other movement disorders, including tics and various tremor disorders, although the response is usually less than in dystonia, particularly in tremor patients.

Botulinum toxin has been evaluated in various spastic disorders. It was shown to improve gait pattern in patients with cerebral palsy with progressive dynamic equinovarus or equinovalgus foot deformities. Treatment of children with cerebral palsy during the key early years when functional skills in walking are being developed improves the outcome and may help to avoid surgery for contracture and bony torsion. In multiple sclerosis the toxin can relieve contractions of thigh adductors that interfere with sitting, positioning, and urethral catheterisation. It can also reduce muscle tone and increase the range of movement in upper extremity spasticity or in spastic foot drop after a stroke. Whether this translates into functional improvement has yet to be substantiated [1].

The use of botulinum toxins has revolutionised the treatment of various ophthalmic spastic disorders, facial dystonias and periocular wrinkles. A precise knowledge and understanding of the functional anatomy of the mimetic muscles is absolutely necessary to correctly use botulinum toxins in clinical practice. Adverse effects are usually mild and transient. The most common substantive complication is excessive or unwanted weakness, and this resolves as the action of the toxin is lost. Brow ptosis, eyelid ptosis, neck weakness, dysphagia, and diplopia may occur. The knowledge of the functional anatomy and the experience with the procedure help injectors avoid complications. The list of possible new indications is rapidly expanding. The cosmetological applications include correction of lines, creases and wrinkling all over the face, chin, neck, and chest to dermatological applications such as hyperhidrosis. Injections with botulinum toxin are generally well tolerated and side effects are few. In future, the development of new potent toxins with increasing effectiveness and duration of effect will further aid this expanding and interesting field of chemodenervation.

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ACIDIC SOILS OF KHARKIV REGION

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Summary: The article considers the causes of the excessive acidity of soils in Kharkiv region, analyzes the current conditions and recommendations on how to resolve existing problems.

Key words: fertilizing, soil acidity, soil protection measures.

Анотація: У статті розглянуто причини виникнення проблеми підвищеної кислотності ґрунтів Харківської області, проаналізовано сучасний стан та наведені рекомендації відносно усунення існуючих проблем.

Ключові слова: внесення добрив, ґрунтозахисні заходи, кислотність ґрунту.

Анотація: В статті розглянуті причини виникнення проблеми підвищеної кислотності ґрунтів Харківської області, проаналізовано сучасне становище і наведені рекомендації щодо усунення існуючих проблем.

Ключевые слова: внесение удобрений, кислотность почвы, почвозащитные мероприятия.

Actuality of the problem of excessive acidity of soils in Kharkiv area is mainly conditioned by the intensification of agriculture, ignoring maximum possibilities and potential of soil, the use of groundless agricultural technologies and physiologically acid mineral fertilizers. These types of soils require individual soil protective measures, reasonable agricultural technologies as well as a dosage control with transfer to organic fertilizers for subsequent improvement of agrochemical and agrophysical properties, supply of nutrients to soils and, consequently, increase of the soil productivity.

Kharkiv region has quite a significant area of acid soils where practically no agrotechnical measures are taken. Liming is the key measure to reduce soil acidity but its application does not meet the standards [2], a lot of soil resources are not provided by the necessary doses of lime, in other cases, on some areas liming has never been carried out. Most soil protective measures in Kharkiv region in relation to acid soils have a recommendation character because of low or absent financing from the state [4].

As compared to previous years, the area of acid soils has remained unchanged (table. 1), which leads to unstable harvest [3], and in future can negatively influence the ecological conditions of the ground resources in general and the economic constituent of our country in particular.

Table 1. Structure of soil cover in Kharkiv region [2]

Soils	Area, thousand ha		
	farmland	arable land	
		ha	% of the total area of arable land
1. Grey forest	37,3	27,0	1,44
including xeromorphic in complex with wind-eroded (10-15%)	29,7	20,7	1,10
2. Dark-grey podzolic	141,3	63,3	3,37
including xeromorphic in complex with wind-eroded (10-15%)	39,3	37,0	2,09
3. Black earth of podzolic	151,7	119,3	6,35
including xeromorphic in complex with wind-eroded (10-15%)	100,0	80,0	4,26
4. Black earth typical	769,2	740,6	39,44
including xeromorphic in complex with wind-eroded (10-15%)	333,7	290,3	15,46
5. Black earth ordinary deep	728,7	648,9	34,56
including xeromorphic in complex with wind-eroded (10-15%)	331,2	260,0	13,85

6. Black earth ordinary	230,6	219,4	11,68
including xeromorphic in complex with wind-eroded (10-15%)	70,2	63,1	3,36
7. Other soils	305,6	59,2	3,15

The main consequences of failure to observe timely realization of chemical land-reclamation of acid soils are the worsening of agrophysical and agrochemical properties, depletion of calcium and magnesium, destruction of buffer mechanisms, the weakening of biological stability and biological diversity as well as of productive and ecological functions of soils, etc. Lack of calcium in soil detains the development of root systems and growth of plants, which leads to the decline in agricultural cultures harvests [5]. Strictly speaking, many illnesses related to the lack of calcium and other elements in the organism of man are connected with excessive soil acidity because it is the people who are an eventual trophic chain in the system soil → plant → animal → people.

Quite a noticeable drawback of agricultural management in Kharkiv region is the fact of groundless supply of fertilizers into soil because organic and mineral fertilizer type and conditions of soil are not taken into account. The soils do not receive adequate amount of fertilizers they need to restore the balance provided by nutrients, as a results of this the amount of acid, broken and degraded soils do not diminish, on the contrary, the ability of these soils to become productive again is very questionable and there is a threat that they will be eliminated from agricultural use in the future. It has been noticed that the use of the soils potential and their regulation with nutrients as fertilizers is not rationally distributed on the districts of the region [1].

If we take into account the features of genetic types of soils, description of their humus composition, mechanical, water-chemical properties, fertility, degree of degradation process development, and the index of acid-base balance, it is possible to attain an optimum in agroecosystems by means of the expedient use, introduction of effective, first of all, ecological, agricultural technologies and the account of possible doses of different types of fertilizers.

For the effective and rational use of agroecosystems in Kharkiv region it is necessary to introduce ecological and organic technologies in agriculture using computer possibilities of exact agriculture. Organic agricultural technologies have considerable advantages based on reasonable reduction, in some cases on banning use of chemical pesticides, physiologically acid mineral fertilizers, GMO, but considerably susceptible to application of biological methods of pest control with maximal introduction of crop rotations, introduction of organic fertilizers and substances. Moreover, sharing possibilities of exact agriculture will allow to optimally supply the required nutrients in soil, taking into account heterogeneity within the limits of one field by means of computer technologies. Using these technologies, the soil potential will increase due to biological processes, optimizing acidity of soil.

Taking into account the aforesaid, we can come to the following conclusions: the problem of excessively acidic soils in Kharkiv region has a progressive character under the anthropogenic impact which in future will considerably influence the potential and possibilities of soils to produce a stable harvest.

To solve the existing problem of excessive soil acidity in Kharkiv region, first of all, it is necessary to monitor all types of soils, considering all features listed above, and coordinate the efforts directed to the solution of primary problems, that can considerably protect the country from inappropriate waste of money. Application of fertilizers, implementation of reclamation activities and the use of agricultural technologies must be reasonable with an account and estimation of all features and possibilities of soils. Subsequently, during optimization of acid soils resources their productivity will substantially increase as well as the possibility to produce high and stable harvest.

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УДК 536.2.02

THE POSSIBILITY OF OBTAINING TOMOGRAPHY IMAGES IN A SCANNING MICRO AND NANO THERMOGRAPHY

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Summary: This article deals with the methods of adapting of Projection Dynamic Thermal Tomography (PDTT) and Microwave Scanning Tomography (MST) to the tasks of scanning micro and nano thermography (SMNT) for obtaining tomographic images of micro and nano structures. It was found that the heat equation for nano structures includes new summands, which are responsible for reradiation, absorption and consider the relaxation time of the oscillation of atoms and the ballistic component of the mechanism of heat transfer in solids.

Key words: cantilever, heat equation, heat transfer, micro scales, nano scales, thermal imager, tomography.

Анотація: Стаття присвячена адаптації методів проекційної динамічної теплової томографії (ПДТТ) та мікрохвильової скануючої томографії (МСТ) до задач скануючої мікро- та нанотермографії (СМНТ) для одержання томографічних зображень мікро- та наноструктур. Було виявлено, що рівняння теплопровідності для наноструктур включає нові доданки, що відповідають за перевипромінювання, поглинання випромінювання, та враховують час релаксації коливань атомів та балістичну складову механізмів теплопередачі у твердому тілі.

Ключові слова: кантилевер, мікророзміри, нанорозміри, теплове рівняння, тепловізор, теплопередача, томографія.

Аннотация: Статья посвящена адаптации методов проекционной динамической тепловой томографии (ПДТТ) и микроволновой сканирующей томографии (МСТ) к задачам сканирующей микро- и нанотермографии (СМНТ) для получения томографических изображений микро- и наноструктур. Было обнаружено, что уравнение теплопроводности для наноструктур включает новые слагаемые, отвечающие за переизлучение, поглощение, и учитывающие время релаксации колебаний атомов и баллистическую составляющую механизмов теплопередачи в твердом теле.

Ключевые слова: кантилевер, микроразмеры, наноразмеры, тепловое уравнение, тепловизор, теплопередача, томография.

Introduction

The method of contactless micro thermography is based on a controlled matrix method of measuring of heat flows from the surface of the controlled object. It has high speed, but cannot get a resolution better than 5 microns. Contact nano thermography can increase a resolution up to 50 nm, but it is based on the scanning method which reduces performance. For both methods the previously developed approaches and algorithms for controlling and building tomographic image of the object could be offered.

In a microwave thermography there is a method of Projection Dynamic Thermal Tomography (PDTT), through which three-dimensional images of the internal structure of the object could be reproduced. Resolution of this method is about 2-5 times less than the depth of heterogeneity. In a contact nano thermography it is possible to use the method of multiple scanning of the field of object with varying frequency of thermal radiation. In this case, for the reconstruction of the internal structure the method of layered decoding can be used.

In this article we will consider one of the possible analytical and numerical algorithms for processing results of scanning applied to micro and nano tomography, which allows determining the internal structure of the object, i.e. to solve the tomographic problem.

In the classical heat equation we will consider the new summands, which are adjusted due to the fact that the size of the object which is being studied is small compared to the wavelength of thermal radiation. We improved the previously developed method of PDTT [2] applied to the problem of micro and nano thermography.

Review of contact and contactless scanning techniques

The need to study nanostructures and nano materials requires the development of new control methods, especially scanning microscopy. One of the promising and recently developed methods is a method of scanning thermal microscopy. One should distinguish a contactless method, which is based on the use of short-imager lens (provides a resolution of up to 5 microns), and a contact method based on the use of AFM cantilever as thermocouples or a thermistor. The latter provides a 50 times higher resolution (100 nm), but inferior to the ground on a number of parameters such as speed, inability to study a dynamic mode and others [1].

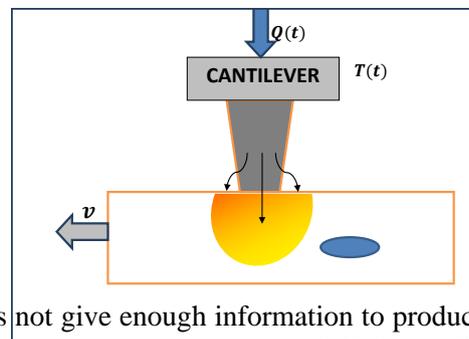
A common limitation for those and other methods is the lack of a tomographic mode. At the same time, we know that not only the area under the edge of the cantilever or under the edge of or visible region of the frame contributes to the resulting, but a certain volume of the object to the depth of penetration of heat waves. This allows expecting that by using appropriate decryption algorithms we can get tomographic (volume) image maps of the distribution of thermal characteristics (TC) of the object to this depth.

There is a well-known method of Projection Dynamic Thermal Tomography (PDTT), which solves a similar problem for macroscopic heat control. In this article we will explore the possibility of modification of this method for micro and nano thermography.

Scanning in thermography

There are several ways to scan data: the harmonious high-frequency heating of the cantilever edge; the method of measuring the impedance of thermal resistance of the tip and adjoining area of object; the harmonious heating of the tip, in which amplitude and phase of mechanical vertical oscillations of the tip are measured at each point of the scan; pulsed heating of the tip at each point in the scan, in which the vertical displacement of the tip and the point of inflection, corresponding to the melting point of the object, is being measured; and the heating of the tip with a heat flow of the constant power, in which the temperature of the tip is being measured.

Fig. 1 *General scanning method*



The procedure of nano thermography does not give enough information to produce tomographic images for in each pixel of thermogram only one or two parameters are measured. It is possible to get the missing information by changing one of the parameters of heating. For example, we could change the frequency of the heat flow: with reduction of frequency, thermal field penetrates deeper and deeper into the object. This allows building a layered decoding algorithm similar to that in microwave tomography.

In addition, in the distance method of measurement of heat flows from the microstructures (Thermal microscope), we could use special mathematical transformations of the variable ([3], the Burgers equation) to reduce the equations derived to a normal heat equation, and then use PDTT method for obtaining tomographic sections.

The method of Projection Dynamic Thermal Tomography

The PDTT method is a method of heating the object of study from two mutually perpendicular directions and getting the thermographic image of the object. The resulting information is handled during the reconstruction process.

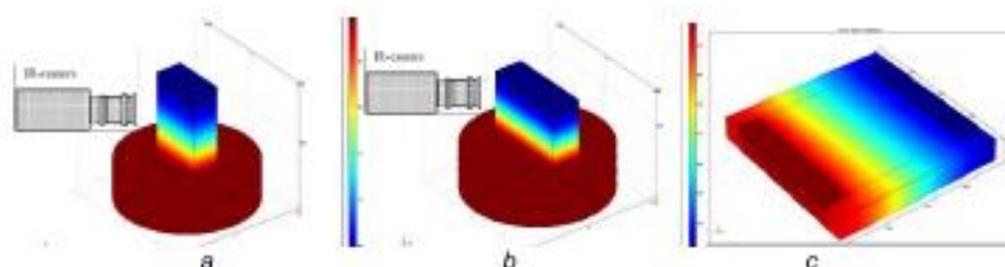


Fig.
One of the

2 (a, b)

possibilities of creating a heat flow using the contact method (heated support); (c) method of creating heat flow using one hand heating (using a laser beam, for example)

The reconstruction process includes three phases: construction of an approximate profile of deep heterogeneity of the decision of two-dimensional inverse heat conduction problem, clarification of the profile obtained by using the focusing algorithm, and the calculation of a priori information about the characteristic features of the required profile. These features can be parameters of its smoothness, amplitude, etc. Using some priori information about the parameters of the internal structure of the object can increase its sensitivity several times [4]. PDTT reduces the area that is insensitive to thermal test [6] and that is beyond the capacity of ultrasonic testing.

Adapting the PDTT method to the problem of Microwave Scanning Tomography (MST)

It is known from [4], that the classical heat equation in thermal physics is:

$$b \frac{dT}{d\tau} = c \frac{d(\lambda \frac{dT}{dx})}{dx} \text{ where } b, c \text{ are some constants, } T - \text{temperature, } \tau - \text{time.}$$

Sizes of the nano object are compared to the length of the heat radiation of the object. As a result, the heat equation raises the following summands:

$$d1 = d \frac{dT}{dx} \text{ and } d2 = eT.$$

Heating the test object is of an ultimate speed. As a result, the classical heat equation becomes hyperbolic. In other words, the equation raises, the second derivative of temperature over time, which is

$$\text{responsible for absorption and reradiation: } d3 = a \frac{d^2T}{d\tau^2}.$$

From all the above it follows that the heat equation can look like:

$$a \frac{d^2T}{d\tau^2} + b \frac{dT}{d\tau} = c \frac{d(\lambda \frac{dT}{dx})}{dx} + d \frac{dT}{dx} + eT. \tag{4.1}$$

First, we will note a way of solution of the equation of the kind:

$$\frac{\partial T}{\partial t} = a^2 \cdot \frac{\partial^2 T}{\partial x^2} + v \frac{\partial T}{\partial x} - \beta T \tag{4.2},$$

which is different from obtained equation only by summand

To simplify the equation we will make the substitution:

After substituting in $T(x, t) = e^{\mu x + \lambda t} \cdot u(x, t) = e^{\mu x + \lambda t} \cdot u$. (4.2) we get:

$$a^2 \cdot \frac{\partial^2 u}{\partial x^2} + (2\mu \cdot a^2 + v) \frac{\partial u}{\partial x} + (a^2 \cdot \mu^2 + v \cdot \mu - \beta - \lambda)u = \frac{\partial u}{\partial t} \tag{4.3}$$

To make two summands in this equation, including the desired function and its derivative, disappear, it is necessary to execute the following conditions:

So the ultimate $\mu = -\frac{v}{2a^2}, \lambda = -\left(\frac{v^2}{4a^2} + \beta\right)$ decision for the substitution in equation is:

$$T(x, t) = \exp\left[-\left(\frac{vx}{2a^2} + \left(\frac{v^2}{4a^2} + \beta\right)t\right)\right] \cdot u(x, t)$$

Similarly we can lead following form:

the equation (4.1) to the

$$a \frac{d^2u}{d\tau^2} + (2\lambda + b) \frac{du}{d\tau} = c \frac{d(\frac{du}{dx})}{dx} \tag{4.4}$$

To simplify the equation we will make the same substitution:

$$T(x, t) = e^{\mu x + \lambda t} \cdot u(x, t) = e^{\mu x + \lambda t} \cdot u.$$

And we will get the equation without the first derivative over the coordinates and the linear summand under the following conditions:

In other words,

$$\begin{cases} \mu = -\frac{d}{2c} \\ a\lambda^2 + b\lambda = c\mu^2 + d\mu + e \end{cases}$$

In equation (4.4) we can not leave only two terms to get its immediate solution because this equation is of the definite type, and any transformations and substitutions can not bring it to another type of equations.

Therefore, when measuring temperature $T(x, t)$, we also need to calculate the second derivative of temperature T over time. Once you can find the exact solution of this equation, make the reverse substitution. The results of approbation of the cards for the object tested

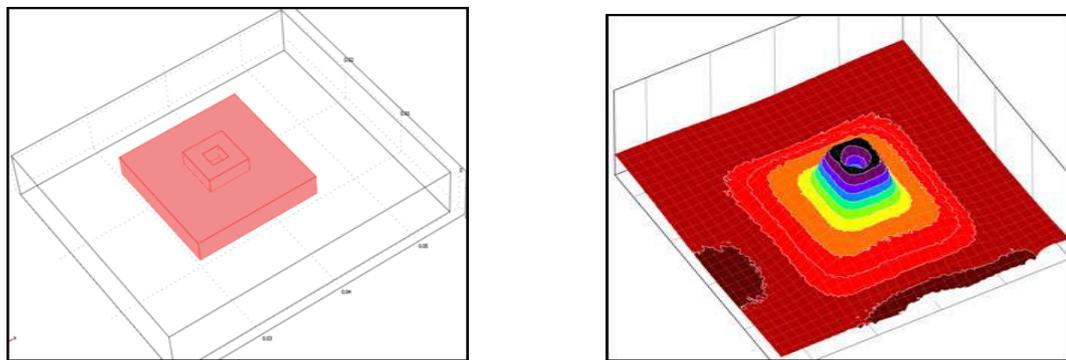


Fig. 3 The results of the approbation cards of the tested object (layers)

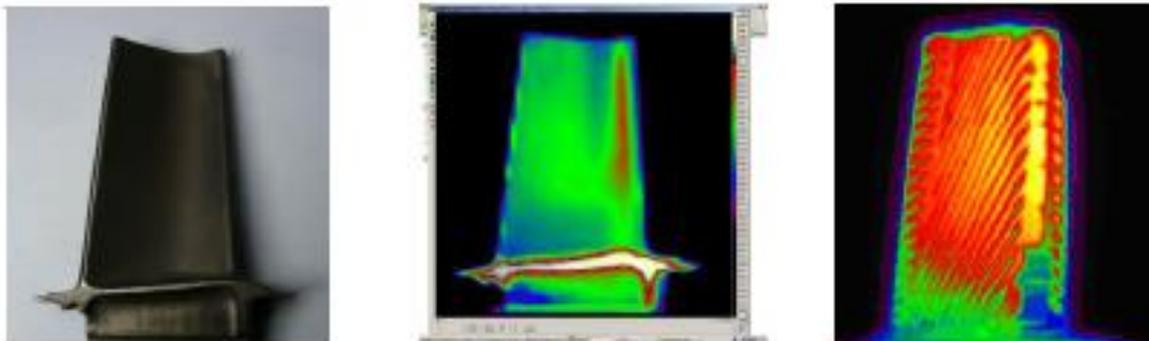


Fig. 4 Investigation of the possibility of control of the internal structure of the cooling channels in turbine blades of high pressure: a - object photography, b - image of an object in an ordinary thermal imaging cameras, c - image obtained using the proposed method of processing (visible metal edges inside the object under the layer of metal)

Conclusions

As a result the analysis of the existing scanning techniques was held and the methods of improvement have been proposed. Due to the peculiarities of nanostructures in the macroscopic heat equation there are additional components. An accurate heat equation for micro nano-objects has been presented, and the method of its decision has been proposed.

A technique of adaptation and application of PDTT methods, and MST for producing tomographic images of micro and nanostructures in micro and nano thermographic studies is suggested in the work. This technique opens the possibility of significant improvements of the informativeness of the tomographic methods.

With the new method the detection of the internal structure of the investigated nano or microscopic object will be possible, including detection of internal defects. The solution to this problem can be used in microelectronics, nano robotics, medicine, and other fields.

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DEVELOPMENT OF TRAVEL DEMAND MODELS

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Summary: The transport sector contributes to a significant proportion of the energy consumed in an urban area. In order to quantify the energy consumed by the transport sector, it is necessary to develop travel demand models that can predict the travel needs of the population by mode, time of day, duration and location. Such travel demand models must consider the travel needs not only of individuals but also of businesses and other organizations.

Keywords: individual's travel patterns, land-use corresponding, transport modelling methodologies, travel demand models, travel-related choices.

Анотація: Транспортний сектор робить свій внесок у значну частину енергії, спожитої в містах. Для того, щоб кількісно оцінити енергію, що споживається в транспортній галузі, необхідно розробити моделі попиту на пересування, які можуть передбачати потреби населення в пересуванні по видам, транспорту часу доби, тривалості та за місцем розташування. Такі моделі попиту на пересування повинні враховувати потреби не тільки окремих осіб, але також підприємств та інших організацій.

Ключові слова: альтернативи переміщення індивідуума, вибір шляху пересування, матриця кореспонденцій, методології транспортного моделювання, моделі попиту на пересування.

Аннотация: Транспортный сектор вносит свой вклад в значительной части энергии, потребленной в городах. Для того, чтобы количественно оценить энергию, потребляемую в транспортной отрасли, необходимо разработать модели спроса на передвижение, которые могут предусматривать потребности населения в передвижении по видам, времени суток, продолжительности и месте расположения. Такие модели спроса на передвижения должны учитывать потребности не только отдельных лиц, но также предприятий и других организаций.

Ключевые слова: альтернативы перемещения индивидуума, выбор пути передвижения, матрица корреспонденций, методологии транспортного моделирования, модели спроса на передвижения.

The development of land-use and travel demand models can be presented in three distinct strands. One strand follows the development of travel demand models from the early 4-step models to the advanced activity-based travel demand models. The second strand follows the development of operational integrated land use-transport models with the 4-step model predominantly forming the transport component. And the third strand follows the development of advanced 'next-generation' land use-transport models (LU-T models) that are disaggregate and use the activity-based approach within the transport component [1].

Aggregate Models. The earliest travel demand models were simple mathematical models, such as a gravity model or an entropy model that quantified travel as a function of the size of a zone. These were essentially aggregate level trip-based models. The number of trips generated from a zone was considered to be proportional to the population in the zone, while the number of trips attracted to a zone was considered to be proportional to the number of sources of attraction in the zone. Moreover, the travel between zones was considered to be inversely proportional to the distance between the zones (also referred to as 'impedance') [5].

Disaggregate Trip-based Models. Advances in modelling techniques resulted in a shift away from these aggregate models and led to the development of disaggregate trip-based models. These models use disaggregate level data on the trips made by individuals between the zones in the study area, and apply modelling methodologies such as constrained optimization and random utility maximisation. The fundamental difference between aggregate and disaggregate models is that the disaggregate models view the individual (or household or

firm) as the decision-making unit. In other words, the disaggregate models take into account the effects of individual socio-demographics (or firm characteristics) on travel-related choices. However, in practice, due to data limitations and modelling constraints, disaggregate trip-based models are sometimes (even to this day) implemented in an aggregate manner with aggregate zonal socio-demographic data [4].

Despite the move to a disaggregate approach, trip-based models continued to exhibit several critical limitations. The most criticised of these limitations was the fact that trip-based models do not consider the linkages between trips. For instance, a commute trip from home to work in a trip-based model is treated independently of the return commute from work to home, and both trips are classified as home-based work trips. As a result, these early models could potentially assign different modes of travel to the home-work and the work-home trips. Tour-based models were developed to address this limitation.

Operational Integrated LU-T models. Travel is derived from the need of households and businesses to interact with their environment. Specifically, it is a result of a firm's logistical needs and an individual's desire to participate in activities such as work, education, shopping and leisure, at locations that are distributed over space. Clearly, the spatial configuration of an urban system (also known as the land-use pattern) influences the travel-related decisions that individuals make. For instance, if an urban area offers shopping opportunities only within a well-defined shopping neighbourhood, then households will necessarily need to travel to this location for their shopping needs. A household located far away from the shopping district will then have greater incentive to own private vehicles, and such a household is likelier to exhibit auto-centric activity-travel patterns. Or, to take another example, businesses may choose to locate (or relocate) themselves in less congested parts of an urban area so as to minimize productivity losses through congestion in the transport system [2].

Next-Generation Integrated LU-T Models. These next-generation models are built on the strengths and experience of currently operational models, which include generally strong microeconomic formulations of land and housing/floor-space market processes and coherent frameworks to deal with land use-transport interactions. The key tool used in these models is the micro-simulation of market processes. However, of the several next-generation LU-T models currently in evolution, UrbanSim is the only model that we are aware of that attempts to build integrated activity-based micro-simulation models of land-use and transport [3].

The travel demand models and LU-T models presented in this paper apply a variety of different modelling methodologies. The choice of modelling methodology is usually motivated by the conceptual model structure, advances in economic and econometric modelling, the data availability, and the computing capability. While early modelling methodologies supported macroeconomic theories, more recent methodologies support classical microeconomic and behavioural decision theories.

Conclusions

The primary objective of next-generation LU-T models is the development of behaviourally realistic and accurate model systems that exploit the econometric and computational advances made over the last century. Specifically, they attempt to develop a model of individuals' travel behaviour, firm behaviour, real estate markets and demographic processes that is as close to reality as possible. Stated simply, integrated LU-T models are evolving toward being comprehensive models of the entire urban system [6].

Comprehensive as they may be, current LU-T models do not truly internalise issues such as environmental impacts, energy consumption and economic productivity. With the advent of climate change, fuel shortage and globalization issues, transport planners and policy-makers are beginning to acknowledge the importance of these links. The relationship between transport and economic productivity is the most complex of these links and has been researched extensively in the last few decades by transport economists.

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ENVIRONMENTAL PROBLEMS AND THEIR SOLUTIONS

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Summary: The article addresses the problem of environmental crisis and solutions to environmental problems today. The pollution of the geographic shell and its components (atmosphere, hydrosphere, biosphere) is also considered. Ecological problems of Ukraine and ways of their solution are described.

Key words: ecology, nature, biosphere, biodiversity, natural systems.

Анотація: У статті розглядаються проблеми екологічної кризи та шляхи вирішення екологічних проблем на сучасному етапі. Забруднення географічної оболонки і її компонентів (атмосфери, гідросфери, біосфери) також досліджується. Екологічні проблеми України та шляхи їх вирішення також розглядаються.

Ключові слова: екологія, природа, біосфера, біорізноманіття, природні комплекси.

Аннотация: В статье рассматриваются проблемы экологического кризиса и пути решения экологических проблем на современном этапе. Загрязнение географической оболочки и ее компонентов (атмосферы, гидросферы, биосферы) рассматривается. Экологические проблемы Украины и пути их решения также обсуждаются в работе.

Ключевые слова: экология, природа, биосфера, биоразнообразие, природные комплексы.

Fifty years ago hardly anybody was concerned about environmental problems. Industrial and economic development, progress and profit were more important. Large cities with thousands of smoky industrial enterprises are appeared all over the world today [1].

The twentieth century history is marked by the emergence and deepening of global issues. Global problems are a set of problems of all humanity, the solution of which depends on the preservation of civilization.

Man is in extricable linked with nature. He is just one link in the endless chain of other organisms, has all characteristic functions of an organism and along with all life on the Earth.

Now it is the time for the humanity to seriously rethink its relationship to nature, while uniting the efforts of nations and peoples in the struggle for the salvation of the planet's biosphere, the implementation of new local, regional and international programs for further development and survival, which should be based on new social and political principles of deep environmental knowledge and increased general human environmental consciousness. The organisms not only adapt to the environment of their existence, but they also adapt the environment, to themselves forming a complex system of controlled conditions that ensure life on the planet [2].

In the twentieth century, the total economic activity of humanity (the scale of energy use and processing of natural materials, involvement of new areas in agricultural production) is progressive lying reassign, that is why there is a risk of environmental crisis of global scale, which must be prevented. Indeed, in the next 20-30 years humanity expect great difficulties, and it is hoped that they would overcome: the first of environmental crisis. There is first positive experience in implementing new environmental policies. More and more countries pay attention to nature protection, preservation of the biosphere that is the highest priority nowadays [1].

The atmosphere adjudged more than 6 million tons of pollutants and carbon dioxide every year in Ukraine. Traditionally, major pollutants are industrial enterprises. However, an increasing number of cars on the roads entailed an increase in harmful emissions. Over the past few years, the number of exhaust gas into the air on the territory of the big cities has grown by 50–70%. 71% of the land resources in Ukraine are used for agro-landscape business. But because of the overuse and misuse of the land the fertility falls every year. Soil ecosystem is destroyed mainly due to the intensive development of erosion in recent years and it has undergone more than 35% of the farmland in Ukraine. The active use of fertilizers has led to the increase in the area of acid soils (2.4 million hectares over the past 15 years). The thickness of the humus layer affects the crop. In addition, almost 40% of the total land resources of Ukraine are contaminated. The critical values of the level of fertility can be achieved in 20–30 years and in some regions even earlier.

All surface waters of Ukraine belong to the Black Sea and Sea of Azov basins. The high population density, heavy industrial development, relatively low fresh water endowment of those basins, and the low governmental priority placed upon environmental protection until very recently, have given rise to chronic and serious levels of water pollution in Ukraine.

Acid rain is an acidic precipitation thought to be caused principally by the release into the atmosphere of sulphur dioxide and oxides of nitrogen. It also comes out of the atmosphere as dry particles and is absorbed

directly by lakes, plants. Acidic gases can travel over 500 km a day. Acid rain is linked to damage and the death of the forests and lake organisms. It also results in damage to buildings and statues.

The human organism consists of water to seventy percent, so it plays one of the most important roles in the life of any organism. However, 80% of Ukrainian population use water from surface sources, and environmental conditions of the sweaters gets worse every year. A lack of the wastewater treatment, bad treatment of industrial waters causes less clean drinkable water every year. All ground waters in Ukraine are of the 3rd class of pollution. As a result – eighty percent of water samples show that the quality does not meet the state standards. If we talk about the purest water in Ukraine, it can be enjoyed in Poltava region, where almost all water is taken from the underground sources.

One sixth parts of Ukrainian territory is covered with forests. But at the same time the exports from Ukraine is 2.5 times higher than the imports. Forest consumption leads to the fact that forests are not restored and they lose biological stability (forest area affected by pests and diseases is constantly increasing). Irrational deforestation has increased frequency and intensity of floods in the western regions of Ukraine, especially in the Carpathian Mountains. A significant part of the gross domestic product connected with extraction and processing of mineral resources (41–43%) is concentrated in the mining regions of Donbass, Kryvbass, and Carpathian regions. Meanwhile, the ecology of these regions suffer not so much from intensive production, but from improper closing of unprofitable and depleted mines and quarries. Ignoring the scientific approaches to this process has led to the activation of floods in the towns and villages, pollution of surface and underground water intake, surface subsidence with harmful elements: sulphur, nitrate, cobalt, arsenic.

One of the most serious environmental problems in Ukraine today is the problem of recovery and recycling of various wastes. The country has about 800 official landfills, the total amount of debris of which exceeded 35 billion tons. Every year, this figure rises by seven-eight thousand tons. The total area of all polygons with waste is already more than 150 hectares (4% of the country). Substances that are released as a result of chemical reactions are able to turn the territory of Ukraine in a continuous zone of ecological disaster. According to the Ministry of Ecology and Natural Resources of Ukraine, every year average Ukrainian citizen throws out in the trash about 250 kilograms of waste.

The total activity of radionuclides, moved beyond the Chernobyl accident, April 26, 1986, and in the following days after the accident, exceeded 300 million curies.

The accident led to the radioactive contamination of more than 145 thousand square kilometres of the territory of Ukraine, Belarus and Russia. Ukrainian scientists are unanimous that the consequences of the Chernobyl accident will be a very long time to remind. At the same time, radiation situation of the territories around the station has improved significantly for the last 25 years. It was facilitated by natural processes, and conducting decontamination and absence of the population. An international environmental research centre has been set up on Lake Baikal. The international organization Greenpeace is also doing much to preserve the environment. But these are only the initial steps and they must be carried onward to protect nature, to save the life on the planet not only for the sake of the present but also for the future generations. We must take care of our nature. That's why we must not drop litter in street, we must improve traffic transport, use bicycles, create more parks.

Today, as throughout many notable changes in both living and in animate, nature have happened as a result of human activities all over the world and Ukraine. Harmonious interaction of society and the environment is now exception. It is becoming increasingly important, as a man gets from nature everything: energy, food, he draws emotional and aesthetic inspiration from it. Therefore, it is necessary not only have a clear strategy of environmental protection and monitoring of natural resources, but also a well thought-out system of environmental education and education of the population as a whole.

One of the most important objectives of nature protections is the preservation of biological diversity. Biodiversity protection begins with saving the planet's living organisms. In general protection of biological diversity is the key to conservation of vegetation, which is food for animals. Without the conservation of plants and vegetation species can not be saved.

The list of species of plants and animals that need protection, is in the so-called Red Book. The Red Book of Ukraine is the main public document generalizing the current state of rare plants and animals in the country under which scientific and practical measures for their protection, restoration and sustainable use are developed.

The most effective way to protect biodiversity of unique and typical natural systems is the establishment of protected areas [3].

Ukraine's environmental problems include the nuclear contamination which resulted from the 1986 Chernobyl accident. One-tenth of Ukraine's land area was affected by the radiation. According to UN reports, approximately one million people were exposed to unsafe levels of radiation through the consumption of food.

Approximately 3.5 million ha (8.6 million ac) of agricultural land and 1.5 million ha (3.7 million ac) of forest were also contaminated.

Pollution from other sources also poses a threat to the environment. Ukraine releases polluted water, heavy metal, organic compounds, and oil-related pollutants into the Black Sea. The water supply in some areas of the country contains toxic industrial chemicals up to 10 times the concentration considered to be within safety limits.

Air pollution is also a significant environmental problem in the Ukraine. In 1992, Ukraine had the world's seventh-highest level of industrial carbon dioxide emissions, which totaled 611.3 million metric tons, a per capita level of 11.72. In 1996, the total had dropped significantly to 397 million metric tons. The pollution of the nation's water has resulted in large-scale elimination of the fish population, particularly in the Sea of Azov.

As of 2001, only 1.6% of Ukraine's total land area is protected, including 22 Wetlands of International Importance. Fifteen mammal species, 10 bird species, and 20 plant species are threatened, including the European bison, the Russian desman, and the Dalmatian pelican.

By changing the environment, improving technical devices, people tend to meet their needs. However, human activities can result in technological and environmental dangers, both for the environment and for the individual. Every one can and should take care of saving and restoring the environment. Daily steps in this direction will improve health and protect life.

So if we do not change spiritually, do not preach the philosophy of the relationship in the nature of all living and dead, will not give up the idea of consumer attitude towards nature, do not stop punishing, it's won't be able to speak about any harmony, coexistence and human co-development with nature. All of us, the inhabitants of a small, beautiful but very heang with the "fruit" of human activity planet, must begin to act to save the environment. Our lives are in our hands.

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THE MAIN CRITERIA OF CLASSIFICATION OF EXCURSIONS

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Summary: This article deals with the classification of the tour and excursions. It also presents a classification for their orientation.

Key words: classification of excursions, ecology, nature.

Анотація: У данній статті розповідається про те, що таке екскурсія, які види екскурсій існують. Також подана класифікація за їхньою спрямованістю.

Ключові слова: класифікація екскурсій, екологія, природа.

Анотация: В данной статье рассказывается о том, что такое экскурсия, Какие виды экскурсий существуют. Также представлена классификация по их направленности.

Ключевые слова: класификация экскурсий, экология, природа.

The tour is a focused, on intuitive process of knowing the environment. This process is based on pre-selected, under natural conditions, take place under the guidance of a qualified guide according to predetermined topics.

The word "tour" comes from the Latin "sightseeing" trip. In the XIX this word originally meant "to run out, a military incursion" and later "trip, trip". Over time there was a change of the word-type names with (excursion).

As the process of cognition of the surrounding world, its objects, properties and relations, the excursion is based on two forms of cognition: sensual, logical and thinking.

In the dictionary Article Dalia excursion is interpreted as "the penetration, walk, departure on a quest, to gather herbs, etc."

The tour is a focused on intuitive process of knowing the human world, a process built upon a pre-selected under natural conditions.

In almost pragmatic sense, the tour includes the visits and locations, familiarization with the help of a guide with an outstanding memory and phenomena in the development of a particular city or region.

Tours are classified into:

- content, composition and number of participants, the venue, means of transportation, duration, the form of holding;

-the content of the excursions which are divided into review (multiple) and thematic.

The composition and number of participants are divided into individual and group; for the local population and visiting tourists, adults and students, and the like. Features of perception tour material each of these groups require changes in the content of the tours, techniques and technology of their implementation, as well as their duration.

The place of the tour are: urban, suburban, industrial, museum and complex.

Over the walking tours various modes of transport are used.

The advantage of walking tours is in creating the required rate of movement, they provide favorable conditions for the show and the story.

Transport trips (the vast majority of buses are used) consist of analysis of excursion sites (for example, monuments of history and culture) of going sightseeing at bus stops and the story about them at the time of movement between objects.

Some tour companies use trolleybuses, trams, river and sea ships, helicopters (choppers) and others for excursions.

Usually excursions last one academic hour and more (45 min.).

In content, they are divided into review (multiple) and thematic.

Sightseeing tours, usually reveal several themes, so they are called multi-faceted. They are based on modern and historical material, on showing various objects (monuments of history and culture, buildings and constructions, natural features, places of famous events, industrial and agricultural enterprises). They provide an overview of the city, territory, region, state as a whole. The chronological framework of this tour – the existence of the town/tourist centre since the first mention of it to date and future prospects.

Sightseeing tours have their own characteristics. Unlike the theme, the wording of the themes in sightseeing tour associated with complexity. Regardless of the place where they are prepared and carried out, guided almost similar to each other primarily in their structure. Each of them covered several sub-themes (the history of the city, brief description of industry, science, culture, education and the like). At the same time in sightseeing tours have their own distinctive features, which are explained by certain features in the historical development that is specific to a particular city, region etc. For example, the military historical sub-theme is present in sightseeing tours of the cities and areas, on which there was a military battle. Literary subtopics include in sightseeing tours of the cities associated with the life and work of writers, poets, etc.

Multi-faceted tours are traditionally held in local historical or educational places, and museums, but during one of the visiting tourist is acquainted with all the expositions of different topics and content.

Thematic excursions are usually devoted to the revelation one theme. If this tour is historical, it is based on one or more events, united by one theme. If it is a tour of the architectural subject, it may become the most interesting action among old or modern architectural complexes. Thematic tours are divided into historical, industrial, artistic, literary, natural science (environmental), architecture and town planning.

Content historical tours are divided into the following subgroups:

- Local history, which is based on the knowledge of the history of their native region (for example, "History of the origin and development").

- Archaeological, based on the display of material of historical sources – monuments of the past, discovered in the excavations of ancient settlements, burial sites, hill forts, etc. for example, excursion round of the ancient city of Chersonesus or the old Russian town of Zvenigorod showing historical excavations;

- Ethnographic, describing the life and customs of different nations and nationalities (for example, museums of folk architecture and life in Pirogovo).

- Military history, which was held in places of fighting glory (for example, the battle of Yellow Waters, Dnepropetrovsk region) is focused on a visit to the fortifications of the ancient military engineering (fortress, castles, ramparts, bastions, bunkers, dugouts, etc.).

- Historical and biographical (in places of life and activity of prominent persons).

- Memorial and historical – combine the features of two sub-groups and are dedicated to exploring and honoring the memory of prominent persons or memorial events (visiting cemeteries of Austrian soldiers in Lviv region, who died during the First world war, memorials to the Ukrainian Sich Riflemen).

Natural history trips often have an environmental direction. They can be conducted in nature reserves and national parks, natural museums etc.

Classification of excursions. The forms of a tour are divided into the following types:

- Tour-crowd. The participants move along the route at the same time by 10-20 buses, each of which operates with a guide (for example, excursions of the caravan to the Egyptian resort of Hurghada to the Great pyramids or the temples of Luxor and Karnak). Such excursions may include massive theatrical shows, folklore festivals, etc.;

- Excursion combines elements of knowledge with elements of recreation. Is carried out in a forest, sea, river, etc .

- Excursion-lecture (a story prevails over the display).

- Tour-concert dedicated to the musical theme by listening to music after (as a special case – with listening to the works of the outstanding composer in the bus on the way to his memorial Museum-estate).

- Tour performance, is a form of literary and artistic excursions, prepared on the basis of specific works of fiction.

The excursion can be viewed as a form of academic work for different groups of tourists. It can be:

- Tour-consultation, which gives clear answers to questions of tourists. It is one kind of excellence.

- Excursion-demonstration is the most visible form of familiarizing the group with natural phenomena, manufacturing processes, etc.

- Excursion-lesson – one of the forms of communication of knowledge in accordance with the curriculum of that particular institution.

- Educational tour (for specific audiences) is a form of training and improvement of qualification of employees of tourist companies.

- Trial tour – this is the final stage of individual work on preparation and carrying out of excursions. The form of checking the knowledge of students or employees of tourist companies in preparing their new tour themes.

- A demonstration tour is a form of educational tours aimed to show a particular methodological reception on a specific object to disclose a certain topic, etc.

Fission excursions are clearly certain groups in practice is somewhat arbitrary, however, is very positive for the activities of tourist companies. Correct classification of trips provides the conditions for better communication of the guide with clients, facilitates specialization, and provides the basis for the activities of teaching sections.

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THE ROLE OF TREES IN OUR LIFE

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Summary: The article deals with the role of trees in human life and its impact on other living organisms. The study revealed many characteristics of trees and their invaluable contribution to the daily lives of mankind.

Key words: trees, health, resources, barriers, pollution, food, medicine, water, wood, carbon dioxide, value, environment.

Анотація: Стаття присвячена розгляду ролі дерев у житті людини та їх впливу на інші живі організми. В результаті дослідження було виявлено дуже багато властивостей дерев та їх безцінний вклад в повсякденне життя людства.

Ключові слова: дерева, здоров'я, ресурси, бар'єри, забруднення, їжа, ліки, вода, деревина, вуглекислий газ, цінність, навколишнє середовище.

Аннотация: Статья посвящена рассмотрению роли деревьев в жизни человека и их влияния на другие живые организмы. В результате исследования было выявлено очень много особенностей деревьев и их бесценный вклад в повседневную жизнь человечества.

Ключевые слова: деревья, здоровье, ресурсы, барьеры, загрязнение, пища, лекарства, вода, дерево, углекислый газ, ценность, окружающая среда.

Trees play a very important role in our surroundings. Trees provide us with fresh air to breathe, shade in summers, food, and other benefits without which we cannot even think of living. As pollution and cutting of trees increases day by day, the ecological balance should be maintained. Trees provide shelter and are home for many animals and birds. Trees give us timber which is used in making of houses, tools, compartments of the train, big boxes, etc.

Trees fulfil some of the important function. These include providing oxygen to every living creature, preventing soil erosion, producing vegetables, medicines and fruits. They also help in maintaining the fertility of the soil. Despite knowing the importance of trees, human beings are still cutting down the trees, and forests have started depleting from this beautiful earth[1].

Trees act as natural air conditioners and air filters. Trees take in carbon dioxide and release oxygen, which is very essential for all the living creatures on earth. They help in purifying the air by absorbing toxic gases, such as sulfur dioxide, nitrogen, carbon monoxide, etc. Trees collect all the energy coming from the sun and store most of it in themselves. Excess carbon dioxide (CO₂) caused by many factors is a building up in our atmosphere and contributing to climate change. Trees absorb CO₂, removing and storing the carbon while releasing the oxygen back into the air. In one year, an acre of mature trees absorbs the amount of CO₂ produced when you drive your car 26,000 miles.

One of the most important factors of the valuability of trees lies in their use in medicines. In the past people used different parts of the tree to cure themselves from many diseases. Most of cosmetic companies have now started using herbs and natural oils which are provided by plants and plant products. Studies have shown that patients with views of trees out of their windows heal faster and with no complications. Children with ADHD show fewer symptoms when they have access to nature. Exposure to trees and nature can aid concentration by reducing mental fatigue. Skin cancer is the most common form of cancer in the United States. Trees reduce UV-B exposure by about 50 percent, thus providing protection to children on school campuses and playgrounds, where children spend hours outdoors [2].

Trees also play a role of sound barriers. They protect us from the noise pollution emitted by the vehicles, industries, etc., which results in stress and tiredness.

One of the natural gifts provided by trees is wood. Wood is used in different ways. It is used as a fuel and for making wooden furniture, equipment for sports. It provides raw material for industries. It also provides hardboard, particle board etc., which are used for the interiors of our offices and homes. Wood pulp is used for producing paper, which is widely used in our lives. Cutting of trees can be avoided if we shift our focus from paper made from wood pulp to other materials. The use of paper should be limited by using technology for communication.

Trees are an important part of every community. Our streets, parks, playgrounds and backyards are lined with trees creating a peaceful and aesthetically pleasing environment. Trees increase our quality of life by bringing natural elements and wildlife habitats into urban settings. We gather under the cool shade they provide during outdoor activities with family and friends. Many neighborhoods are also the home of very old trees that serve as historic landmarks and a great source of town pride. Using trees in cities to deflect the sunlight reduces the heat island effect caused by pavement and commercial buildings.

Trees control climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer. Trees also preserve warmth by providing a screen from harsh wind. In addition to influencing wind speed and direction, they shield us from the downfall of rain, sleet and hail. Trees also lower the air temperature and reduce the heat intensity of the greenhouse effect by maintaining low levels of carbon dioxide. Trees reduce runoff by breaking rainfall, thus allowing the water to flow down the trunk and into the earth below the tree. This prevents stormwater from carrying pollutants to the ocean. When mulched, trees act like a sponge that filters this water naturally and uses it to recharge groundwater supplies [2].

The main reason we like trees is because they are both beautiful and majestic. No two trees are alike. Different species display a seemingly endless variety of shapes, forms, textures and vibrant colors. Even individual trees appearance varies with a seasons change. The strength, long lifespan and regal stature of trees give them a monument-like quality. Most of us react to the presence of trees with a pleasant, relaxed, comfortable feeling. In fact, many people plant trees as living memorials of life-changing events.

Trees help to record the history of your family as they grow and develop alongwith you and your kids. We often make an emotional connection with trees we plant or become personally attached to the ones that we see every day. These strong bonds are evidenced by hundreds of groups and organizations across the country that go to great lengths to protect and save particularly large or historic trees from the dangers of modern development. How many of your childhood memories include trees in your backyard or old neighborhood? A sentimental value of a special tree is simply immeasurable. Tree plantings provide an opportunity for

community involvement and empowerment, which improves the quality of life in our neighborhoods. All cultures, ages, and genders play an important role in tree planting or tree care event.

Trees have supported and sustained life throughout our existence. They have a wide variety of practical and commercial uses. Wood was the very first fuel, and is still used for cooking and heating by a about half of the world's population. Trees provide timber for building construction, furniture manufacture, tools, sporting equipment, and thousands of household items. Wood pulp is used to make paper.

We are all aware of apples, oranges and countless other fruits and nuts provided by trees, as well as the tasty syrup of North American sugar maples. But do you know that the bark of some trees can be made into cork and is a source of chemicals and medicines? Quinine and aspirin are both made from bark extracts. The inner bark of some trees contains latex, the main ingredient of rubber.

Shade from trees slows water evaporation from thirsty lawns. Most newly planted trees need only fifteen gallons of water a week. As trees transpire, they increase atmospheric moisture.

Individual trees and shrubs have value and contribute to savings, but it is the collective influence of a well-maintained landscape that makes a real economic impact and has the greatest effect on property value. Direct economic benefits come from a savings in energy costs. Cooling costs are reduced in a tree-shaded home, and heating costs are lowered when a tree serves as a windbreak. According to the USDA Forest Service, "Trees properly placed around buildings can reduce air conditioning needs by 30% and save 20-50 percent in energy used for heating."

Property values of homes with well-maintained landscapes are up to 20% higher than others. Here are some eye-opening facts and statistics regarding the effect of healthy trees and shrubs:

- Homes with "excellent" landscaping can expect a sale price 6-7% higher than equivalent houses with "good" landscaping. Improving "average" to "good" landscaping can result in a 4-5% increase. – Clemson University.

- Landscaping can bring a recovery value of 100-200% at selling time. (Kitchen remodeling brings 75-125%, bathroom remodeling 20-120%) – Money Magazine.

- A mature tree can have an appraised value between \$1000 and \$10,000. – Council of Tree and Landscape Appraisers.

- 99% of real estate appraisers have concurred that landscaping enhances the sales appeal of real estate. – Trendnomics, National Gardening Association.

- 98% of realtors believe that mature trees have a "strong or moderate impact" on the salability of homes listed for over \$250,000 (83% believe the same for homes listed under \$150,000). – American Forests, Arbor National Mortgage [1].

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УДК 524

THE CAT'S WHISKER

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Summary: In this article the mechanism of semiconductor diode such as nature of p-n junction is described. There was an attempt to recreate the ancient diode, disclose the importance of the invention and analyze the application of detector from its origin to this day. The principle of operation of the simplest radio is also presented there.

Key words: semiconductor diode (crystal detector), p-n junction, radio

Анотация: В этой статье рассмотрен принцип действия полупроводникового диода, а именно, что происходит на p-n переходе. Мы осуществили попытку воссоздать первый его вариант. Раскрыли важность открытия диода и проанализировали его использование от самых истоков до наших дней. Так же показан принцип работы элементарного радио и использованием диода.

Ключевые слова: полупроводниковый диод, p-n переход, радио

Анотація: У цій статті розглянуто принцип роботи напівпровідникового діода, а саме явище, виникаюче на з-п переході. Ми спробували відтворити перший його варіант. Розкрили важливість винаходу діоду та провели аналіз його використання від винаходження до сучасності. Також показано принцип роботи найпростішого радіо із використанням діоду.

Ключові слова: напівпровідниковий діод, p-n перехід, радіо

Radio, telephone, internet...How can we imagine our present life without this smart technologies? We won't experience it without finding the semiconductor diode. Invented at wartime it was developed not long after. Scientists improved the diode when they learned more about p-n junction. The aim of our article is to consider the mechanism of the first crystal detector.

To introduce the problem of crystal detector mechanism some words about its history should be said.

The "unilateral conduction" of crystals, as it was then called, was discovered by Ferdinand Braun, a German physicist, in 1874 at the University of Würzburg, before radio had been invented. Indian scientist Jagadish Chandra Bose was the first to use a crystal to detect radio waves, in his pioneering experiments with microwaves in 1894, applying for a patent on a galena detector in 1901.

Greenleaf Whittier Pickard was responsible for the development of the crystal detector, Cat's Whisker detector, a radio wave detector which was the central component in early radio receivers called crystal radios, which were the most widely used radio receivers until about 1920 and continued to be used until World War Two.

In August 30, 1906 he filed a patent for a silicon crystal detector, which was granted In November 20, 1906. Pickard's detector was revolutionary in that he found that a fine pointed wire known as a "Cat's Whisker," in delicate contact with a mineral produced the best semiconductor effect. Picard went on to study the field exhaustively, eventually testing over 30000 combinations of minerals and contacting wires, patenting many of these in the process. Picard was clearly a better scientist than a product marketer.

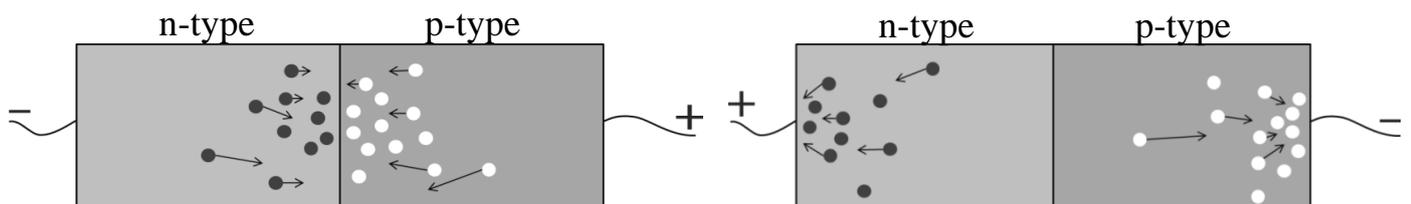
After 1920, receivers using crystal detectors were largely superseded by the first amplifying receivers, which used vacuum tubes.

Today crystal detectors are used to study the nature of p-n junction.

One of the crucial keys to solid state electronics is the nature of the P-N junction. When p-type and n-type materials are placed in contact with each other, the junction behaves very differently than either type of material alone. Specifically, current will flow readily in one direction (forward biased) but not in the other (reverse biased), creating the basic diode. This non-reversing behavior arises from the nature of the charge transport process in the two types of materials.

The white circles on the right side of the junction represent "holes" or deficiencies of electrons in the lattice which can act like positive charge carriers. The gray circles on the left of the junction represent the available electrons from the n-type dopant. Near the junction, electrons diffuse across to combine with holes, creating a "depletion region".

The forward current in a p-n junction when it is forward-biased (illustrated above at pic.1) involves electrons from the n-type material moving rightward across the junction and combining with holes in the p-type material. Electrons can then proceed further rightward by jumping from hole to hole, so the holes can be said to be moving to the left in this process.



Pic.1

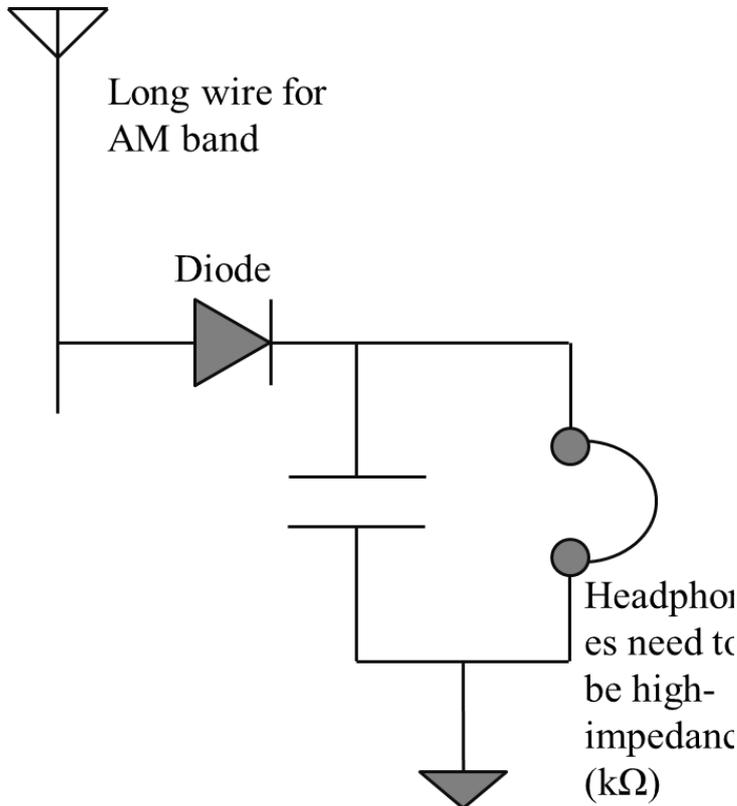
Pic.2

Forward biasing the p-n junction drives holes to the junction from the p-type material and electrons to the junction from the n-type material. At the junction the electrons and holes combine so that a continuous current can be maintained.

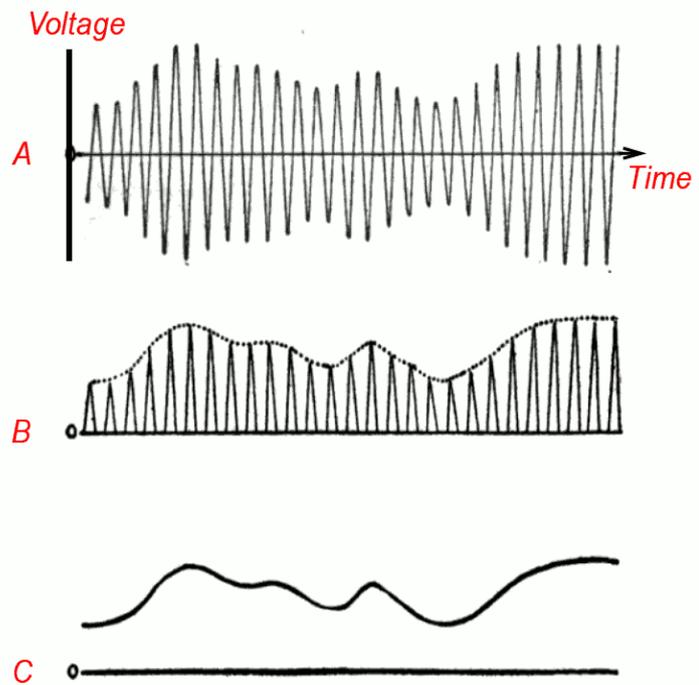
The application of a reverse voltage to the p-n junction (pic.2) will cause transient current to flow as both electrons and holes are pulled away from the junction. When the potential formed by the widened depletion layer equals the applied voltage, the current will cease except for the small thermal current.

Below the differences between resistances of forward and reverse bias are shown. Now let's look how a crystal detector works in a radio receiver. On the picture 3 we can see the simplest circuit of a radio. Near, on the pic. 4 (A) the AM (amplitude modulated) radio signal from the receiver's tuning section is introduced. The rapid oscillations are the radio frequency carrier wave. The audio signal (the sound) is contained in the slow variations (modulation) of the size of the waves. This signal cannot be converted to sound by the earphone, because the audio excursions are the same on both sides of the axis, averaging out to zero, resulting in no net motion of the earphone's diaphragm. Below on (B) there is the picture that remains after the signal passes the diode. The crystal conducts current in only one direction, stripping off the oscillations on one side of the signal, leaving a pulsing direct current whose amplitude does not average zero but varies with the audio signal. Finally, on the (C) a bypass capacitor across the earphone smooth the waveform, removing the radio frequency carrier pulses, leaving the audio signal.

The reason that no batteries are needed is that the human auditory system is truly amazing. The



Pic.3



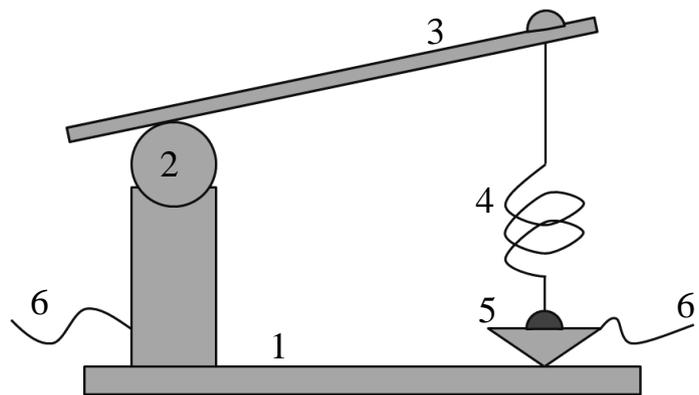
Pic.4

threshold of hearing at 1 kHz corresponds to an eardrum displacement on the order of the diameter of a hydrogen atom. So, the magic here isn't in the radio, it's in biology.

Of course, the absence of any electrical amplification means that crystal radios require rather good antennas and reasonable proximity to radio stations.

So now we know a lot of information to build our own Cat's Whisker diode. Let's see what do we need to make our device.

One of the most sensitive detectors, and one of the most popular with the radio amateur because of its extreme simplicity, is the Galena Detector. In this instrument a piece of Galena (5) is mounted in a brass cup. A light copper or bronze sharp wire called a Catwhisker (4) rests gently on the surface of the mineral. The operation of the radio required that the point of

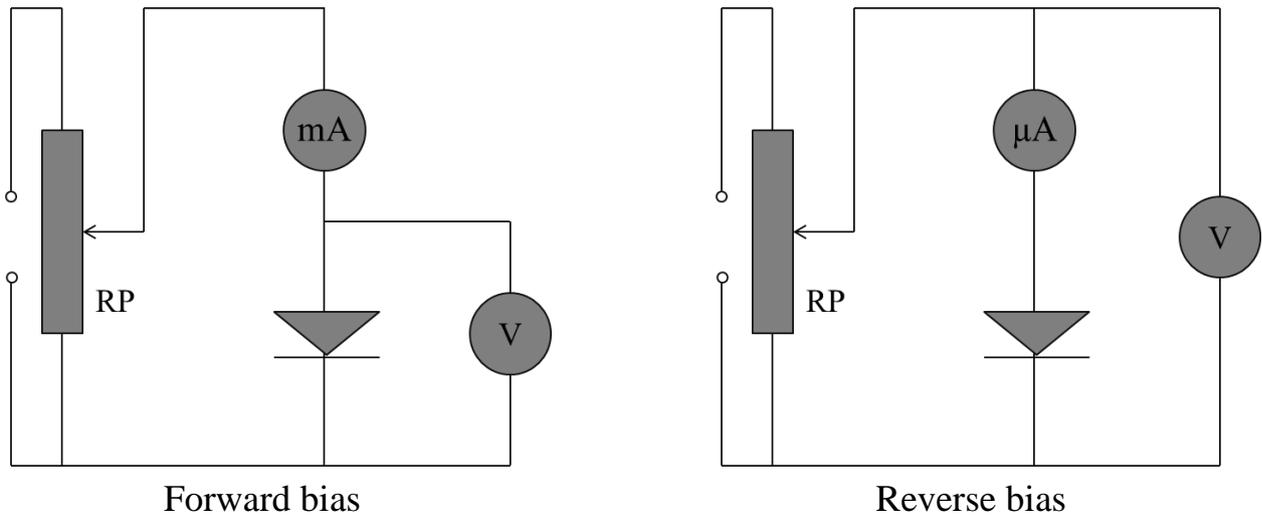


1 - foundation; 2 - post with a hinge; 3 - lever; 4 - contact wire; 5 - cup with a crystal; 6 - leads.

contact on the galena be shifted about to find a part of the crystal that acted as a rectifying diode. It is sometimes difficult to find sensitive specimens of Galena. For our detector we found little piece of galena and copper wire.

To determine and understand the basic parameters of a component or device are generally used voltampere characteristic (I-V curves). Here is the circuits of forward and reverse bias. We need to use the different circuits to calculate the current and the voltage because diode has a different resistance in the both cases.

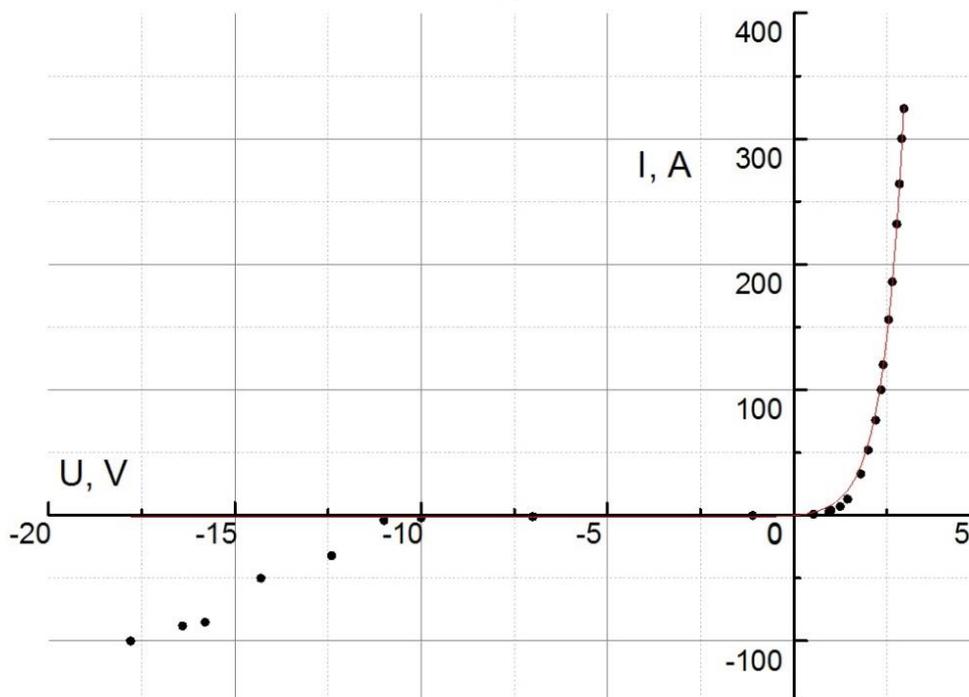
So we obtained such volt ampere characteristic, that submitted below. Here we can see that the



maximum reverse bias voltage that can be applied to a p-n diode is limited by breakdown. Breakdown is characterized by the rapid increase of the current under reverse bias. The corresponding applied voltage is referred to as the breakdown voltage.

In our model take into account only the material of the crystal and the wire.

$$R = \Delta U / \Delta I$$



$$\begin{aligned} & \frac{2,9 V}{300 \cdot 10^{-6} A} \approx \\ & \approx 9,7 \text{ k}\Omega \\ R_{\text{обп.}} &= \frac{2,9 V}{2 \cdot 10^{-6} A} \approx \\ R_{\text{обп.}} / R_{\text{np.}} &\approx 150 \end{aligned}$$

As we can see the resistance ratio of forward and reverse bias is 150, when the table value for standard diodes is near 1000. So here we have a mistake in one degree. That is a good result for home experiment.

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THE ARCHITECTURE AND PHYSIOLOGY OF SLEEP

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Summary: The article examines such important aspects of sleep research as the architecture of sleep, the variability of physiological processes at different stages of sleep, and also covers the issue of changes in architectural and physiological characteristics of sleep that are observed at different stages of human ontogenesis.

Keywords: sleep architecture, REM, NREM, suprachiasmatic nucleus, stages of sleep.

Анотація: У статті розглянуто такі важливі аспекти дослідження сну, як архітектура сну, мінливість фізіологічних процесів на різних етапах сну, а також висвітлює питання про зміни в архітектурних і фізіологічних характеристиках сну, які простежуються на різних етапах онтогенезу людини.

Ключові слова: архітектура сну, REM(NREM)-фаза, супрахіазматичне ядро, етапи сну.

Аннотация: В статье рассмотрены такие важные аспекты исследования сна, как архитектура сна, изменчивость физиологических процессов на разных этапах сна, а также освещает вопрос об изменениях в архитектурных и физиологических характеристиках сна, которые прослеживаются на разных этапах онтогенеза человека.

Ключевые слова: архитектура сна, REM(NREM)-фаза, супрахиазматическое ядро, этапы сна.

About one-third of their lives people spend in sleep. Sleep is a universal need of all higher life forms including humans, absence of which has serious physiological consequences. Sleep architecture describes the structure and pattern of sleep and encompasses several variables. Azerinsky K. showed that during sleep the brain is not dormant and demonstrates different types of activity that constitute the different stages of sleep. There are two types of sleep— non-rapid eye-movement (NREM) and rapid eye-movement (REM) sleep. Each has unique characteristics including variations in brain wave patterns, eye movements, and muscle tone. Over the course of a period of sleep, NREM and REM alternate cyclically. The function of alternations between these two types of sleep is not yet understood, but irregular cycling or absent sleep stages are associated with sleep disorders. For example, instead of entering sleep through NREM is typical for individuals with narcolepsy [1].

A sleep episode begins with a short period of NREM stage 1 progressing through stage 2, followed by stages 3 and 4 and finally to REM. NREM sleep constitutes about 75 to 80 percent of total time spent in sleep, and REM sleep constitutes the remaining 20 to 25 percent. The length of the first NREM-REM sleep cycle is 70 to 100 minutes. The second, and later, cycles are longer lasting—approximately 90 to 120 minutes [2].

Sleep architecture includes four stages of NREM sleep each associated with distinct brain activity and physiology. NREM stage 1 sleep serves a transitional role in sleep-stage cycling. Aside from newborns and people with narcolepsy and other specific neurological disorders, the individual's sleep episode begins in NREM stage 1. This stage usually lasts 1 to 7 minutes in the initial cycle, constituting 2 to 5 percent of total sleep, and is easily interrupted by a disruptive noise. Brain activity on the EEG in stage 1 transitions from wakefulness (rhythmic alpha waves) to low-voltage, mixed-frequency waves [2]. Stage 2 sleep lasts approximately 10 to 25 minutes in the initial cycle and lengthens with each successive cycle, eventually constituting between 45 to 55 percent of the total sleep. An individual in stage 2 sleep requires more intense stimuli than in stage 1 to awaken. Brain activity on an EEG shows relatively low-voltage, mixed-frequency [3]. Sleep stages 3 and 4 are collectively referred to as slow-wave sleep (SWS). Stage 3 lasts only a few minutes and constitutes about 3 to 8 percent of sleep. The EEG shows increased high-voltage, slow-wave activity. The stage 4 lasts approximately 20 to 40 minutes in the first cycle. This stage is characterized by increased amounts of high-voltage, slow-wave activity on the EEG [2].

Talking about REM sleep it should be noted that REM sleep is defined by the presence of desynchronized brain wave activity, muscle atonia, and bursts of rapid eye movements [2]. "Sawtooth" wave forms, theta activity (3 to 7 counts per second), and slow alpha activity also characterize REM sleep. During the initial cycle,

the REM period may last only 1 to 5 minutes; however, it progressively prolonged. REM sleep may also be important for memory consolidation.

Dreaming is most often associated with REM sleep. Loss of muscle tone and reflexes likely serves an important function because it prevents an individual from “acting out” their dreams or nightmares while sleeping [4].

There are body system changes that occur during sleep. Generally, these changes are well tolerated in healthy individuals, but they may compromise the sometimes fragile balance of individuals with vulnerable systems, such as those with cardiovascular diseases. Physiological changes are observed in the work of cardiovascular system – blood pressure and heart rate are primarily determined by autonomic nervous system activity. There is an increased risk of myocardial infarction in the morning due to the sharp increases in heart rate and blood pressure that accompany awakening. Sympathetic-nerve activity decreases.

Some changes are observed in the respiratory system – ventilation and respiratory flow change during sleep and become increasingly faster and more erratic, during REM sleep [5]. Hypoventilation (deficient ventilation of the lungs that results in reduction in the oxygen content or increase in the carbon dioxide content of the blood or both) occurs in a similar way as during NREM sleep.

NREM sleep is associated with significant reductions in blood flow and metabolism, while total blood flow and metabolism in REM sleep is comparable to wakefulness.

The renal system decreases excretion of sodium, potassium, chloride, and calcium during sleep that allows more concentrated and reduced urine flow. The changes that occur during sleep in renal function are complex and include changes in renal blood flow, glomerular filtration, hormone secretion, and sympathetic neural stimulation.

Endocrine functions such as growth hormone, thyroid hormone, and melatonin secretion are influenced by sleep. Growth hormone secretion occurs during SWS, while thyroid hormone secretion takes place in the late evening. Melatonin, which induces sleepiness, is influenced by the light-dark cycle and is suppressed by light.

A system of sleep-wake regulation is also very important for sleep regulation. The sleep-wake system is thought to be regulated by the interplay of two major processes, one that promotes sleep (process S) and the other that maintains wakefulness (process C). The need for sleep (process S) accumulates across the day, peaks just before bedtime at night and dissipates throughout the night. Process C is regulated by the circadian system. Process C serving to counteract process S and promote wakefulness and alertness. Process C also works to consolidate sleep and wake into fairly distinct episodes.

The suprachiasmatic nucleus (SCN) is also responsible for regulation of sleep. The suprachiasmatic nucleus (SCN) is a tiny region of the brain in the hypothalamus, situated directly above the optic chiasm. It receives direct inputs from a class of nerve cells in the retina that act as brightness detectors. The SCN then transmits to the rest of the brain signals that bring all of the daily cycles in synchrony with the day-night cycle. Another major output of the SCN is to a pathway that controls the secretion of melatonin, a hormone produced by the pineal gland. Melatonin is mainly secreted at night and has limited effects directly on sleep. The SCN also coordinates cycles of feeding, locomotor activity, and hormones, such as corticosteroids.

Sleep architecture changes continuously with age. From infancy to adulthood, there are marked changes in how sleep is initiated and maintained, the percentage of time spent in each stage of sleep, and overall sleep efficiency. A general trend is that sleep efficiency declines with age. Although the consequences of decreased sleep efficiency are relatively well documented, the reasons are complex and poorly understood.

At birth, sleep timing is distributed evenly across day and night for the first few weeks. Newborns sleep about 16 to 18 hours per day. Newborns have three types of sleep: quiet sleep (similar to NREM), active sleep (analogous to REM), and indeterminate sleep (Davis et al., 2004). Sleep onset occurs through REM, not NREM, and each sleep episode consists of only one or two cycles [2]. This distinctive sleep architecture occurs mostly because circadian rhythms have not yet been fully entrained. By 3 months of age, sleep cycles become more regular: sleep begins with NREM, the total NREM and REM sleep is typically 50 minutes. By 12 months old, the infant typically sleeps 14 to 15 hours per day.

The total sleep time of young children decreases by 2 hours from age 2 to age 5 (13 hours to 11). In addition, older children are more likely to have nightmares, which usually disrupt sleep, making it discontinuous.

As to the adolescents, it should be noted that a complex and bidirectional relationship exists between pubertal development and sleep. It has been determined that adolescents require 9 to 10 hours of sleep each night [1]. Over a quarter of high school and college students were found to be sleep deprived. SWS and sleep latency time progressively declines with advancing pubertal development [2]. These changes are likely in part due to pubertal and hormonal changes. Afternoon sleepiness is greater than that in late afternoon and evening in more mature adolescents than in younger subjects.

Sleep architecture continues to change with age. Adults also have some changes in the sleep architecture. Two major attributes of age-related sleep changes are earlier wake time and reduced sleep consolidation. Older adults (approximately ages 65 to 75) typically awaken 1.33 hours earlier, and go to bed 1.07 hours earlier, than younger adults (approximately ages 20 to 30) [5]. Younger adults may experience brief awakenings, but they are usually minor and occur close to an REM sleep transition.

To summarize, compliance with the correct sequence of stages that constitute the architecture of sleep is essential. Any violation related to changes in the primordial structure of sleep can result in a number of problems with health. Sleep disorders can cause mental diseases, such as depression: somatized (latent) depression, cyclothymia (chronic instability of mood with episodes of mild depression and mild elation), and obsessions (continuous repetitive thoughts and motives which a person would like to get rid of but cannot). Violation of time, quantity and quality of sleep can result in dyssomnia which, in its turn, can lead to insomnia (difficulty in falling asleep) or hypersomnia (high or inadequate daytime sleepiness). Sleep deprivation and excessive tiredness can also cause sleepwalking to occur. It is observed in the third and fourth phases of deep sleep and has a neurotic character as well as speaking in sleep, a behavioral disorder that usually occurs during REM-sleep stage.

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IMPORTANCE OF SLEEP

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Summary: The article focuses on the issue of sleep, mechanisms of its influence on the organism and negative impact exerted due to sleep deprivation. The article also reveals the sleep duration required to different age groups as well as presents recommendations for following a healthy sleep and wake schedule for the most efficient functioning of a human organism.

Key-words: mental activity, restoration of organs and systems, sleep deprivation, sleep and wake schedule, sleep stage.

Анотація: Стаття посвящена проблемам сна, механізмам його впливу на організм та негативному впливу, яке здійснюється в результаті його нехватки. В статті розкрито тривалість сну, необхідна різним віковим категоріям, а також представлені рекомендації по дотриманню здорового режиму сну та бодрствования для найбільш ефективного функціонування організму людини.

Ключевые слова: восстановление органов и систем, нехватка сна, режим сна и бодрствования, фаза сна, умственная активность.

Анотація: Статтю присвячено проблемам сну, механізмам його дію на організм та негативному впливу, що здійснюється в результаті його браку. У статті розкрито тривалість сну, що необхідна різним віковим категоріям, а також представлено рекомендації із дотримання здорового режиму сну та бодрості для найбільш ефективного функціонування організму людини.

Ключові слова: відновлення органів та систем, недостатній сон, режим сну та бодрості, розумова активність, фаза сну.

Getting enough sleep is the shortest way to health and beauty, but with a modern rhythm of life we neglect this essential life process exposing our organism to risks. Do we really understand the importance of sleep?

To learn how to achieve maximum benefit from the hours of sleep for human health, one should know the main phases within which organs and systems of a person go through an entire cycle of restoration [8].

- The first stage takes a few minutes when a person is in a state between sleep and wakefulness (stage of dormancy) characterized by fragmentary visual images, spontaneous muscle contractions and a sense of falling.

- The second stage represents a phase of slow wave sleep, which basically lasts 20 minutes. At this time the body temperature drops, breathing becomes leveled and visual images disappear, at the same time the subconscious mind is “awake” to experience different emotions in people with the nervous system marked by anxiety. Also, the connections between the cortex and other parts of the brain are gradually weakening.

- The third and fourth stages are those of profound sleep (stage of recovery). The body relaxes and the person is so deeply asleep that makes it difficult to wake up during these stages. After, a rapid eye movement is observed as we have the most emotional and spectacular dreams. All phases of sleep tend to repeat about 5 times a night.

Sleep is a unique tool for the recovery of physical and mental forces of the body. So, what does really happen when we sleep?

At night, the body synthesizes hormones, storing them for the beginning of the day [1]. Adrenaline, the stress hormone, synthesized by the adrenal cortex, is vital during our daily activities. The adrenal cortex also synthesizes cortisol, which regulates the metabolic processes and produces anti-inflammatory effect. Restoration of bone tissue is promoted due to growth hormone that influences the metabolic rate. Thyroid hormone is required to normalize metabolism and regulates the thyroid gland. Most of these hormones are controlled by the pituitary gland, which works more actively at night. Its activation occurs within an hour after falling asleep, at 3-4 a.m. the body is completely ready for a new day. The melatonin hormone, generated by the pineal gland, regulates the daily rhythm and allows a person to adapt to adverse environmental conditions. The maximum concentration of melatonin in blood is between midnight and 4 a.m. At night, the pancreas secretes more insulin. It makes stocks of sugar to get energy quickly and efficiently next morning. Skin produces collagen and elastin, compensates for the effect of free radicals and restores itself. Epidermal cells begin to divide extensively, recovering the horny layer of the skin - the peak of regeneration falls at a time between one and three o'clock in the morning.

Inadequate sleeping hours can cause serious health problems. Despite the fact that everyone understands the importance of sleep, many people in modern life have fallen victims of sleep deficit, the reasons for which can be divided into two types [5]:

- intentional (a person consciously opts for an increase in hours of wakefulness or night work);
- unintentional (insomnia as a result of stress, medications, disease, or becoming mother for the first time).

Scientists of the University of Chicago carried out a new study that shows that the impact of chronic sleep deprivation on human health may be much more serious than an insignificant lack of attention, temporary weakening of ability to process information efficiently, irritability or drowsiness [3]. Within the research, Dr. Catherine Spiegel, Dr. Eve Van Coter and Rachel Leprul found that the lack of sleep, when person sleeps for three or four hours a night for one week produces a substantially negative impact even on healthy young people. The human body exposed to such rhythm is unable to cope with the digestion and absorption of vital substances properly and becomes less resistant to stressful conditions. The organism experiences deviations from the normal hormonal balance while the immune system is being weakened.

To identify the changes associated with sleep deprivation a group of volunteers participating in the study were forced to stay awake for 24-48 hours, and then the scientists investigated the influence exerted by such an experiment. As the results showed, lack of sleep does reduce the speed of reaction and does alter the mood. Such negative effect was comparable to smoking. The addicts can perform regular physical exercise, follow an appropriate diet and take the necessary vitamins, but it all goes down the drain if they sleep only 5 hours a day. The systematic lack of sleep causes drastic changes in the metabolism and endocrine function, similar to the effects of aging.

Blood and saliva also revealed hormonal changes in metabolic functions resulting from sleep deprivation. The organism of the study participants could not manage the glucose absorption in a regular manner, consequently, its concentration in blood began to rise, which caused the body to secrete more insulin, and that eventually can lead to increased insulin resistance, a typical sign of the so-called adult-onset diabetes. Excessive insulin presence promotes fat accumulation, increasing the risk of obesity and high blood pressure. Further, researchers have found that the concentration of cortisol in blood increased as well. Such a rise in cortisol levels is typical of human aging and associated with an increase in insulin resistance and memory impairment. Lack of sleep also changes the level of thyroid hormone. The weakening of the immune system was manifested in the compromised reactions of tested influenza vaccine.

Researches from the University of Pennsylvania in Philadelphia have shown that after two weeks of chronic sleep deprivation, many people are starting to say that they have adapted to the new regime, and that now they sleep less without feeling any drowsiness. However, in fact the body is subject to a decrease in mental capacity. Psychologists warn that the brain function is inhibited which sometimes even leads to hallucinations.

Scientists of the University of Chicago, in their turn, carried out research, the results of which revealed that the reduction of sleep by 1 hour over 5 years increases the incidence of hypertension by 37%. Thus the study proves that hypertension is another possible result of sleep deprivation.

Additionally a group of neuroscientists from New Zealand discovered an interesting fact. Lack of sleep exerts quite a specific effect on the human brain, namely researchers concluded that poor sleep is just as dangerous for the body as alcohol abuse [6]. To draw a parallel, the scientists compared the period of sleep deprivation with the amount of consumed beer. The first hour without sleep causes in the brain the same changes as 0.04 liters of beer. If a man does not sleep for 20 hours, the effect on the body will be equivalent to that of almost 2 liters of beer.

The longer a person is awake, the greater the risk to health is, experts insist. During the day, when a person is up, functions of the systems, responsible for metabolism, are deteriorating by 10-15%, the protective potential of the immune system is reduced by 7-9%, at the same time the intensity of cortisol providing for the function of the nervous system is increasing. The accumulation of this hormone is detrimental to the emotional state of the person who begins to feel constant dissatisfaction, excessive irritability.

Doctors from the UK, engaged in research on the influence of sleep on the health of their patients found that chronic sleep deprivation leads to reduced activity of more than 700 genes in the human body, which distorts the chemical processes in the human body [4]. During the research it was also revealed that a sleep disorder not only affected the internal rhythms of patients, but, also had a negative impact on the body immune system and cell metabolism. Thus these studies have proved that the body was unable to grow new cells in a timely manner, which in future gave rise to degenerative diseases. Currently, scientists have not yet managed to establish exactly which changes the sleep deprivation entails in the human body in order to override the negative impact of lack of sleep on the human body in the future.

We ignore the relevance of sleep, and still wonder about the diseases of our internal organs, which are the first to suffer first from temporary effects, and then gradually undergo irreversible destruction [7]. Considering the influence of sleep deprivation we should focus on such human organs and systems:

Heart

Permanent lack of sleep is perceived by the body as a consequence of terrible disasters in the outside world: the body begins active spending of internal reserves, turning food into energy stocks. The main burden falls on the heart and blood vessels, which are rapidly ageing. In 2007, British scientists have shown that the duration of sleep of less than 7 hours a day increases the risk of death caused by various factors twice. In particular, the lack of sleep doubles the mortality risk from cardiovascular diseases. Chronic sleep deprivation is also expressed in the risk of:

- Myocardial infarction
- Heart failure
- Heart rhythm disturbances
- Hypertension
- Stroke

Blood

Under the conditions of insufficient sleep blood cells in the human body find challenging even the simplest tasks such as breaking down sugar, as if you were diabetic. We are used to invigorate our body by filling it with liters of coffee. These measures are effective only if the person does not get enough sleep occasionally. Constant consumption of caffeine leads to aging of the skin and blood vessels.

Eyes

Lack of sleep dries up tissues, therefore, eventually blood vessels become more transparent leading to the effect of "bloodshot eyes". The same lack of moisture makes eyes hurt and itch. In addition to using the eye drops do not forget to make a compress of tea leaves if you experience any of these symptoms.

Brain

Normal sleep is a necessary condition for the regeneration of neurons in the gray matter. Lack of sleep is fraught with problems with foreign languages, associative thinking and any creative work. Normal thinking and learning is not possible without adequate sleep. When asleep we process information received during the day, and if the period allocated for sleep is insufficient some of the information is simply lost. In 2009, the American and French scientists have found that the processing of information received during the day takes place at the stages of profound sleep only. It is at this time that the transfer of information from the hippocampus to the neocortex responsible for long-term memory is performed. The person who ignores sleep cannot make rational decisions. The majority of drivers who get into road accidents because of lack of sleep are under 25. It is interesting to mention that the most common hallucination is a vision of a so-called "black dog", a spot seen by a sleepy man. In this case, the driver must immediately stop the car. In addition, sleep deprivation

and poor quality sleep leads to accidents in the workplace. According to studies, people who sleep little, suffer more injuries at work. Sooner or later chronic lack of sleep provokes depression. According to the data of the US scientists, depression and anxiety are more common in people who sleep less than 5 hours a night. It should be noted that insufficient sleep increases the risk of developing insomnia or depression 5 times. Lack of sleep exacerbates depression and depression disrupts sleep, in this manner, we find ourselves in a vicious circle requiring medical treatment.

Stomach

Sleep deprivation inevitably leads to an increased appetite (by raising the amount of ghrelin) and, accordingly, to an increased weight. According to a study carried out in 2004, if the sleep duration is less than 6 hours per day, the risk of obesity increases by 30%.

Reproductive system

Lack of sleep results in energy deficit and overexertion leading to a decrease in libido. In 2002, researchers confirmed that due to the lack of sleep testosterone levels in men drop significantly. The level of sex hormones is reduced by 15%.

Skin

In a person having no normal sleep for a few days the complexion is deteriorating, in particular, baggy skin under the eyes appears. Chronic lack of sleep leads to wrinkles and dark circles under the eyes. Skin quickly loses its smoothness and elasticity. Capillaries, age spots and acne are becoming visible.

Striving to be on time with everything, we are willing to sacrifice our sleep. But living on the basis of this principle, we are approaching a fatal outcome. According to doctors, the maximum period without sleep, which was experimentally recorded by instruments, lasted 120 hours, that is, five or six days.

To ensure a normal sleep and prevent various diseases the following rules should be obeyed [5].

- First and foremost, you need to create your own rituals before bedtime (to provide a repeating series of actions before bedtime, establish a permanent sleep-wake schedule).

- Also, you should perform at least a minimum set of exercises during the day. In this way a week later exercising will become your habit, the muscles will grow more active and the body will be more agile due to the ligaments mobility.

- You have to stop drinking caffeinated beverages 4-6 hours before bedtime.

- It is necessary to try and reduce the intensity of activities before going to bed.

- In order not to overload the digestive system, you should have dinner at least 3-4 hours before bedtime. The same rule applies to alcoholic beverages. In the evening, you must abstain from alcohol intake completely.

- If it is difficult to fall asleep at night, you need to force yourself not to take a nap during the day.

- It is important to create favorable conditions for sleep - air the room, dim the lights and other appliances for illumination, use special aromas.

- Try never fall asleep later than 0.00, it is advised to go to bed no later than 22.00-23.00.

- Develop a habit of going to bed at one and the same time, even on weekends. The body quickly become accustomed to the offered schedule and will be ready to sleep in the allotted time.

- Avoid stress. Try not to argue and not to take everything close to heart, if it is possible.

- Work only at work. Home is a place for rest and relaxation. Do not take business calls in the evening, leave business correspondence for tomorrow. Almost everything can wait till morning.

- Relax in the evenings. Take a warm bath, read a good book (preferably a paper one, without a luminous screen).

Life of each of us is very personalized, so the amount of hours required for sleep varies depending on the age of a person. To avoid health problems it is important to take into consideration the following scheme: [2]

- Elderly people 65+ years need 7-8 hours of sleep.
- Adults 24-64 years - 7-9 hours.
- Young people 18-25 years - 7-9 hours.
- Teens 18-25 years - 8-10 hours.
- Students 6-13 years - 9-11 hours.
- Children 3-5 years - 10-13 hours.
- Toddlers 1-2 years - 11-14 hours.
- Babies 4-11 months - 12-15 hours.
- Newborns 0-3 months - 14-17 hours.

The older the person is, the less sleep is required to regain his or her capacities fully. Psychologists say that this fact is justified by changes in the brain tissue, as well as a decrease in emotional contact claiming further psychological recovery.

Chronic lack of sleep is an enemy undermining human health, mental efficiency, the pungency of wit. That is why, switching to a healthy lifestyle and good-quality sleep, among other things, will allow a person to prevent severe health disorders, increase performance in all spheres of activities and simply feel better.

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VEGETATION

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Summary: This article deals with creation and usage of new geographical methods of visualization and analysis used in the cadastral spheres and mapping which serve as geographical informational systems. Trying to improve these systems, geographers have created an absolutely new product AGROGIS, which is aimed at agricultural activities and preserves the best of the traditional GIS.

Key words: vegetation period, agroanalysis, cadastral question, AGROGIS

Анотация: У цій статті йдеться про створення та вживання географічних методів візуалізації та аналізу, що застосовуються в кадастрі та при створенні карт, які є географічними інформаційними системами. У спробах покращення системи географі створили принципово новий продукт – АГРОГІС, що є направленим на сільськогосподарську діяльність та зберігає у собі кращі сторони традиційних ГІС.

Ключові слова: вегетаційний період, агроаналіз, кадастрове питання, АГРОГІС

Аннотация: В этой статье идёт речь о создании и использовании географических методов визуализации и анализа, которые применяются в кадастре и при создании карт, и которые являются географическими информационными системами. При попытках улучшить систему, географы создали принципиально новый продукт – АГРОГИС, который направлен на сельскохозяйственную деятельность и сохраняет в себе лучшие стороны традиционных ГИС.

Ключевые слова: вегетационный период, агроанализ, кадастровый вопрос, АГРОГИС.

Since ancient time people have been trying to use soil as better as possible to get a bigger yield. However, it has always been difficult to create appropriate conditions for plants like soil humidity, soil salinity, temperature, disease protection, quantity of solar radiation etc. In addition, different plants require different conditions. For example, maize grows better with chernozem soil (black earth), potato needs potassium salt for its better yield. All these difficulties, which people face on a way of improving agricultural sphere, lead them to one conclusion agroanalysis. Agroanalysis always starts from getting information from the field: soil, humidity, salt conditions, vegetation period of plants and so on. Agronomists should take into account latitude and ecological situation. It takes a lot of time and resources to do this like specialists, instruments and so on. However, having information about field condition does not mean that agroanalysis has been done, which is only the beginning [3, p.71].

Using relevant information and taking some historical measuring, the agronomist creates an agromap or a collection of different maps about one territory. That is a map which has all the needed information.

Agronomists need this map because that is one of the requirements of agroanalysis; it is reviewing of information in geographical spectrum. Having a map agronomist can compare all the information, differentiate important thing from unimportant, see a tendency and try to make a forecast. One of the most difficult aspects in forecasting is impossibility to take into account all the factors, which could change the main process. For example when agronomist forecast a yield he makes calculates using statistical meteorological information about precipitations, medium temperature and so on. However, there is no guarantee about the weather changings such as drought, cold temperature that could destroy seeds and so on. When the factors scientist using in a forecasting, change in any way, forecast will not be accurate.

In 1960s with computer technologies development, the USA government decided to create a program which could register all the land properties and make a governmental archive – “cadastral question”. Thus, Geographical Informational Systems were created in the 1960s. GIS development depended on the computer development, so geographers made the better maps, created new programs and spread these technologies, keeping line with computers. Firstly GIS were used by programmers, but soon it became obvious that a user without geographic education couldn’t use all the possibilities properly. There are some positive features of using GIS instead of traditional mapping: 1) Data operating. User can change Data within the process of the mapcreation. 2) Time. GIS require less time and resources to create a map with the same quantity of information [2, p. 93]

With all good features we can name using GIS one “difficultness” should be revealed – it requires computer knowledge. It is impossible to create a map without that. After a visualization possibilities programmers decided to add analysis. There are some modules that are usually used in GIS: ArcGIS Geostatistical Analyst, ArcGIS Spatial Analyst.

One of the most useful modules is ArcGIS 3D Analyst, which consists of visualization and analysis of three-dimensional data including ArcGlobe and ArcScene giving the opportunity to work with the data on the earth's surface and geoprocessing tools. The ArcGIS 3D Analyst extends ArcGIS to be a fully three-dimensional GIS system. It allows viewing, organizing, analyzing, and sharing three-dimensional GIS data. GIS data views of large amounts of 3D in a global scale using ArcGlobe or individual sites in the local coordinate system using ArcScene. GIS data manages 3D by editing features directly in ArcGlobe or ArcScene, and adds 3D components to 2D data through geoprocessing tools. GIS data analyzes in three dimensions using geoprocessing tools, and uses interactive tools in a 3D view. In addition, it allows sharing 3D views of GIS data by publishing globe services and shares 3D analytical tools through geoprocessing services [5, p. 171].

It becomes clear that GIS Platform is a modern developing program that might be used in a lot of territorial analyses [4, p. 100]. It became obvious that agrospherical forecasting and GIS should be synthesized in one commercial product with technologies development, which is called in general Agrogis. Geographers and agronomists propose a totally new way of forecasting using new geospatial analysis and possibilities of modeling.

Nowadays there are two famous products proposing this idea: AgroLife and Agrogis. AgroLIFE is a software application specially developed for automated agriculture production processes management. Agronomists and owners of agriculture households are enabled to plan, organize and manage agriculture production processes at the same time increasing yields, total revenues and decreasing operating expenses. Whether it is homogenous plot or location-distributed land, the software generates data on total area of land disposed by the company, as well as on plants, seeding plans, harvest, necessary expenses for fuels and seeds [3, p. 81].

Features of AgroLIFE are the following:

- Tracking the agriculture processes
- Maintaining standards for each operation / process
- Planning the agriculture production processes
- Alarm system warning to any deviation or irregularities compared to planned processes
- Tracking the employees’ working hours and productivity
- Tracking the agriculture machinery
- Monitoring vehicles and implements via advance GPS tracking system
- Managing costs and overall resources

AgroGIS is a software application specially designed for managing all types of land owned by the Government and Public Enterprises. It is implemented in order to manage automated geo-referenced data in contemporary and efficient manner. AgroGIS is a globally recognizable solution which will enable public institutions, on the one hand, to manage information on the type and total size of the land within the country easily and efficiently as well as plans for further development, plants, sales, renting, and, on the other hand, to

provide individual agriculture manufacturers with automated overviews, analyses, plans and overall land management [1, p. 71].

Features of AgroGIS are the following:

- Cadastral records of plots for agriculture processing owned by the governmental or privately-owned enterprises

- Recording soil quality
- Tracking and monitoring the development of agriculture crops
- Tracking weather reports
- Creating 3D waterways
- Floods forecasting
- Tracking and controlling insects

Trying to improve GIS sphere, specialists decided to band GIS with remote censoring. It became obvious that satellites could bring the needed information better and faster than searching by land. The normalized difference vegetation index (NDVI) is a simple graphical indicator that can be used to analyze [remote sensing](#) measurements, typically but not necessarily from a [space platform](#), and assess whether the target being observed contains live green vegetation or not. Live green plants absorb solar radiation in the [photosynthetically active radiation](#) (PAR) spectral region that they use as a source of energy in the process of [photosynthesis](#). Leaf cells also evolve to scatter solar radiation in the near-infrared spectral region. [3, p.93]. That is why the energy level per photon in that domain is not sufficient to be useful to synthesize organic molecules by contrast, clouds and snow. They tend to be rather bright in the red (as well as other visible wavelengths) and quite dark in the near-infrared. The pigment in plant leaves, chlorophyll strongly absorbs visible light (from 0.4 to 0.7 μm) for use in photosynthesis. The cell structure of the leaves, on the other hand, strongly reflects near-infrared light (from 0.7 to 1.1 μm). The more leaves a plant has, the more these wavelengths of light are affected.

To sum up all the above information about GIS, we can say that the creation of GIS in the 1960s was a necessity because of huge territories and a great need of its management. GIS became a part of IT sphere, but soon it became clear, that a person without geographical education could not create a right, well-qualified map. In such a way a new profession as a GIS-specialist appeared. With computer development, GIS tried to stand up to time and offered more and more functions in cartography, management and analysis. Faster map creation gave people a chance to make better ones, leaving more time for description and map information. GIS used to be a necessary part of each geographical research, because it offered a lot of analysis modules such as “Spatial analysis module”, which could give new information so fast, as a geographer by himself would never get. It is obvious that progress never stops. GIS become a product of mass and everyone can create its own map. However, to tell the truth, quality of those maps are getting worse because of lack of educations and experience. It is a problem of nowadays` geographers. Making GIS is simpler than leave it in a sphere of Geography.

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SPLIT-THICKNESS SKIN GRAFTING IN DIABETIC WOUNDS

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Summary: The article is devoted to an alternative method of treatment of diabetic foot – the use of skin graft. It covers necessary conditions for successful implementation of the manipulation and identifies possible complications of this procedure. It also describes methods of dealing with adverse effects in the postoperative period.

Key words: diabetic foot, split-thickness skin grafting.

Анотація: Стаття присвячена альтернативним методам лікування діабетичної стопи – використання шкірного трансплантата. Висвітлено необхідні умови для успішного виконання

маніпуляції та виявлено можливі ускладнення цієї процедури. Також описані методи боротьби з негативними наслідками у післяопераційній період.

Ключові слова: діабетична стопа, шкірний трансплантат.

Анотація: Стаття посвячена альтернативному методу лічення діабетической стопи – використанню кожного трансплантата. Описані необхідні умови для успішного виконання маніпуляції і виявлені можливі ускладнення даної процедури. Також описані методи боротьби з негативними наслідками в післяопераційному періоді.

Ключевые слова: диабетическая стопа, кожный трансплантат.

Diabetic foot ulcerations are difficult to treat despite advanced therapeutic modalities. There are numerous modalities described in the literature ranging from non-invasive topical wound care to more invasive surgical procedures such as primary closure, skin flaps, and skin grafting. While skin grafting provides faster time to closure with a single treatment compared to traditional topical wound treatments, the potential risks of donor site morbidity and poor wound healing unique to the diabetic state have been cited as a contraindication to its widespread use.

There are many means of treating diabetic ulcerations. A conservative approach may entail regular debridement and dressing changes. Topical solutions such as saline, iodine, antimicrobial absorbent fiber sheets, and collagenase ointments may be included. Some institutions employ the use of negative pressure wound therapy (NPWT) to stimulate granulation tissue and help remove fibrotic tissue formation [2]. Also, NPWT is good for draining wounds, along with calcium alginates which support absorption. Collagenases can be used to chemically debride wounds, and sharp debridement is a time tested method to remove non-viable tissue. Sometimes chronic wounds remain or the wound is deep with an irregular contour, and plastic surgery techniques must be employed such as skin grafts and flaps. More advanced flaps are ideal for plantar or weight-bearing wounds because they have more substance and contain their own blood or nerve supply which increases the graft take. These are also detected in wounds with avascular bases such as directly over tendons, or bone without periosteum. Advanced techniques are challenging at times and create a new wound or leave a large donor site deficit. They are not ideal in a diabetic patient with diminished healing properties and increased susceptibility to infection. Thus, if a flap is not possible, split-thickness skin grafts may be a better treatment option to close challenging wounds once a granular base is achieved.

Split-thickness skin grafting (STSG) is a plastic surgery technique with documented use dating back to 3000 B.C. in India for traumatic facial wounds. Ollier began experimenting with skin grafting methods in 1872. An electrodermatome was used to harvest STSG by Pagett & Hood in 1939. Modern techniques involving the use of meshed STSG were first described in 1964 by Tanner et al. Despite the original use for facial reconstruction, STSG is now commonly employed on burn wounds, when skin coverage is required, as well as to close chronic ulcerations, frequently seen in the diabetic population [2].

A flap is defined as a mass or tongue of tissue for transplantation being vascularized by a pedicle or stem. Local flaps include the epidermis, dermis, and subcutaneous tissue. The local flap may also include underlying fascia, muscle, or both. Flaps can be categorized in accordance with their blood supply, shape, donor anatomic location, eponymous, tissue type, or movement [3].

Preplanning must be performed prior to an incision, including excision of the initial ulcer or defect. Considerations include an assessment of the general health of the patient, the source of blood supply to the flap, donor site selection, the recipient site, and the optimum positioning and design of the flap. Intraoperative handling of the flap, such as using atraumatic techniques and minimizing the amount of undermining are paramount in the success and viability of the flap. Postoperative care of flap, especially prophylaxis against common postoperative compliance, should be maximized. External factors, such as patient compliance, vascular status of the patient, and the presence of an underlying bony prominence must be evaluated and addressed for a successful postoperative result [1].

Infections must also be eliminated prior to flap reconstruction, bearing in mind the options for wound closure. Infected wounds should be packed open after debridements and incision and drainage procedures.

The knowledge of the vascular anatomy allows the reconstructive foot and ankle surgeon to plan safe incisions providing a sufficient blood flow for healing. This allows the surgeon to assess whether a given amputation will heal, the flap can be harvested successfully, or revascularization will give the best chance to heal existent ischemic ulcers.

Ideal conditions for successful STSG include red granulation tissue dominating the wound bed, no visible tendon or bone, no discernible sloughing or exudate in wound, no residual necrotic tissue, no local signs of soft-tissue infection, no systemic signs of infection, and no severe peripheral arterial disease (ankle-brachial

index >0.9 or distal pulses present). Giving the high prevalence of peripheral vascular disease in the diabetic population, it is important to identify the need for co-management of vascular surgeons.

Necrotic tissues in a wound should be removed as it prevents proper assessment of the wound bed, and also can be the source of bacterial growth. Of note, bacterial colonies can produce unwanted metalloproteinases that adversely affect extracellular matrix (ECM) components during the healing process, and form a biofilm in wound beds. Biofilm is a bacterial colonization of the wound surface that is highly resistant to antibiotic treatment, including standard treatments such as systemic antibiotics. The reason acute wounds progress through stages of healing, while chronic wounds appear to stall in the inflammatory stage, is likely because of persistent bacteria colonization, leading to persistent inflammatory responses with abnormal cytokine and matrix metalloproteinase levels [4].

After harvesting of STSG, to ensure success, seroma/hematoma must be managed, along with the prevention of shear forces that would disrupt the plasmotic phase and angiogenesis phase while the STSG is being incorporated onto the wound bed. To meet all the requirements mentioned above, a uniform pressure over the entire grafted area through a non-adherent, semi-occlusive, absorbent dressing material is required. NPWT finds a role both before split-thickness skin grafting by decreasing bacterial load and assisting with the wound bed preparation, as well as after grafting by fixating graft and reducing/eliminating seroma/hematoma.

Graft survival is predicted on several factors: historically, graft failure rates were high and primarily attributed to infection, highlighting the importance of biofilm management and eradication; as well, preventing shearing, seroma, and hematoma formation beneath the graft with immobilization to allow for the initial take or incorporation, which occurs by diffusion of nutrition from the recipient site, termed 'plasmatic imbibition' [5]. STSGs must be placed on a well-vascularized bed with low bacterial counts to prevent infection. Revascularization generally occurs between days 3 and 5 by reconnection of blood vessels in the graft to recipient site vessels or by ingrowth of vessels from the recipient site into the graft. Skin grafts generally will not take on poorly vascularized wound beds, such as bare tendons, cortical bone without periosteum, heavily irradiated areas, or infected wounds. However, virtually any tissue type with a vascular granulating bed is acceptable for grafting. NPWT has been shown to provide many aspects of STSG success by promoting granulation tissue, lowering bacterial counts, and removing accumulated fluid, such as hematoma/seroma, both of which reduce the chronic inflammatory process that occurs in chronic wounds such as elevated MMPs.

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FORAMINIFERS OF TURONIAN STAGE IN RAIGORODSKII CHALK DESPOSITS

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Summary: The data on the stratigraphic distribution of foraminifers from the Turonian deposits north-west of Donbass. Shown possibility identify two foraminifera zones: *Helvetoglobotruncana helvetica* (Mid Turonian) and *Whiteinella archeocretacea* (Lower Turonian).

Key words: Turonian stage, foraminifers, dismemberment, Donbass, Raygorodok.

Анотація: Наведені дані про стратиграфічне поширення форамініфер з туронських відкладів північно-західного Донбасу. Показана можливість виділення двох зон за форамініферами: *Helvetoglobotruncana helvetica* (середній турон) та *Whiteinella archeocretacea* (нижній турон).

Ключові слова: Туронський ярус, форамініфери, розчленування, Донбас, Райгородок.

Анотация: Приведены данные о стратиграфическом распространении фораминифер из туронских отложений северо-западного Донбасса. Показана возможность выделения двух зон по

фораминиферам: *Helvetoglobotruncana helvetica* (средний турон) и *Whiteinella archeocretacea* (нижний турон).

Ключевые слова: Туронский ярус, фораминиферы, расчленение, Донбасс, Райгородок.

Turonian stage, north-west of Donbass, is represented by chalk and chalk-like mergelyan [3,4]. Down swept-loamy sediments are gradually transformed into glauconite sandstones Senomanian, up - with no visible differences, into lithological chalk of the Coniacian layer [5].

The lithological rocks of the Turonian and Coniacian layers extremely are monotonous, which served as the basis for combining them into a single suite, the thickness of which is 200 meters or more [7]. This situation makes it difficult to conduct a large-scale geological mapping and eliminates structural paleogeograficheskie, paleotectonic features of this thickness.

In addition, in these rocks there are practically no remains of macrofauna that has long served as the basis for discussions on the completeness of the Turonian deposits and only 60s years of the twentieth century, with the massive study of microfossils, foraminifera or rather, it has been proved [6].

We studied foraminifera of Turonian's stage in the area of the village. Raygorodok (Fig.1). This village is situated north-east from Slavyansk, on the Kazyenui Torets flowing, near its confluence into the Seversky Donets. The samples were taken from the core of exploration wells on the Raigorodskii chalk deposits.

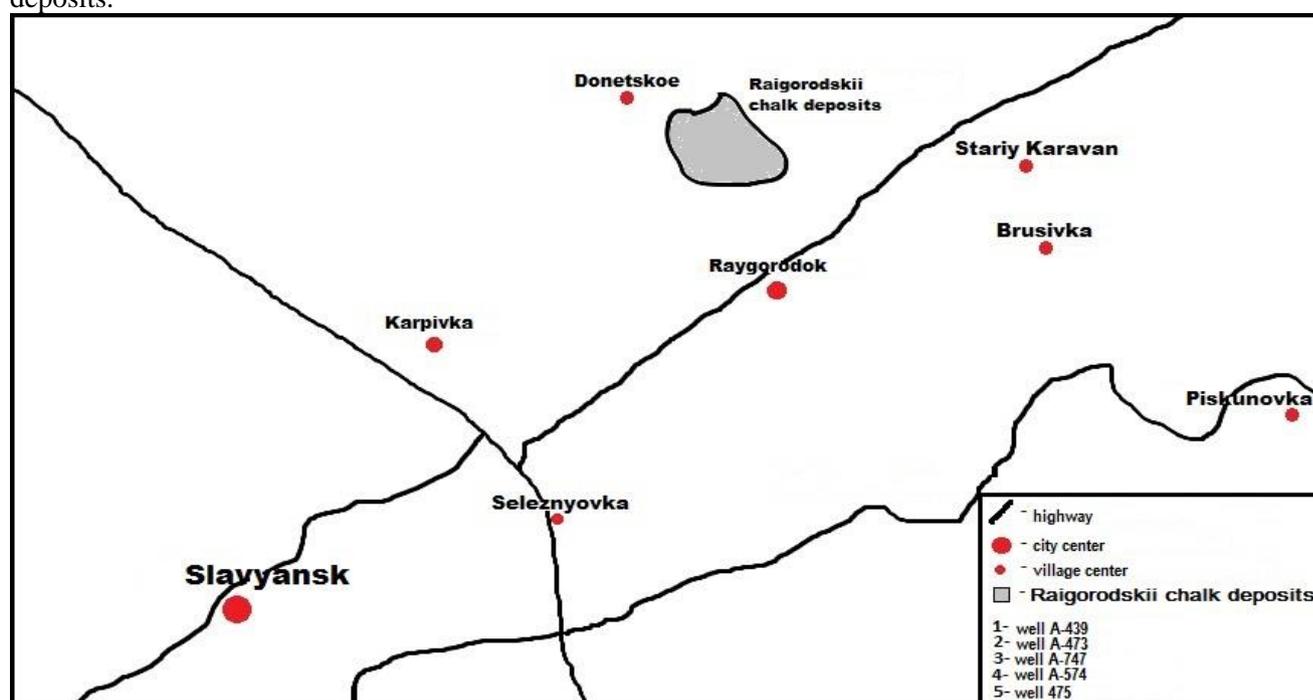


Figure 1. Scheme of study sections

We have treated a collection VP Bobrova collected as a result of additional exploration of the Raigorodskii chalk deposits MSE "Artemgeologiya" in 1972, from five wells: A-574, A-473, A-747, A-439, 475 in each well of five samples. The study was performed with help of using Foraminifers binocular stereoscopic microscope MBS-9 in reflected light.

Foraminifera are an important stratigraphic group for stratigraphy of the Turonian deposits, including the northern outskirts of Donbass [9].

Remains of microfossils in the sediments of the Turonian northwest of Donbass are abundant, and are represented by many species, and allow to allocate within the Turonian stage substages and separate areas [14].

After the analysis of the stratigraphic position of foraminifera, we can confidently identify the zone *H. helvetica* middle Turonian by the appearance and quite often finding of the index species. In the underlying sediments of the Lower Turonian is currently not possible to carve out any zone due to the lack of reliable types of indexes. Perhaps these include *R.turonica* and *M. marginata*, but the study of stratigraphic rasprostronenie requires more detailed study.

In the range studied was identified 34 species of foraminifera (Table 1). Depending on their stratigraphic importance, they were divided into the following groups:

1. Transit: *Whiteinella paradubia* (Sigal),1952, *Heterohelix reussi* (Cushman),1938, *Bolivinita eouvigeriniformis* Keller,1935 [2], *Dicarinella canaliculata* (Reuss),1854, *Lingulogavelinella globosa*

- (Brotzen, 1945), *Hedbergella delrioensis* (Carsey,1926), *Epistomina caracolla* (Roemer, 1841) [12], *Gaudryina angustata* Akimez, 1961 [2], *Marginotruncana marginata* (Reuss),1845, *Haplopragmoides kirki* Wickenden,1932, *Gyroidina micheliniana* Brotzen,1942
2. Zonal: *Helvetoglobotruncana helvetica* (Bolli),1957, *Marginotruncana sigali* (Reichel),1950
 3. Transient: *Anomalina kelleri* Mjatiuk,1947 [1], *Reussella turonica* Akimez,1961, *Heterohelix moremani* (Cushman),1938 [15], *Whiteinella baltica* Douglas & Rankin,1969 [8], *Valvulineria lenticula* Cushman,1926, *Dicarinella imbricate* (Mornod),1976, *Nonionellina taylorensis* (Hofker),1975, *Marginotruncana pseudolinneiana* Pessagno,1967 [1].
 4. Unspecified stratigraphic situation (types of meetings in one copy): *Bifarina regularis* Parker & Jones, 1872[10], *Planulina aff lundegreni* d'Orbigny,1826, *Globigerinelloides ultramicra* (Subbotina),1949 [11], *Dicarinella algeriana* (Mornod,1976), *Nodosaria sp.*, *Bulimina brevis* Cushman& Wickenden,1928 [1].

Table 1. Stratigraphic importance of foraminifera

Turonian		Stage
Lower	Mid	Substage
Gorskaya (K ₂ sr ₂)		Formation
Whiteinella archeocretacea ?	Helvetoglobotruncana helvetica	Zone
		Lithology
		Whiteinella paradubia
		Heterohelix reussi
		Dicarinella canaliculata
		Hedbergella delrioensis
		Epistomina caracolla
		Reussella turonica
		Gyroidina micheliniana
		Pullenia dampfiae
		Lingulogavelinella globosa
		Bolivinita eouvigeriniformis
		Marginotruncana marginata
		Bolivinitopsis rosula
		Haplopragmoides kirki
		Eouvigerina regularis
		Arenobulimina truncata
		Heterohelix moremani
		Valvulineria lenticulata
		Dicarinella imbricata
		Anomalina kelleri
		Heterostomella carinata
		Marginotruncana pseudolinneiana
		Whiteinella baltica
		Nonionellina taylorensis
		Helvetoglobotruncana helvetica
		Gaudryina angustata
		Bifarina regularis
		Marssonella oxycona
		Trochammina globigeriniformis
		Planulina aff lundegreni
		Globigerinelloides ultramicra
		Dicarinella algeriana
		Marginotruncana sigali
		Nodosaria sp.
		Bulimina brevis

Types of codes *Marginotruncana sigali* and *Helvetoglobotruncana helvetica* appear at a depth of 53-54 m in well A-473 at a depth of 88-89 m in well A-439, that allowed establishing the same name area.

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MOLLUSKS OF LARGE STORAGE POOLS OF THE SEVERSKIY DONETS BASIN

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Summary: The present study considers the major storage pools hydromalacofauna of the Severskiy Donets basin. Comprehensive literature review was made. Analysis of fauna and the division on the ecological complexes was described. Bio-mathematical calculations were established.

Key words: hydromalacofauna, ecological complexes, statistics calculations, storage pools.

Анотація: У статті розглядається малакофауна великих водосховищ басейну річки Сіверський Донець. Зроблено огляд наявних даних з теми дослідження. Був проведений фауністичний аналіз, розподіл на екологічні комплекси, а також зроблені деякі біоматематичні підрахунки.

Ключові слова: водосховища, гідромалакофауна, екологічні комплекси, статистичні підрахунки.

Аннотация: В статье рассматривается малакофауна крупных водохранилищ бассейна реки Северский Донец. Сделан обзор имеющихся данных по теме исследования. Проведен фаунистический анализ, разделение на экологические комплексы, а также сделаны некоторые биоматематические подсчеты.

Ключевые слова: гидромалакофауна, водохранилища, экологические комплексы, статистические подсчеты.

The fauna of mollusks of storage pools of the Severskiy Donets basin has not been studied enough yet. Therefore, the theme of our research is very actual. The purpose of research was to give preliminary information on composition of malacocoenosis and conduct the comparative malacofauna's analysis of five large storage pools of the Severskiy Donets basin.

The tasks of research were to make a literature review on the topic of study, to collect material and determine mollusks, to calculate some indexes of biological statistics.

Process of collecting mollusks was conducted in 2011-2012 in three storage pools – Belgorod, Krasnopavlovsk and Kleban-Byk – using standard hydrobiological methods. Relative quantity of mollusks, Berger-Parker's index of prevailing, Margalef's index of specific variety, Zhakkar's coefficient of likeness of specific composition were determined.

The Belgorod storage pool was built in 1985 in the Severskiy Donets in Belgorod region of Russian Federation. Its area is 2300 hectares. We conducted research in April 2012 there. We inspected the underbody of storage pool, took 55 samples and collected about 300 specimens of mollusks. We found 32 species.

Thus in the Belgorod storage pool we for the first time noticed 6 kinds, such as: *Acroloxus lacustris*, *Lymnaea truncatula*, *Segmentina nitida*, *Anisus albus*, *Anisus septemgyratus*, *Anisus contortus*. And 5 species were first noticed in Belgorod region: *Lymnaea gueretiniana*, *Armiger crista*, *Armiger bielzi*, *Physa skinneri*, *Opisthorchophorus hispanicus*. 3 kinds were dominants. These were smaller individuals of genera of *Lymnaea*, *Planorbis planorbis* and *Lymnaea palustris*.

We also noticed 7 subdominant species, 8 recedent species and 16 subrecedent species. Berger-Parker's index of prevailing was 0.21. Margalef's index of specific variety was 5.62.

The Krasnopavlovsk storage pool was built in 1984 in the Popelnaya in Kharkiv region. The area of reservoir is 3400 ha. Nobody explored the fauna of mollusks of the Krasnopavlovsk storage pool before us.

Collecting mollusks was conducted in July-August 2012. 20 tests were taken and 75 specimens were discovered.

Thus, we found shells of 5 types of mollusks. The most meaningful discovery was *Hipanis colorata*, a type of mollusks, which dwells mainly in off-shore, most desalinated areas of the Black Sea and the Sea of Azov. As for the Severskiy Donets basin we specified it for the first time.

Apart from these kinds we assume dwelling of at least 35 kinds in the Krasnopavlovsk storage pool.

The Kleban-Byk storage pool is arranged in the mouth of the Bychok in Donetsk region. The area of storage pool is 650 ha. The fauna of mollusks of this reservoir was not explored before.

In 2011-2012 the material was collected practically in all reservoir. In about 90 samples we identified about 760 specimens of mollusks.

During the whole period of our research we found out 34 types of mollusks, related to 2 classes, 3 subclasses, 6 orders, 9 families and 15 genera.

10 Prosobranchia relates to the class of Gastropoda and 19 types of pulmonary mollusks which we indicated in the composition of a phytophilous complex.

Thus such species as *Bithynia decipiens*, *Bithynia producta*, *Armiger crista* and *Armiger bielzi* was adduced in Donetsk region for the first time. Species like *Bithynia curta* and *Physa skinneri* we first noticed in the Severskiy Donets basin and Donetsk region.

In composition of a phytophilous complex (periphyton) we also found a representative of bivalve's class, order Cardiida.

Psammofil complex of animals is formed at the sandy bottom, and two types of bivalves of subfamily of Unioninae are included in its composition.

Pelofil complex of animals is formed on silty soils, and 2 types of bivalves of subfamily of Anodontinae are included in its composition.

Bithynia tentaculata and *Cincinna piscinalis* are dominants in quantity in the Kleban-Byk storage pool

8 kinds were subdominants. We found 9 recedent species and 16 subrecedent species. Berger-Parker's index of prevailing was 0.22. Margalef's index of specific variety was 5.28.

The Pechenegi storage pool is arranged in the Severskiy Donets in 1962 in Kharkiv region. Its area is 8620 hectares. Here we assume dwelling of no less than 46 types of mollusks.

The Krasny Oskol storage pool was built in the Oskol in Kharkiv and Donetsk regions. Its area is 12260 hectares. It is one of the largest in Ukraine.

Information about the hydromalacofauna's composition of the Krasny Oskol storage pool is taken from the work of Tymoshenko of 1992 [9], in which he mentioned 28 types of freshwater mollusks.

Besides we also assume dwelling of no less than 21 kinds in the Krasny Oskol storage pool.

The most widespread in 4-5 storage pools are 39 species.

The least widespread in 1 or 2 storage pools are 20 species.

Zhakkar's likeness coefficient of specific composition was 0.85 – the highest for the Pechenegi and the Krasny Oskol and 0.81 for the Belgorod and the Pechenegi storage pools. The lowest Zhakkar's likeness coefficient of specific composition 0.56-0.66 we indicated for the Kleban-Byk, the Belgorod and the Krasny Oskol storage pools.

Thus, on the basis of studies that was done the following conclusions can be made. 1. For research period 2011-2012 in five large storage pools we found 68 types of freshwater mollusks, or 70 % of all hydromalacofauna of the Severskiy Donets basin.

2. In the Belgorod storage pool we found 33 types of mollusks from 62 known, 11 kinds were noticed for the first time in that storage pool and Belgorod region.

3. In the Kleban-Byk storage pool we found 36 species, 6 of them were noticed for the first time in the Severskiy Donets and in Donetsk region.

4. In the Krasnopavlovsk storage pool we indicated 5 specimens from 40 supposed, one of them we saw at first in the Severskiy Donets basin and in Kharkiv region.

5. Prevailing structure in the Belgorod and the Kleban-Byk storage pools is approximately identical, Berger-Parker's indexes of prevailing for them are almost the same, however, species-dominants are different.

6. There is a dependence of the amount of species on the size of storage pools, that was proved by the large value of Margalef's index of specific variety for the Belgorod storage pool is higher, than for the Kleban-Byk storage pool.

7. More similar in specific composition are storage pools located in the same terrestrial ecosystem – Zhakkar's likeness coefficient of specific composition for them is almost identical.

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EDUCATION FOR SUSTAINABLE DEVELOPMENT: PRO AND CONTRA

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Summary: The article considers questions of social and economic disparities in the context of the global economy's transition to a balanced environmental management. The main aspects of school environmental education reorientation for sustainable development have been specified.

Keywords: balanced environmental management, energy saving, environmental education, sustainable development.

Анотація: У публікації розглянуто питання соціально-економічної нерівності в контексті переходу світової економіки до збалансованого природокористування. Висвітлено основні аспекти переорієнтації шкільної екологічної освіти для сталого розвитку.

Ключові слова: екологічна освіта, енергозбереження, збалансоване природокористування, сталий розвиток.

Аннотация: В публикации рассматриваются вопросы социально-экономического неравенства в контексте перехода мировой экономики к сбалансированному природопользованию. Освещены основные аспекты переориентации школьного экологического образования для устойчивого развития.

Ключевые слова: сбалансированное природопользование, устойчивое развитие, экологическое образование, энергосбережение.

Ensuring sustainable development (SD), namely the balanced components of the triune system "man-environment-economy" today is the starting point of any socio-political process in civilized countries. Hundreds of the countries of the world have become participants in the international agreements on the problems of sustainable development («Agenda 21" – more than 170 countries, «Strategy on Education for Sustainable Development» – 55 countries). National economies, education, regulatory and legal framework are rapidly reoriented on the SD goals and needs.

A number of antagonistic directions and schools arise along with the obvious dominance of sustainable development concept in all areas from science to policy. The reports of Club of Rome, attempts to green the industry and the very idea of sustainable development are being criticized. One of the most authoritative is the school of universal evolutionism which is developing under the guidance of academician N. Moiseyev on the basis of V. Vernadsky's teachings about the noosphere [1]. This school considers the SD concept to be "dangerous delusion of modernity". Instead, coevolution of society and nature which will reach the conditions of the noosphere is proposed.

In the opinion of some scientists [2], the concept of sustainable development is contrary to the second law of thermodynamics for open systems in a stable condition because the production of entropy, increasing in the course of the technological civilization development, must be balanced by its outflow into the environment (degradation of the environment), and thus sustainable development on the background of the environment preservation can be ensured only locally.

A number of comments refer to the attempts to overcome the regions' socio-economic disparity. One of the principles in the Rio de Janeiro's Declaration in 1992 proclaims overcoming poverty, as a necessary condition of SD [6]. To implement this provision at the present level of social development without harming the environment is virtually impossible. Transition of agro-industrial and agrarian countries where more than 2 billion people live (India, Pakistan, Bangladesh, etc.) to the industrial phase will inevitably lead to a significant increase in pollution, acceleration of ecosystem degradation, resource depletion, enhanced greenhouse effect and other global problems. A conflict contradicting the major purpose of sustainable development arises: preservation of the biosphere for present and future generations.

Low quality of life affects the feasibility of SD educational projects implementation. Adoption of the aforementioned agreement – «Strategy on Education for Sustainable Development» provides for the reorientation of the public education system to the needs and goals of sustainable development. But the introduction of environmentally-oriented programs causes considerable difficulties in weakly-developed and depressed areas. For the children living in the regions where most of the population lives below the poverty line, other problems are paramount. Moreover, the scientific and technological base significantly differs in the center and in the periphery. Thus, trying to introduce environmental principles in the educational sphere, we break the social ones, including equitable distribution of resources and equal access to quality education.

In this context the programs that integrate environmental and economic problems simultaneously will be more expedient. A striking example is the practice of energy-efficient education originating from 1973, when the first studies on the rational use of electricity began in American colleges and universities during the oil embargo [3]. The purpose of energy-efficient education is to draw attention to the excessive production of electricity, to form environmental awareness and a sense of personal responsibility through the control of fuel resources use. Today various methods of energy conservation make an integral part of the curricula in schools in France, Belgium, Spain, Portugal and many other countries.

In addition to economic gains, optimization of the energy balance structure allowed to significantly reduce the negative impact on the environment. According to the research in the Italian lyceum (Prato), rational use of natural light throughout the day saves about 580 € and allows to reduce CO₂ emissions by 900 kg [7]. According to the data obtained in a survey of 129 schools in Sweden, the average electricity consumption can be reduced by 30% [4]. If all Swedish schools adhere to this index, savings can reach 1 terawatt (1 TW) per year, which roughly corresponds to the total electricity consumption in the country within two days. We can also talk about the positive pedagogical and psychological effects, including better working efficiency and academic performance.

The tests have showed that under the influence of daylight the students solved 20% math problems and read 26% faster, than in artificial light [5].

The main criticism of the education reform is aimed at profilization. Teachers, scientists, public figures oppose limiting curriculum with single subjects. Profile education can actually be seen as a part of sustainable development, because the interest of students is the starting point. However, education for Sustainable Development provides a multidisciplinary approach, integration of disciplines, combination of research and learning. Let's consider this on the example of ecological class.

The course "Informatics" can be made more interesting through familiarization of learners with scientific metric databases, information search features, statistics processing, such as graphs, trends, charts, diagrams. Teaching of the subject "Biology" can be supplemented by sections on biogeography and bioecology, themes on biodiversity, biotechnology methods for the needs of alternative energy. The curriculum of the subject "Man and the World" should also include the basics of socio-ecological knowledge, highlight the philosophical aspects of environmental problems such as war and peace, the ideology of over-consumption, demographic crises, etc.

With access to the required material and technical base practical lessons should be conducted in the laboratory with the possibility to analyze samples of water, air, plants. If this is not possible, lessons can be conducted in the open space – determining soil texture, bioindication, studying hydrological characteristics of the water bodies and so on.

The proposed approaches will contribute to professional self-determination of students, improving their mental state, increasing their motivation to learning. Education for sustainable development can be positioned as a kind of consensus between supporters and opponents of profilization. Integrated training, on the one hand, helps to create interest in different scientific areas instead of "confining in one or more major subjects "; and on the other hand, is oriented to meet the individual needs of the student and his professional self-realization.

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FOREST PROTECTION AGAINST FIRES

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Summary: The article considers the problems of fire hazard in the use of forest resources, examples of the modernization of fire stations and the first steps in the forest fire have been given.

Key words: forest conservation, forest fires, ground fires, human factor.

Анотація: в статті розглядаються проблеми пожежної небезпеки при використанні лісового ресурсу, наведені приклади модернізації пожежних частин та перші дії при лісовій пожежі.

Ключові слова: антропогенний фактор, лісові пожежі, низові пожежі, охорона лісів.

Аннотация: в статье рассматриваются проблемы пожарной опасности при использовании лесного ресурса, приведены примеры модернизации пожарных частей и первые действия при лесном пожаре.

Ключевые слова: антропогенный фактор, низовые пожары, охрана лесов лесные пожары.

Forest fires is a terrible natural phenomenon that causes great damage to forestry. That is why forestry has to strengthen the protection of forests from fires. To do this, you must know the nature of forest fires well, especially the burning of forest combustible materials, strategies, techniques and tactics of fighting the fire.

Uncontrolled fire causes huge losses not only of timber but also of other industries. Forest fires cause significant adverse changes in the global carbon balance, energy balance of the Earth's surface, the water cycle and atmospheric pollution [3].

Forest fires are divided into grassroots, top, underground. According to burning intensity, wildfires are divided into weak, medium, severe.

Forest grass-roots fires are characterized by the burning of dry grass, undergrowth and forest floor without catching trees. The velocity of the front fire from the grassroots is 0,3-1 m / min (weak fire) to 16 m / min (large fire) flame height: 1.2 m, the maximum temperature on the edge of the fire reaches 900 ° C [1].

Forest top fires develop normally with grassroots and are characterized by the burning of the top of the trees. In fast top fire the flame spreads from crown to crown with a high speed which achieves 8-25 km / h [1], leaving whole patches of forest free from the fire. At the stable top fire the flame catches not only the crown but also trees. The flame spreads at speed of 5-8 km / h, covering the whole forest soil layer to the tops of trees [1].

Among the causes of forest fires an anthropogenic factor is considered the key one (according to statistics 98% of forest fires occur because of the population's carelessness) [1]. Therefore, forests located near

major industrial centers, medical and health institutions, roads, electrical lines require special attention. Natural and climatic conditions (high temperature, low rainfall, etc.) often only increase the probability of ignition and affect the rate of fire spread.

In order to identify and bring the perpetrator of fire safety regulations to administrative responsibility, the State Fire Protection brigades have been established to patrol forest areas on weekends and holidays. This practice gave some positive results. During 2001 more than 18,000 raids were conducted, 4.100 perpetrators have been identified and fined. The total sum of fines amounted to 83.8 thousand hryvnas [2].

Under these conditions it is impossible to ensure reliable protection of forests from fires without an adequate material base that would include high-performance detection and extinguishing fires. To some extent, these requirements are met by forest fire stations (fire station) which belong to the State Forestry Committee of Ukraine. Now in Ukraine there are 226 such fire stations [2]. Their equipment is: 437 fire engines, 17 fire units and 9 ground digging machines, 8 car trains, 5 band making machines, 38 removable tanks, over 1700 fire extinguishers of different types, 599 pumps and nearly 50.000 meters of fire hoses, 3.036 radio stations. For early detection of forest fires 402 towers and masts have been built, of which 30 are equipped with TV units [2].

Every year the fire departments prepare for the fire risk period, together with local councils develop and approve of operational and mobilization plans in case of major forest fires, forestry offices lay fire breaks and mineralized bands, control the bands and gaps that have been laid before [1].

In order to improve the interaction of fire protection divisions in the event of large and complex forest fires "Instruction on the interaction between the units of Ministry of Forestry of Ukraine and the State Fire Service of Ukraine during forest fire" has been developed [1].

Efficiency in extinguishing forest fires, as well as coordination of air and ground services should be provided by the special control service. Its objective is collection and transfer of information on forest fires coming from the forestry department to the committee [1].

Better financing of the industry, establishment of fire stations on newly created forest areas, replacement of obsolete equipment – are the measures to help protect our green friend from fire.

Some recommendations as to the rules of behavior in case of fire are as follows: in case of fires one should beware of high temperature, when fighting forest fires use twigs of deciduous trees (birch, hazel), shovels etc. start from the edge of the fire using branches from the trees, shoveling the fire with earth [2].

Every year in Canada about 2.5 million hectares of forest are subjected to fires. However, over the past two decades, there has been a tendency in Canada to reduce the area covered by fires. So, for the period from 1990 to 1999, the average area affected by fires a year amounted to 2.8 mln. ha and from 2000 to 2009 - only 1.6 million ha. At the same time to extinguish the fires from 500 million to 1 billion Canadian dollars are spent a year. In the United States, during 1990-1999 period on average 1 360 thousand hectares were affected with fires, during 2000-2009 - about 2800 thousand hectares (NIFC, 2008, 2009). The Federal US Forest Service spent about 1.4.blm US dollars on firefighting (2008 - 2009) [4].

Compared to Canada, in Eastern and Western Europe we see an increase in the dynamics of forest fires (Figure 1).

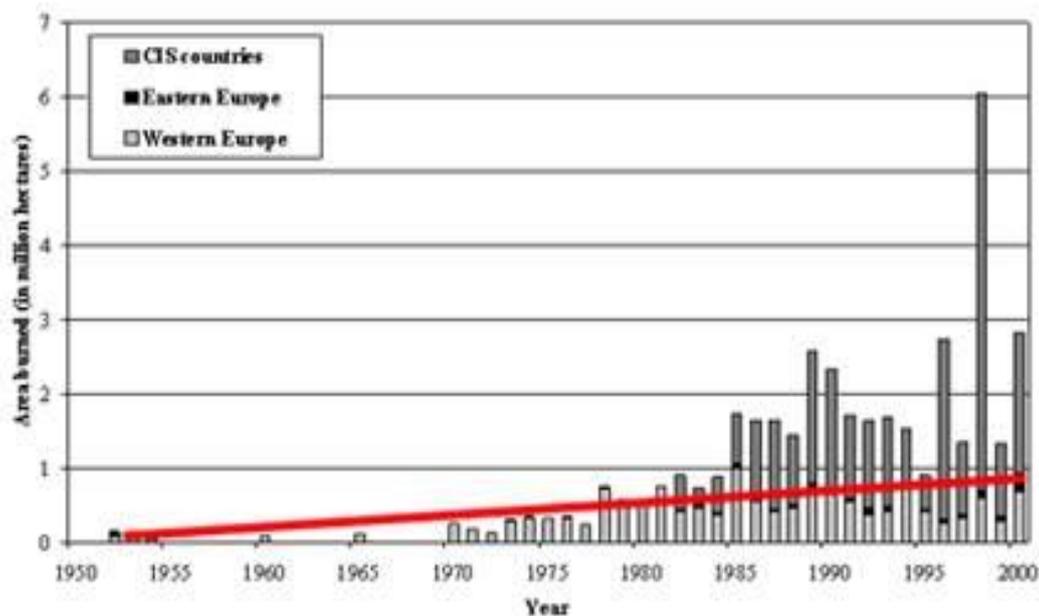


Figure 1. Dynamics of the area subjected to forest fires, Eastern and Western Europe [5].

In the dynamics of the area subjected to forest fires in Eastern and Western Europe from 1970 to 2000, a steady growth rates for these areas with a sharp increase in 1998 has been noticed [5]. These figures show carelessness in handling forest resources.

Thus, we can conclude that the growth of the area exposed to the fire arises because of the strong anthropogenic load, improper handling of fire, lack of proper equipment to fight forest fires. Also, the impact of climate strongly affects the conditions of the forest and, therefore, its resistance to fire. It is necessary to put aside the financial position of institutions engaged in forest monitoring.

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SIMPLEX METHOD AS A WAY OF SOLVING LINEAR PROBLEMS

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Summary: The article focuses on different mathematical problems and the way of their solving through the simplex method. The analysis of some fixed problems is described in this article and also examples of solving the given problem.

Key words: linear programming, minimization, optimal vector, simplex method.

Анотація: Стаття присвячена різноманітним математичним проблемам та способу їх вирішення за допомогою симплекс методу. Стаття описує аналіз деяких фіксованих проблем а також приклади вирішення наданої проблеми.

Ключові слова: лінійне програмування, мінімізація, оптимальний вектор, симплекс метод.

Аннотация: Стаття посвящена разнообразным математическим проблемам и способу их решения с помощью симплекс метода. Стаття описывает анализ некоторых фиксированных проблем а также примеры решения данной проблемы.

Ключевые слова: линейное программирование, минимизация, оптимальный вектор, симплекс метод.

Linear programming (LP; is also called linear optimization) is a method to achieve the best outcome (such as maximum profit or the lowest cost) in a mathematical model whose requirements are represented by linear relationships. Linear programming is a special case of mathematical programming (mathematical optimization). A linear programming problem may be defined as a problem of maximizing or minimizing a linear function subject to linear constraints. The constraints may be equalities or inequalities. At first, it is necessary to begin with terminology to provide readers with the useful information needed for understanding as well as for analysis of given linear problem. The procedure is called the *simplex method*, proceeds by moving from one feasible solution to another, at each step improving the value of the objective function. Moreover, the method terminates after a finite number of such transitions. The function to be maximized or minimized is called the *objective function*. X-vector for the standard maximum problem or Y-vector for the standard minimum problem is said to be *feasible* if it satisfies the corresponding constraints. The set of feasible vectors is called the *constraint set*. A linear programming problem is said to be *feasible* if the constraint set is not empty; otherwise it is said to be *infeasible*. A feasible maximum (or minimum) problem is said to be *unbounded* if the objective function can assume infinite large positive (or negative) values at feasible vectors; otherwise, it is said to be *bounded*. The value of a bounded feasible maximum (or minimum) problem is the *maximum* (or minimum) value of the objective function as the variable range over the constraint set. A feasible vector at which the objective function achieves the minimum or maximum value is called *optimal* [1].

If one wants to solve a linear programming problem, one should certify that one has all essential parts, such as decision variables, objective and constraints. The decision variables present unknown decisions to be made. They can be a number of notebooks to be produced or quantity of calories to be eaten. Usually these unknown values are presented by the way of x_i , where i is an index which depends on a number of values. Every linear program has an objective which set people a task to minimize or to maximize the function. Objective should also be linear. Every linear program also has constraints limiting feasible decisions. For example, restrictions should be linear. One can not use more material than one has, and one also can not produce more products than our consumer needs [2]. Finally, one gets the complete model of a given linear problem (if one considers, for example, minimizing problem):

$$\begin{cases} a_{11}x_1 + a_{12}x_2 + \dots + a_{1n}x_n \geq b_1 \\ a_{21}x_1 + a_{22}x_2 + \dots + a_{2n}x_n \geq b_2 \\ \dots \\ a_{m1}x_1 + a_{m2}x_2 + \dots + a_{mn}x_n \geq b_m \end{cases}$$

$$x_1 \geq 0, x_2 \geq 0, \dots, x_n \geq 0$$

$$L(x) = c_1x_1 + c_2x_2 + \dots + c_nx_n \rightarrow \min \square$$

To solve the linear problem means:

- to find out that constraints are incompatible;
- to find out that the function is unbounded;
- to find an optimal decision.

There is an example of a linear problem which is called "The Diet Problem" which is exactly the standard minimum problem. This example shows how one can apply linear method in life. There are n different types of food that will be denoted such as F_1, F_2, \dots, F_n (we use the letter F as the first letter of the word 'food' to facilitate understanding). Let b_i be the price per unit of food F_i ($i=1, 2, \dots, n$). There are also m nutrients - N_1, N_2, \dots, N_m which should be in our ration. Let c_j be the minimum daily requirement of nutrient N_j ($j=1, 2, \dots, m$). Let a_{ij} be the amount of nutrient N_j contained in one unit of food F_i . If one considers x_i like the number of units of food F_i to be purchased per day then the cost per day of the whole diet is

$$b_1x_1 + b_2x_2 + \dots + b_nx_n$$

The amount of nutrient N_j contained in this diet is:

$$a_{1j}x_1 + a_{2j}x_2 + \dots + a_{nj}x_n \geq c_j, \text{ for } j=1, 2, \dots, m$$

It is greater than c_j because one does not consider the diet where not all the minimum requirements are met. One cannot also purchase a negative amount of food, so one automatically has the constraints:

$$x_1 \geq 0, x_2 \geq 0, \dots, x_n \geq 0$$

One can see that all requirements are executed and it is in fact the linear program. Further, one considers the simplified example of the minimizing problem where all variables are given [3].

$$\begin{cases} x_1 + x_2 - 2x_3 \geq 2 & (1.1) \\ x_1 - x_2 + x_3 \geq 1 & (1.2) \\ x_2 + x_3 \geq 5 & (1.3) \\ 2x_1 - x_2 \geq 2 & (1.4) \\ x_1 \geq 0, x_2 \geq 0, x_3 \geq 0 & (1.5) \end{cases}$$

$$\begin{cases} x_1 - x_2 + x_3 \geq 1 & (1.2) \\ x_2 + x_3 \geq 5 & (1.3) \\ 2x_1 - x_2 \geq 2 & (1.4) \end{cases}$$

$$\begin{cases} x_2 + x_3 \geq 5 & (1.3) \\ 2x_1 - x_2 \geq 2 & (1.4) \end{cases}$$

$$\begin{cases} 2x_1 - x_2 \geq 2 & (1.4) \\ x_1 \geq 0, x_2 \geq 0, x_3 \geq 0 & (1.5) \end{cases}$$

$$\begin{cases} x_1 \geq 0, x_2 \geq 0, x_3 \geq 0 & (1.5) \end{cases}$$

$$L(x) = x_1 - 2x_2 - x_3 \rightarrow \min \quad (2)$$

If the left member of inequality (1.1) greater than (2) (right member), then one can change (1.1) thus: $x_1 + x_2 - 2x_3 + y_1 = 2$, where y_1 is a new value, $y_1 \geq 0$. In the same way inequalities (1.2) – (1.4) will be changed:

$$\begin{cases} x_1 + x_2 - 2x_3 + y_1 = 2 & (1.1) \\ x_1 - x_2 + x_3 + y_2 = 1 & (1.2) \\ x_2 + x_3 + y_3 = 5 & (1.3) \\ 2x_1 - x_2 + y_4 = 2 & (1.4) \end{cases}$$

$$\begin{cases} x_1 - x_2 + x_3 + y_2 = 1 & (1.2) \\ x_2 + x_3 + y_3 = 5 & (1.3) \\ 2x_1 - x_2 + y_4 = 2 & (1.4) \end{cases}$$

$$\begin{cases} x_2 + x_3 + y_3 = 5 & (1.3) \\ 2x_1 - x_2 + y_4 = 2 & (1.4) \end{cases}$$

$$\begin{cases} 2x_1 - x_2 + y_4 = 2 & (1.4) \end{cases}$$

The next step one rewrites a system of equations as the following:

$$\begin{cases} y_1 = 2 - (x_1 + x_2 - 2x_3) & (1.1) \\ y_2 = 1 - (x_1 - x_2 + x_3) & (1.2) \\ y_3 = 5 - (x_2 + x_3) & (1.3) \\ y_4 = 2 - (2x_1 - x_2) & (1.4) \end{cases}$$

$$\begin{cases} y_2 = 1 - (x_1 - x_2 + x_3) & (1.2) \\ y_3 = 5 - (x_2 + x_3) & (1.3) \\ y_4 = 2 - (2x_1 - x_2) & (1.4) \end{cases}$$

$$\begin{cases} y_3 = 5 - (x_2 + x_3) & (1.3) \\ y_4 = 2 - (2x_1 - x_2) & (1.4) \end{cases}$$

$$\begin{cases} y_4 = 2 - (2x_1 - x_2) & (1.4) \end{cases}$$

If one considers $x_1 = x_2 = x_3 = 0$, then one becomes the feasible vector for this linear problem $(x_1, x_2, x_3, y_1, y_2, y_3, y_4) = (0, 0, 0, 2, 1, 5, 2)$, $L(x) = 0$. But it is not an optimal vector yet. To

minimize a function (2) one should not change values with a positive sign, because of a constraint (1.5) (it will only maximize the function). One changes values with negative sign - x_2 and x_3 . It is unimportant which value to change first. Let's change x_2 with some y_i . One chooses that y_i , where equation x_2 in brackets has the sign '+' and it is the possible value is minimum. If one chooses not minimum x_2 , then y_i in

equation, where x_2 is minimum will be negative. Thus one will get $\min x_2 = 2$ in (1.1) and will change $x_2 \leftrightarrow y_1$. Let's rewrite the system with this transformation:

$$\begin{cases} x_2 = 2 - (x_1 + y_1 - 2x_3) & (1.1) \\ y_2 = 3 - (2x_1 + y_1 + 3x_3) & (1.2) \\ y_3 = 3 - (-x_1 + y_1 + 3x_3) & (1.3) \\ y_4 = 4 - (3x_1 - 2x_3 + y_1) & (1.4) \end{cases}$$

After rewriting the function (2) it takes the view:

$$L(x) = -4 + 3x_1 + 2y_1 - 5x_3$$

A feasible vector has no the following form:

$$(x_1, x_2, x_3, y_1, y_2, y_3, y_4) = (0, 2, 0, 0, 3, 3, 4), \text{ function } L(x) = -4.$$

Next let's carry out the same thing with $x_3: x_3 \leftrightarrow y_3$. The new system and the function:

$$\begin{cases} x_2 = 4 - \left(\frac{1}{2}x_1 + \frac{1}{3}y_1 + \frac{2}{3}y_3\right) & (1.1) \\ y_2 = 6 - (3x_1 + 2y_1 - y_3) & (1.2) \\ x_3 = 1 - \left(-\frac{1}{3}x_1 - \frac{1}{3}y_1 + \frac{1}{3}y_3\right) & (1.3) \\ y_4 = 6 - \left(\frac{7}{3}x_1 - \frac{2}{3}y_3 + \frac{1}{3}y_1\right) & (1.4) \end{cases} \quad L(x) = -9 + \frac{4}{3}x_1 + \frac{1}{3}y_1 + \frac{5}{3}y_3$$

Feasible vector $(x_1, x_2, x_3, y_1, y_2, y_3, y_4) = (0, 4, 1, 0, 6, 0, 6)$ and it is changed into the optimal

vector, because one cannot minimize the function $L(x)$:

$$(x_1, y_1, y_3 \geq 0 \Rightarrow L(x) = \min \Leftrightarrow x_1, y_1, y_3 = 0)$$

$$L_{\min}(x) = -9 -$$

minimum value of a function. The problem is solved. Thus, it can be said that the simplex method or the simplex algorithm is one of the easiest ways for solving different mathematical tasks, which are applied in life. So, it is necessary to note that nowadays any sciences, any concerns, developments and in general nothing cannot function without using mathematics. Mathematics is everywhere: in our study, in our work and in our life.

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УДК 524.7

CLUMPY TORI INACTIVE GALACTIC NUCLEI

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Summary: A brief review of observational features of active galactic nuclei under the unification scheme is given in the article. The article reviews a problem of particle (cloud) motion in the gravitational field of the central mass (black hole) within the two-body problem. The code on C# which simulates Keplerian torus for arbitrary number of particles using both Euler's and Heun's methods has been written.

Keywords: active galaxy, black hole.

Аннотация: В статье дан краткий обзор наблюдаемых особенностей активных ядер галактик в рамках унифицированной схемы. Рассмотрена задача о движении частиц (облаков) в гравитационном

поле центральной массы (черной дыры) в рамках задачи двух тел. Написан код на C#, который моделирует тор Кеплера для произвольного количества частиц, используя методы Эйлера и Гюна.

Ключевые слова: активная галактика, чёрная дыра.

Анотація: У статті поданий короткий огляд особливостей активних ядер галактик, які спостерігаються в рамках уніфікованої схеми. Розглянуто задачу про рух частинок (хмар) в гравітаційному полі центральної маси (чорної діри) в рамках задачі двох тіл. Написаний код на C #, що моделює тор Кеплера для довільної кількості частинок, використовуючи методи Ейлера і Гюна..

Ключові слова: активна галактика, чорна діра.

Active galaxies are galaxies that contain a supermassive accreting black hole in it. The luminosity of the centre of such galaxy called active galactic nucleus (AGN) is even higher than the host galaxy luminosity on the whole electromagnetic spectrum. Most of the host galaxies are spiral or elliptical.

The main component of AGN is a central supermassive black hole (BH) with the mass 10^6 to 10^{10} times the [Solar mass](#) but these structures are complex and consist of an accretion disk, jets, a torus and clouds. Our work is focused on the investigation of dynamics and structure of the dusty torus. The accretion disk consisting of the gas is one of the factors that make a galaxy active while converting potential energy of the infalling gas into its kinetic energy or into electromagnetic radiation. It is supposed that the torus feeds the accretion disk. Inner radius of the accretion disk is about 10^{-5} pc while outer radius can approach 10^{-2} pc which approximately coincides with inner boundary of the dusty torus; we can also say that it is inner radius of the torus. The torus is a massive region beyond an accretion disk that consists of gas and, what is more important, of obscuring dust. More information about the torus is given below. Jet is a stream of plasma that is usually emitted normally to the galactic plane with speeds approaching the speed of light. Jets are huge; their length can be thousands of parsecs. Also there are some gas clouds that are situated at a different distance from the BH.

The observational data show that AGN can be divided into several groups: Seyfert galaxies (Sy), radio galaxies, quasars and blazars. Seyfert galaxies have less massive BHs and thus lower luminosity compared to more massive and energetic quasars, radio galaxies and blazars. Another classification (AGN-I and AGN-II types) appeared from the features of spectral energy distribution. Well known representatives of AGN-I are quasars and blazars and representatives of AGN-II are radio galaxies.

Seyfert galaxies also fall into Seyfert I and Seyfert II. Seyfert I and AGN-I galaxies have a hump in UV/optical band, bright nuclei and regions of both narrow emission lines (NLR) and broad emission lines (BLR), while Seyfert II and AGN-II galaxies have loud IR luminosity and only NLR. This distinction comes from the clouds, which move on different speeds according to their distance from the BH. The faster an object moves, the broader its emission lines are, therefore we get narrow and broad line regions, NLR and BLR respectively. According to the unification scheme provided by Antonucci [1] all the types are AGN consisted of the same structure elements but viewed from different angles. Therefore we see a galactic plane of Seyfert II and AGN-II galaxies and actually a plane of the obscuring torus; its obscuration means that we cannot see radiation coming from clouds that are covered by the torus – BLR and thus cannot see broad emission lines. When the viewing angle is 60 degrees or less we deal with Seyfert I and AGN-I galaxies since the torus does not partially or fully cover BLR.

For our research the most important part of the AGN is the torus. Since the torus is seen in IR spectrum it is believed to consist of silicates and graphite which is dust. From observational data the scale of the torus is a few parsecs and the values of temperature vary from 300 to 800 K.

One of the main problems related to the dusty tori is how they stand up against gravity. If we consider a torus consisting of continuous medium such system is not stable due to the Jeans instability and centrifugal force. Bannikova et al. [2] showed that torus can be more stable if the clouds in it move in inclined orbits spread by eccentricities. The aim of this work is to investigate the evolution of self-gravitating torus located in the gravitational field of two BHs. This situation can occur when two galaxies collide.

In our work we simulate the formation of such torus in several steps: firstly, we form it without considering gravitational interaction between the clouds, secondly, we take the interaction into account by using N-body simulation and finally we would like to study the torus evolution in the case of two interacting BHs at the centre. By changing the distance between the BHs we can see whether it is possible to form such structures when the torus is stable. As initial condition we use the Keplerian torus proposed by Bannikova et al. [2] Keplerian torus is an idealized object which consists of test particles moving in the gravitational field of the central mass. It is important that orbits of particles in this torus do not intersect with each other. In the next stages of our investigation we will pass from test particles to more realistic objects that have sizes and, therefore, the interaction between particles will be taken into account. The thickness of the torus is formed by the inclined orbits of the particles.

The torus can be characterized by two radii: minor R_0 and major R . It is convenient to use parameter $r_0=R_0/R$. To provide a quasi-circular cross-section of the torus we choose the semi-major axes of all orbits equal R . In this case eccentricities must not be more than r_0 , otherwise the clouds orbits would happen to extend beyond the torus surface. The expression for the inclinations measured from the symmetry plane is

$$i = \sin^{-1}\left(q \frac{e}{\sqrt{1-e^2}}\right),$$

where q is a parameter that allows us to change the ellipticity of the torus cross-section. Provided that the maximal value for $\sin i$ is 1, we obtain the maximal value of the eccentricity $e_{max}=(q^2+1)^{-0.5}$ which is the upper restriction for r_0 . Thus the highest value of the geometrical parameter r_0 is 0.7.

To calculate coordinates for each cloud we use formulae [3]

$$(x, y, z) = r * (\alpha, \beta, \gamma),$$

where

$$\alpha = \cos \Omega \cos \nu - \sin \Omega \sin \nu \cos i$$

$$\beta = \sin \Omega \cos \nu + \cos \Omega \sin \nu \cos i$$

$$\gamma = \sin \nu \sin i$$

We suppose that the argument of perihelion $\omega = 0$; the longitude of the ascending node Ω and true anomaly ν are generated randomly from 0 to 2π ; $R = 1$. The amplitude of the radius vector from the BH to the cloud is

$$r = \frac{R(1 - e^2)}{1 + e \cos \nu}$$

The components of the velocity are to be

$$\begin{pmatrix} V_x \\ V_y \\ V_z \end{pmatrix} = \frac{I}{p} \left[\begin{pmatrix} \alpha \\ \beta \\ \gamma \end{pmatrix} e \sin \nu + \begin{pmatrix} \alpha' \\ \beta' \\ \gamma' \end{pmatrix} (1 + e \cos \nu) \right],$$

where

$$(\alpha', \beta', \gamma') = \frac{d}{dv}(\alpha, \beta, \gamma)$$

and $p = R(1 - e^2)$ is a focal parameter, $I = (GMp)^{0.5}$ is the kinetic moment. We use a system in which $G = R = M = 1$. And as R equals 1, r_0 uniquely determines the minor radius of the torus.

The algorithm of the simulation of Keplerian torus is the following: first set number of the clouds, then find their initial coordinates and velocities, using the formulae shown above, solving differential equation of motion with initial conditions at every step, find new coordinates and use them to calculate the value of the total energy. Conservation of the total energy is very important for testing numerical method accuracy. To solve the equation many algorithms can be used; at the beginning we used Euler's method which gave us accuracy up to 10^{-4} , but then we started applying improved Euler's method called Heun's method which gave conservation to 10^{-5} provided that in both methods the step was 10^{-4} . Control of the energy conservation and simulation of the Keplerian torus for arbitrary number of particles are realized in the program written in C#.

To show the torus' cross-section it is convenient to use the co-moving system with the centre at the BH and which turns at the velocity of a cloud. The period of a cloud in the co-moving system equals the orbital period. Furthermore, the periods of all clouds are equal because the semi-major axes of all orbits equal unity.

The first stage of our investigation confirmed that a torus can be formed by clouds moving in inclined orbits around the central mass. We wrote the code on C# which simulates Keplerian torus for arbitrary number of particles, using both Euler's and Hune's methods. This code will be used in the future N-body simulations in which the effect of gravitational field of two BHs and interaction between clouds will be considered.

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CRACKS ON THE GLASS

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Summary: The article outlines dependence of crack density distribution on different parameters. The general theory of glass is presented at the beginning of the article and then the method of experiment is described. In conclusion some findings from the experiment and ideas for future research are elucidated.

Key words: crack density distribution, impact force, glass.

Анотація: Стаття висвітлює залежність розподілу густини тріщин від різних параметрів. На початку статті представлена загальна теорія про скло та описана методика експерименту. Насамкінець вказані деякі висновки з експерименту та ідеї для подальших досліджень.

Ключові слова: розподіл густини тріщин, сила удару, скло.

Аннотация: Статья освещает зависимость распределения плотности трещин от разных параметров. В начале статьи представлена общая теория о стекле и описана методика эксперимента. В заключение указаны некоторые выводы из эксперимента и идеи для дальнейших исследований.

Ключевые слова: распределение плотности трещин, сила удара, стекло.

So, what is the glass? Modern science gives a lot of different definitions of the term “glass”. We use the fact formulated by Mikhail Shultz, famous glass specialist: "Glass is a state of an amorphous substance which is obtained during the solidification of a supercooled liquid." [1, p. 25-26]

The term “glass” generally refers only to the type of material which is familiar from use. Of the many silica-based glasses that exist, ordinary glazing and container glass is formed from a specific type called [soda-lime glass](#), composed of approximately 75% [silicon dioxide](#) (SiO₂), [sodium oxide](#) (Na₂O) from [sodium carbonate](#) (Na₂CO₃), [calcium oxide, also called lime](#) (CaO), and several minor additives. A very clear and durable [quartz glass](#) can be made from pure silica which is very tough and resistant to thermal shock, being able to survive immersion in water while red hot. However, quartz must be heated to well over 3000 °F (1650 °C) (white hot) before it begins to melt, and it has a very narrow glass transition, making glassblowing and hot working difficult. In glasses like soda lime, the other compounds are used to lower the melting temperature and improve the temperature workability of the product at a cost in the toughness, thermal stability, and optical transmittance.

Many applications of silicate glasses derive from their optical [transparency](#) which gives rise to one of silicate glasses' primary uses as window panes. Glass will [transmit](#), [reflect](#) and [refract](#) light; these qualities can be enhanced by cutting and polishing to make optical lenses, prisms, fine glassware, and [optical fibers](#) for high speed data transmission by light. Glass can be colored by adding metallic salts, and can also be painted. These qualities have led to extensive use of glass in manufacture of [art objects](#) and, in particular, [stained glass windows](#). Since glass can be formed or molded into any shape, and also because it is a sterile product, it has been traditionally used for vessels: [bowls](#), [vases](#), [bottles](#), jars and drinking glasses. In its most solid forms it has also been used for [paperweights](#), [marbles](#), and [beads](#). When extruded as [glass fiber](#) and matted as [glass wool](#) in a way to trap air, it becomes a thermal insulating material, and when these glass fibers are embedded into an organic polymer [plastic](#), they are a key structural reinforcement part of the composite material [fiberglass](#).

In science, [porcelains](#) and many polymer [thermoplastics](#) familiar from everyday use are glasses too. These sorts of glasses can be made of quite different kinds of materials than silica: metallic [alloys](#), ionic melts, molecular liquids, and [polymers](#). For many applications, like [glass bottles](#) or [eyewear](#), polymer glasses are a lighter alternative than traditional glass [4].

The main difference between crystalline solid and glass lies in absence of periodicity of the structure and a long range order in the structure. At the same time glass cannot be called a superviscous liquid which has only a close order, i.e. relative ordering of the nearest neighboring atoms and molecules. The structure of glass is characterized by a so-called middle-order arrangement of atoms over distances, only slightly higher than the interatomic. [2]

We do not need to specify all properties of glass, so we will designate only some of them.

The first property of glass is brittleness. Brittleness is defined as the ratio of the modulus of elasticity to the tensile strength. From a reference tables it can be seen that glass is more brittle than metals, but for the same thickness is less brittle than porcelain, concrete, cement and granite. It is also evident that the higher the

Young's modulus, the greater is fragility of the material. It is determined by the strength of the impact which is produced by lowering the load on the sample from a certain height. Brittleness of glass largely depends on its chemical composition.

And the second property is dualism of mechanical properties: during rapid load the glass behaves like a Hookean solid and during low load – like a viscous Newtonian fluid. In the Newtonian fluid the shear stress is transferred layers of material connected to each other. These shear stresses are proportional to the velocity

$$\tau = \eta \frac{dv}{dx}$$

gradient

$$\tau = \eta \frac{dv}{dx} = \eta \frac{d}{dx} \left(\frac{dy}{dt} \right) = \eta \frac{d}{dt} \left(\frac{dy}{dx} \right), \text{ where } \frac{dy}{dx} = \gamma$$

, where η – viscosity. If

shear deformation, then $\tau = \eta \frac{d\gamma}{dt}$ (1), where τ – shear stress and $\frac{d\gamma}{dt}$ – rate of deformation. Thus, a stress is proportional to the strain rate. This ratio differs from Hooke's law for solids, according to which a stress is proportional to the strain. The relative contribution of the elastic and the viscous components of deformation of viscoelastic solids such as glass can be associated with time τ . This time is determined from the

$$\tau = \eta \frac{d\gamma}{dt} = \frac{\tau}{G}$$

ratio

(2), where G is the instantaneous value of the elastic shear modulus in the

absence of viscous flow. Combining the expressions (1) and (2), we have $\tau = \eta \frac{d\gamma}{dt} = \frac{\tau}{G}$. That is equal to the interval of time over which the viscous deformation reaches the elastic deformation.

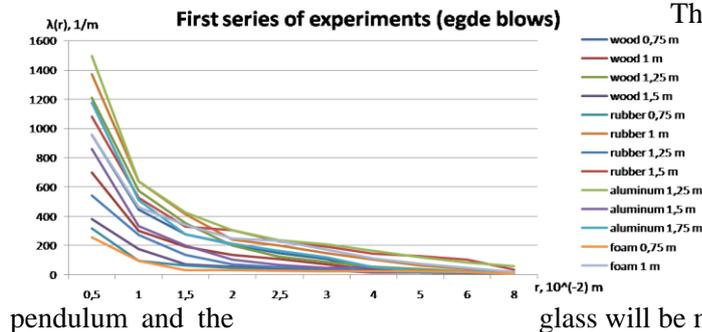
What properties of the glass dominate – elastic or viscous, – depends on the duration of load to the relaxation time. For glasses $G \approx 30 \frac{GN}{m^2}$, and η at room temperature is $10^{13} \frac{N \times s}{m^2}$, or even bigger. Hence τ equals to 330 s. Therefore, under normal load short, leading to failure at room temperature, glass is an elastic material. At

temperatures, for which manual processing is possible (400–600 °C), viscosity decreases to $10^7 \frac{N \times s}{m^2}$, which reduces τ to $3,3 \times 10^{-4}$ s. Under these conditions, at normal strain rates glass is a viscous liquid. [3]

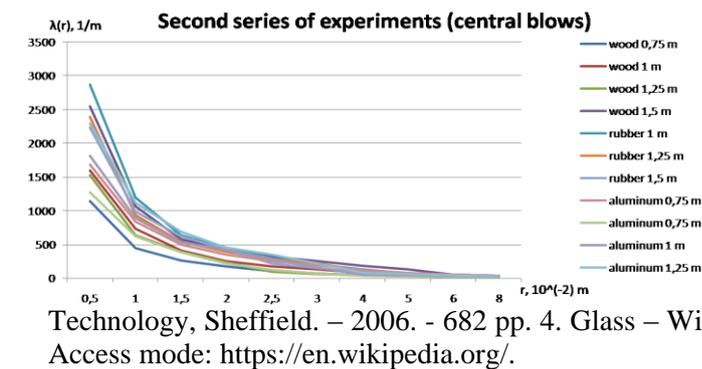
Let us move on to the method of experiment. For its realization we used a laboratory tripod with a two-toed foot, a metal ball, cut glass, and various types of substrates – wood, rubber, aluminum and foam. For recording of the experiment results we made a target from a plexiglas. We used the following technique: tripod foot was set at a certain height, a metal ball was fixed in it. Then we prepared a specific substrate, a glass sample was placed on it. The sample and the substrate were covered with a polyethylene film to avoid any possible dispersion of small fragments of glass. Then the screw of the fastening of the foot was loosed, and the ball fell on the sample. The point of impact of the ball on the sample aligned with the center of the target, and the number of cracks intersecting each of the 10 circles was measured. The results (the number of cracks on the current distance from the center) were recorded in the table and then by dividing over the length of corresponding circle were led to a linear density of cracks on the sample. The resulting graphics was processed in the application package OriginLab, and thus we found the functions that define the graphics. We carried out a lot of series of experiments by changing parameters such as sample size, the height of the fall of a metal ball, impact site (central or edge) and substrate material.

As a result, we have found the general dependence of the linear density of the cracks in the form $\lambda(r) = a \times r^b$, with $b < 0$. Also we found out how the distribution of density of cracks will depend on the following parameters:

- impact force: with its increase coefficient a grows, while the behavior of the exponent b is different for different substrate materials;
- point of impact: the behavior of the coefficient a is different for different substrate materials, for the edge blow exponent b is less than for the central blow;
- sample thickness: with its increase the behavior of the coefficient a is different for different substrate materials, the exponent b grows.



Thus, it was found that the substrate material plays an important role in determining the significance of the coefficient a and the exponent b . In the future we are going to conduct a series of experiments by getting rid of the substrate to find out how the distribution will depend on the density of cracks in this case. To do this we need to change the method of the experiment in the following way: instead of the tripod with a foot we will use the calibrated glass will be mounted in a frame.



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USING MULTICORE PROCESSORS IN EMBEDDED COMPUTING SYSTEMS

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Summary: The advent of multicore processors is putting greater demands on applications and the programmers who build them. In a symmetrical multi-processing model, certain mechanisms built into the RTOS can greatly ease that burden.

Key words: embedded computing systems, multicore processors, real-time operating systems.

Анотація: Стаття присвячена появі багатоядерних процесорів, у результаті яких ставляться більш високі вимоги до програмного забезпечення і програмістів, які створюють його. У симетричній моделі мульти-обробки, певні механізми, вбудовані в ОС реального часу можуть вирішити цю проблему.

Ключові слова: багатоядерні процесори, вбудовані обчислювальні системи, операційні системи реального часу.

Аннотация: Статья посвящена появлению многоядерных процессоров, в результате которых появляются более высокие требования к программному обеспечению и программистам, которые создают его. В симметрической модели мульти-обработки, определенные механизмы, встроенные в ОС реального времени могут решить эту проблему.

Ключевые слова: встроенные вычислительные системы, многоядерные процессоры, операционные системы реального времени.

Many of the developments in silicon, software and development tools that embedded engineers use today first appeared in disciplines other than embedded computing, and have been adopted and adapted from

these other disciplines to meet the requirements of embedded projects. Moore's prediction that transistor density would double every year has been realized, driven primarily by the thirst for higher performance. It can be roughly summarized as "shrink the silicon and increase the clock speed». However, the traditional approach to the development of superscalar microprocessors, where performance gain was derived largely by increasing the frequency, is failing to meet the performance and power requirements of the next generation of microprocessors. [2, 4].

The world's leading manufacturers are offering dual-core microprocessors to address these increasingly stringent requirements. Power consumption is especially critical for power-sensitive embedded systems, such as network communication implementations, where dual-core devices offer a favorable performance/watt trade-off. Beyond just the processing power offered by an additional core, higher integration reduces bottlenecks in bandwidth [4]. For years, processor performance has increased, following Moore's Law, at a rate of 2x every 18 months. But, in October 2004, Intel acknowledged that power consumption was making it more and more difficult to continue to boost clock speed, and canceled plans for a 4.0 GHz Pentium 4. Instead, it announced that it was working on two other methods that it called "dual core" and "hyper threading." The former combines two microprocessors onto one piece of silicon, while the latter breaks down processing jobs into multiple parts [1]. HT Technology allows a single processor or processor core to handle two independent sets of instructions at the same time. In essence, HT Technology converts a single physical processor core into two virtual processors [5]. Intel was not the first to embrace multiple processors as a way to increase performance, and since their announcement in 2004, other manufacturers have released products that incorporate multiple processors and multithreading [1].

It is known, that [multicore](#) processors offer a solution to the need for mixing new features with legacy code and combining multiple operating environments on the same system. Compared to traditional embedded systems composed of multiple subsystems, a highly integrated system can be constructed with real-time software components and human-directed elements running on separate cores in a single processing system, decreasing system manufacturing and maintenance costs by eliminating redundant hardware.

Today, systems are applying processor cores to separate, distinct operating environments for both Real-Time Operating Systems (RTOSs) and General-Purpose Operating Systems (GPOSs) [3].

It should be also mentioned that architectural improvements such as caches, pipelining, FPUs, superscalar architectures and hyper threading have also played their part in increasing system performance. These improvements have combined to provide system with increasing performance and lower cost, and all without having to make a single change to the software [2].

The advent of multicore processors is putting greater demands on applications and the programmers who build them. In a symmetrical multi-processing model, certain mechanisms built into the RTOS can greatly ease that burden [1]. Computing with several CPUs was provided by SMP (Symmetrical Multiprocessing) long ago, and companies like Cray, Amdahl and IBM have been making a good living out of building Supercomputers with tens, hundreds or even thousands of computing elements for even longer than that.

All processors in an SMP system have access to the same physical memory. Since they all have identical instruction sets as well, a process or thread can run on any processor from the same memory location. This is a key to adapting an application to SMP architecture [1].

However, while multiprocessors offer exciting opportunities for power-efficient performance increase, achieving the goals of code reuse and fast development times are serious challenges. Traditional programming paradigms are single-processor-oriented, with logic that isn't easily split among processors. Programming tools to assist in the mapping of applications to multiple processors are not generally available. However, there is an opportunity to use software that lies between the application and the multiprocessor to help abstract the hardware for the application – the operating system. In embedded applications, this means the real-time operating system (RTOS) that is found in most intelligent devices to help manage multiple tasks or threads of operation.

Typically, the RTOS is used to handle interrupts and manage the scheduling of application threads. A thread is a sequence of logically complete code that performs a particular role. Embedded real-time applications generally are made up of multiple threads, each performing its intended function. In a multiprocessor system, in addition to these services, the RTOS can also distribute processing across all processors – this frees the application from deciding what should be programmed to run and where.

To achieve minimum power consumption, the RTOS can adjust clock frequency or shut down individual processors to conserve power during periods of light demand. Using the RTOS enables a "write once, run anywhere" approach that maximizes code reuse across multiple architectures, whether they are single processor or multiple processor. These RTOS capabilities combine to make the developer's job easier. And that

is the key to enable shorter, less risky development projects with faster time-to-market, while still reaping the benefits of a complex multiprocessor architecture [1].

One method of achieving programming transparency in a multiprocessor system is to assign individual threads to run on specific processors based on the availability of the processor. In this way, the processing load can be shared among processors with work automatically assigned to a free processor. The RTOS must determine whether a processor is free and if it is, then a thread can be run on that processor even though the other processors may already be running other threads.

In order to utilize such an approach, the developer must set up multiple, identical threads, allocate threads to process portions of the data stream, and set equal priorities. Preemption occurs when a thread is made *ready* to run while a lower priority thread is already running. In this event, the lower priority thread is suspended (context saved), the higher priority thread is started (context restored or initialized), and any lower priority threads on other processors are suspended. This is critical to maintain the priority order of executing threads [1].

Within this automatic load-balancing approach to managing the resources of an SMP like ARM's MPCore, additional features are beneficial to overall performance. One processor can be made responsible for all external interrupt handling (this does not include interprocessor interrupts needed for synchronization or communication). This leaves the other processor(s) with virtually zero overhead from interrupt handling, enabling it (them) to focus all of its (their) cycles on application processing, even during periods of intense interrupt activity that otherwise might degrade performance.

Figure 1, which shows a two-processor system that is intended to handle a continuous stream of incoming data, such as streaming video. The data must be decompressed in real time. This is a typical data flow and processing model using an RTOS with automatic load-balancing support for an SMP.

Input is set up to fill Buffer 1 in memory, with an interrupt generated upon a buffer-full condition (or based on input of a specified number of bytes). As Buffer 1 reaches a full condition, Interrupt 1 is generated. In response, the ISR handling Interrupt 1 marks Thread 1 READY-TO-RUN (as the highest-priority), and the scheduler runs Thread 1 on Processor 1. Simultaneously, data is directed to Buffer 2, and processor 2 remains idle for the moment [1].

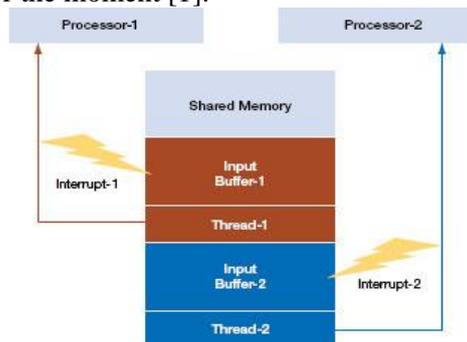


Figure 2 In this example, two processors are allocated by the RTOS to work on separate data sets as they arrive in the system.

Then, as more data arrives while Thread 1 is active, Buffer 2 fills up, generating Interrupt 2. The ISR handling Interrupt 2 marks Thread 2 READY-TO-RUN, and the scheduler runs Thread 2 on Processor 2, while Thread 1 continues to run on Processor 1.

An RTOS that can manage an SMP system can provide increased performance compared to a single processor system, while minimizing demand on the development of applications. This delivers the benefit of greater performance with little effort, making SMP architectures very attractive for embedded applications requiring high performance, but with stringent demands on fast time-to-market [1].

So, we have seen that the semiconductor industry can no longer rely on Moore's Law to meet the demand for increased performance in computer systems. As a matter of fact, Parallel Processing, provided by multicore processors, before found only in exotic supercomputers, now seems to offer a new way to increase performance, but adding extra cores by itself does not guarantee its increasing. It seems more profitable to optimize the operating systems and applications within to take advantage of the potential benefits of multicore processors. It turns out that now the main way to provide extra embedded system performance is to apply specialized tools and techniques for the creation of optimized, multithreaded programs which can fully use advantages of the new hardware multicore architectures.

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HISTORY OF ROADS
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Summary: The article deals with the history of roads, road-building materials, the methods of road-building as well as the activities of well-known engineers – road-builders. The article is very cognitive as it traces the history of road-building, which is of great interest not only for a student majoring in engineering but for a vast audience as well.

Key words: track, traffic, load, drainage, incline, vehicle, pavement, highway, traffic flow, roadway.

Анотація: Стаття розглядає історію доріг, дорожньо-будівельні матеріали, методи будівництва доріг, а також діяльність відомих інженерів - шляховиків. Стаття дуже пізнавальна, так як в ній простежується історія будівництва доріг, яка викликає великий інтерес не тільки серед студентів технічних спеціальностей, але і серед великої аудиторії.

Ключові слова: дорога, рух, навантаження, дренаж, нахил, автомобіль, дорожнє покриття, автомагістраль, дорожній потік, проїжджа частина.

Аннотация: Статья рассматривает историю дорог, дорожно-строительные материалы, методы строительства дорог, а также деятельность известных инженеров - дорожников. Статья очень познавательная, так как в ней прослеживается история строительства дорог, которая представляет большой интерес не только для студентов технических специальностей, но и для большой аудитории.

Ключевые слова: дорога, движение, нагрузка, дренаж, наклон, автомобиль, дорожное покрытие, автомагістраль, дорожний потік, проезжая часть.

Early roads

The first forms of road transport were horses, oxen or even humans carrying goods over tracks that often followed game trails, such as the Natchez Trace. In the Stone Age humans did not need constructed tracks in open country. The first improved trails would have been at fords, mountain passes and through swamps. The first improvements would have consisted largely of clearing trees and big stones from the path. As commerce increased, the tracks were often flattened or widened to accommodate human and animal traffic. Some of these dirt tracks were developed into fairly extensive networks, allowing communications, trade and governance over wide areas. The Incan Empire in South America and the Iroquois Confederation in North America, neither of which had the wheel, are examples of the effective use of such paths.

The first goods transport was on human backs and heads, but the use of pack animals, including donkeys and horses, developed during the Stone Age. The first vehicle is believed to have been the travois, a frame used to drag loads, which probably developed in Eurasia after the first use of bullocks (castrated cattle) for pulling ploughs. In about 5000 BC, sleds developed, which are more difficult to build than travois, but are easier to propel over smooth surfaces. Pack animals, ridden horses and bullocks dragging travois or sleds require wider paths and higher clearances than people on foot and improved tracks were required. As a result, by about 5000 BC roads, including the Ridgeway, developed along ridges in England to avoid crossing rivers and bogging. In central Germany, such ridgeways remained the predominant form of long-distance road till the mid-18th century.

Wheeled transport

A Greek street - 4th or 3rd century BC - The Porta Rosa was the main street of Elea. It connects the northern quarter with the southern quarter. The street is five meters wide and has an incline of 18% in the steepest part. It is paved with limestone blocks and on one side there is a small gutter for drainage.

Wheels appear to have been developed in ancient Sumer in Mesopotamia around 5000 BC, perhaps originally for the making of pottery. Their original transport use may have been as attachments to travois or sleds to reduce resistance. It has been argued that logs were used as rollers under sleds prior to the development of wheels, but there is no archeological evidence for this. Most early wheels appear to have been attached to fixed axles, which would have required regular lubrication by animal fats or vegetable oils or separation by

leather to be effective. The first simple two-wheel carts, apparently developed from travois, appear to have been used in Mesopotamia and northern Iran in about 3000 BC and two-wheel chariots appeared in about 2800 BC. They were hauled by onagers, related to donkeys.

Heavy four-wheeled wagons developed about 2500 BC, which were only suitable for oxen-haulage, and therefore were only used where crops were cultivated, particularly in Mesopotamia. Two-wheeled chariots with spoked wheels appear to have been developed around 2000 BC by the Andronovo culture in southern Siberia and Central Asia. At much the same time the first primitive harness enabling horse-haulage was invented.

Wheeled-transport created the need for better roads. Generally natural materials cannot be both soft enough to form well-graded surfaces and strong enough to bear wheeled vehicles, especially when wet, and stay intact. In urban areas it began to be worthwhile to build stone-paved streets and, in fact, the first paved streets appear to have been built in Ur in 4000 BC.

Roman roads

With the advent of the Roman Empire, there was a need for armies to be able to travel quickly from one area to another, and the roads that existed were often muddy, which greatly delayed the movement of large masses of troops. To solve this problem, the Romans built great roads. These 'Roman roads' used deep roadbeds of crushed stone as an underlying layer to ensure that they kept dry, as the water would flow out from the crushed stone, instead of becoming mud in clay soils. The legions made good time on these roads and some are still used millennia later.

On the more heavily traveled routes, there were additional layers that included six sided capstones, or pavers, that reduced the dust and reduced the drag from wheels. The pavers allowed the Roman chariots to travel very quickly, ensuring good communication with the Roman provinces. Farm roads were often paved first on the way into town, to keep produce clean. Early forms of springs and shocks to reduce the bumps were incorporated in horse-drawn transport, as the original pavers were sometimes not perfectly aligned [1, p. 23].

New road networks

As states developed and became richer, especially with the Renaissance, new roads and bridges began to be built, often based on Roman designs. Although there were attempts to rediscover Roman methods, there was little useful innovation in road building before the 18th century.

Between 1725 and 1737 General George Wade constructed 250 miles (400 km) of road and 40 bridges to improve Britain's control of the Scottish Highlands, using Roman road designs with large stones at the bottom and gravel on top, with a typical overall depth of two metres. They were so poorly aligned and steep, according to Thomas Telford, "as to be unfit for the purposes of civil life" and also rough and poorly drained [2, p. 401].

Toll roads

The Great North Road near Highgate on the approach to London appeared before turnpiking. The highway was deeply rutted and spread onto adjoining land. Responsibility for the state of the roads lay with the local parish since Tudor times. In 1656 the parish of Radwell, Hertfordshire petitioned the Parliament for help to maintain their section of the Great North Road. The Parliament passed an act that gave the local justices powers to erect toll-gates on a section of the Great North Road, between Wadesmill, Hertfordshire; Caxton, Cambridgeshire; and Stilton, Huntingdonshire for a period of eleven years and the revenues so raised should be used for the maintenance of the Great North Road in their jurisdictions. The toll-gate erected at Wadesmill became the first effective toll-gate in England.

The first scheme that had trustees who were not justices was established through a Turnpike Act in 1707, for a section of the London-Chester road between Farnhill and Stony Stratford. The basic principle was that the trustees would manage resources from the several parishes through which the highway passed, augment this with tolls from users from outside the parishes and apply the whole to the maintenance of the main highway. This became the pattern for the turnpiking of a growing number of highways, sought by those who wished to improve flow of commerce through their part of a county [3, p. 67].

Turnpikes were also built later in the United States. They were usually built by private companies under a government franchise. They typically paralleled or replaced routes already with some volume of commerce, hoping the improved road would divert enough traffic to make the enterprise profitable. Plank roads were particularly attractive as they greatly reduced rolling resistance and mitigated the problem of getting mired in mud. Another improvement, better grading to lessen the steepness of the worst stretches, allowed draft animals to haul heavier loads.

Industrial civil engineering

Metcalf

By the late 18th and early 19th centuries, new methods of highway construction had been pioneered by the work of two British engineers, Thomas Telford and John Loudon McAdam, and by the French road engineer Pierre-Marie-Jérôme Trésaguet.

The first professional road builder to emerge during the Industrial Revolution was John Metcalf, who constructed about 180 miles (290 km) of turnpike road, mainly in the north of England, from 1765, when Parliament passed an act authorising the creation of turnpike trusts to build new toll funded roads in the Knaresborough area. Metcalf won a contract to build a three-mile (5 km) section of road between Minskip and Ferrensby on a new road from Harrogate to Boroughbridge. He explored the section of countryside alone and worked out the most practical route.

He believed a good road should have good foundations, be well drained and have a smooth convex surface to allow rainwater to drain quickly into ditches at the side. He understood the importance of good drainage, knowing it was rain that caused most problems on the roads. He worked out a way to build a road across a bog using a series of rafts made from ling (a type of heather) and furze (gorse) tied in bundles as foundations. This established his reputation as a road builder since other engineers had believed it could not be done. He acquired a mastery of his trade with his own method of calculating costs and materials, which he could never successfully explain to others.

Macadam

It was another Scottish engineer, John Loudon McAdam, who designed the first modern roads. He developed an inexpensive paving material of soil and stone aggregate (known as macadam). His road building method was simpler than Telford's, yet more effective at protecting roadways: he discovered that massive foundations of rock upon rock were unnecessary, and asserted that native soil alone would support the road and traffic upon it, as long as it was covered by a road crust that would protect the soil underneath from water and wear [4, p. 277].

Also, unlike Telford and other road builders, McAdam laid his roads as level as possible. His 30-foot-wide (9.1 m) road required only a rise of three inches from the edges to the center. Cambering and elevation of the road above the water table enabled rain water to run off into ditches on either side.

The size of stones was central to McAdam's road building theory. The lower 200-millimetre (7.9 in) road thickness was restricted to stones no larger than 75 millimetres (3.0 in). The upper 50-millimetre (2.0 in) layer of stones was limited to 20 millimetres (0.79 in) size and stones were checked by supervisors who carried scales. A workman could check the stone size himself by seeing if the stone would fit into his mouth. The importance of the 20 mm stone size was that the stones needed to be much smaller than the 100 mm width of the iron carriage tyres that traveled on the road [5, p. 98].

Modern roads

Macadam roads were adequate for use by horses and carriages or coaches, but they were very dusty and subject to erosion with heavy rain. The Good Roads Movement occurred in the United States between the late 1870s and the 1920s. Advocates for improved roads led by bicyclists turned local agitation into a national political movement.

Outside cities, roads were dirt or gravel; mud in the winter and dust in the summer. Early organizers cited Europe where road construction and maintenance was supported by national and local governments. In its early years, the main goal of the movement was to provide education for road building in rural areas between cities and to help rural populations gain the social and economic benefits enjoyed by cities where citizens benefited from railroads, trolleys and paved streets. Even more than traditional vehicles, the newly invented bicycles could benefit from good country roads.

Later on, they did not hold up to higher-speed motor vehicle use. Methods to stabilise macadam roads with tar date back to at least 1834 when John Henry Cassell, operating from *Cassell's Patent Lava Stone Works* in Millwall, patented "Pitch Macadam". This method involved spreading tar on the subgrade, placing a typical macadam layer, and finally sealing the macadam with a mixture of tar and sand. Tar-grouted macadam was in use well before 1900, and involved scarifying the surface of an existing macadam pavement, spreading tar, and re-compacting. Although the use of tar in road construction was known in the 19th century, it was little used and was not introduced on a large scale until the motorcar arrived on the scene in the early 20th century.

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WHAT EXACTLY IS GITHUB ANYWAY?

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Summary: The article deals with a Web-based Git repository hosting service. It offers all of the distributed revision control and source code management (SCM) functionality of Git as well as addition of its own features. Unlike Git, which is strictly a command-line tool, GitHub provides a Web-based graphical interface and desktop as well as mobile integration. It also provides access control and several collaboration features such as bug tracking, feature requests, task management, and wikis for every project.

Key words: Git, GitHub, hosting, project, repository, SCM.

Анотація: У статті розповідається про веб-орієнтований Git-хостинг. Він пропонує всі види розподіленого контролю та управління вихідним кодом за допомогою (SCM) функціональності Git, а також деякі свої особливі можливості. На відміну від Git, який є тільки інструментом терміналу, GitHub надає веб-орієнтований графічний інтерфейс, комп'ютерну програму, а також мобільний додаток. Система також дає можливість контролю доступу і кілька функцій спільної роботи, таких як відстежування помилок, побажання, управління завданням і вікі для кожного проекту.

Ключові слова: Git, GitHub, SCM, проект, репозитарій, хостинг.

Аннотация: В статье рассказывается о веб-ориентированном Git-хостинге. Он предлагает все виды распределенного контроля и управления исходным кодом с помощью (SCM) функциональности Git, а также некоторые свои особые возможности. В отличие от Git, который является только инструментом терминала, GitHub предоставляет веб-ориентированный графический интерфейс, компьютерную программу, а также мобильное приложение. Система также дает возможность контроля доступа и несколько функций совместной работы, таких как отслеживание ошибок, пожелания, управления задачей, и вики для каждого проекта.

Ключевые слова: Git, GitHub, SCM, проект, репозитарий, хостинг.

Andreessen Horowitz (a \$4 billion venture capital firm, founded in 2009 by Marc Andreessen and Ben Horowitz. The company is headquartered in Menlo Park, California.) announced a whopping \$100 million investment in GitHub. You can read commentary and speculation all over the web about what GitHub will do with the money, whether this was a good investment for Andreessen Horowitz and whether taking such a large investment is a good thing for GitHub.

But what the heck is GitHub and why are developers so excited about it? You may have heard that GitHub is a code sharing and publishing service, or that it is a social networking site for programmers. Both statements are true, but neither explains exactly why GitHub is special.

At the heart of GitHub is Git, an open source project started by Linux creator Linus Torvalds. Matthew McCullough, a trainer at GitHub, explains that Git, like other version control systems, manages and stores revisions of projects. Although it is mostly used for code, McCullough says Git could be used to manage any other type of file, such as Word documents or Final Cut projects. Think of it as a filing system for every draft of a document.

Some of Git's predecessors, such as CVS and Subversion, have a central "repository" of all the files associated with a project. McCullough explains that when a developer makes changes, those changes are made directly to the central repository. With distributed version control systems like Git, if you want to make a change to a project, you copy the whole repository to your own system. You make your changes on your local copy, then you "check in" the changes to the central server. McCullough says this encourages the sharing of more granular changes since you don't have to connect to the server every time you make a change.

GitHub is a Git repository hosting service, but it adds many of its own features. While Git is a command line tool, GitHub provides a Web-based graphical interface. It also provides access control and several collaboration features, such as a wikis and basic task management tools for every project.

The flagship functionality of GitHub is "forking" – copying a repository from one user's account to another. This enables you to take a project that you do not have, write access to it and modify it under your own account. If you make changes you'd like to share, you can send a notification called a "pull request" to the original owner. That user can then, with a click of a button, merge the changes found in your repo with the original repo.

These three features – fork, pull request and merge – are what make GitHub so powerful. Gregg Pollack of Code School (which just launched a class called TryGit) explains that before GitHub, if you wanted to contribute to an open source project you had to manually download the project's source code, make your changes locally, create a list of changes called a "patch" and then e-mail the patch to the project's maintainer.

The maintainer would then have to evaluate this patch, possibly sent by a total stranger, and decide whether to merge the changes.

This is where the network effect starts to play a role in GitHub, Pollack explains. When you submit a pull request, the project’s maintainer can see your profile, which includes all of your contributions on GitHub. If your patch is accepted, you get credit on the original site, and it shows up in your profile. It’s like a resume that helps the maintainer determine your reputation. The more people and projects are on GitHub, the better idea picture a project maintainer can get of potential contributors. Patches can also be publicly discussed.

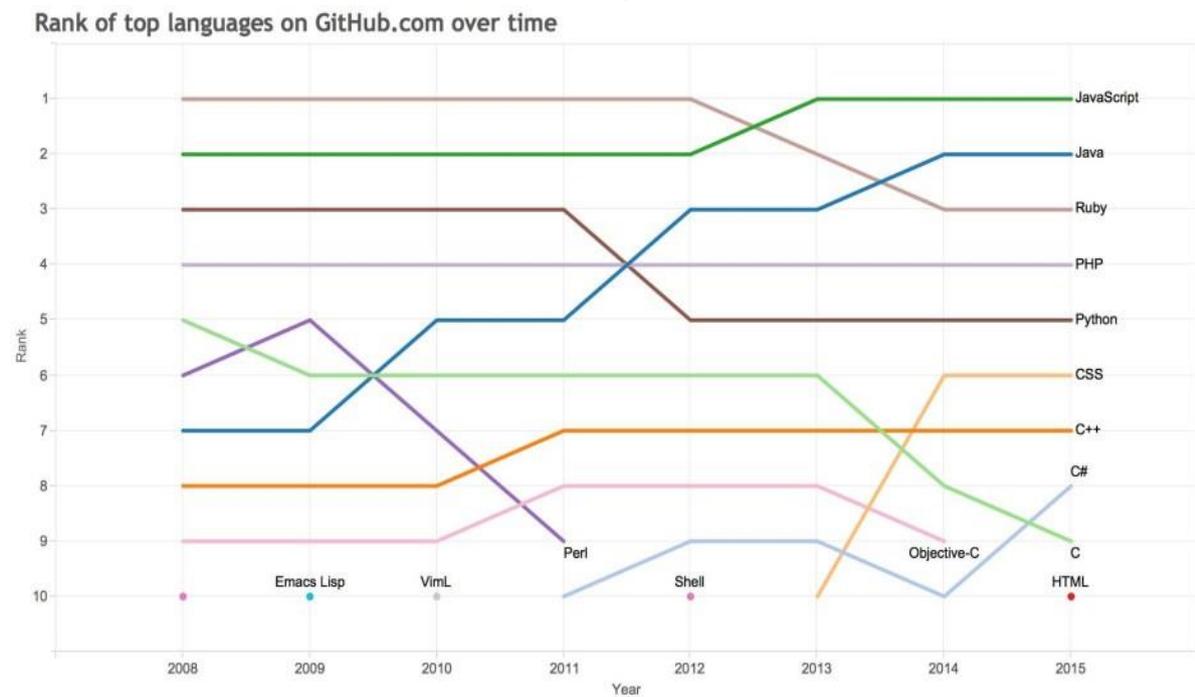
Even for maintainers who don’t end up using the GitHub interface, GitHub can make contribution management easier. “I end up just downloading the patch anyway, or merging from the command line instead of from the merge button,” says Isaac Schlueter, the maintainer of the open source development platform Node.js. “But GitHub provides a centralized place where people can discuss the patch.”

Lowering the barrier to entry democratizes open source development, and helps young projects grow. “Node.js wouldn’t be what it is today without GitHub,” Schlueter says.

Besides its public facing open source repositories, GitHub also sells private repositories and on-premise instances of its software for enterprises. These solutions obviously can’t take full advantage of GitHub’s network effect, but they can take advantage of the collaboration features. That’s how GitHub makes money, but it is not alone in this market.

Atlassian acquired a competitor called BitBucket in 2010. And earlier this year Atlassian launched Stash, a product that enables you to host private, on-premise Git repositories with BitBucket/GitHub-style collaboration features. The company also sells developer collaboration tools like the bug tracker Jira and the wiki Confluence. Competition from Atlassian, which took \$60 million in funding from Accel Partners in 2010, could help explain why GitHub took this round of funding, and hint at some possible future directions for the company. For example, Schlueter says GitHub’s issue tracking feature could eventually compete with JIRA for some projects, the greatest developers in the world and find out how they solved thorny problems. But if GitHub were ever to meet the same fate as the Library of Alexandria, it could be reconstructed from all those local forks distributed on so many developers laptops all over the world. Regardless of how this investment works out, that’s a hell of a legacy for the GitHub team to leave behind. Money may be in private and on-premise hosting, but the love is in the public repositories. Perhaps most importantly, GitHub has become the Library of Alexandria for code examples. Since Git encourages granular recording of changes, programmers, be they absolute beginners or experts, can trace the steps of some of the greatest developers in the world and find out how they solved thorny problems. But if GitHub were ever to meet the same fate as the Library of Alexandria, it could be reconstructed from all those local forks distributed on so many developers laptops all over the world. Regardless of how this investment works out, that is a hell of a legacy for the GitHub team to leave behind [2].

Statistics



Source: GitHub.com

GitHub today shared a closer look at how the popularity of programming languages used on its code collaboration website has changed over the years. In short, the graph above shows the change in rank for programming languages since GitHub launched in 2008 all the way to what the site's 10 million users are using for coding today.

The big climber is of course Java: The programming language grew more than any other language between 2008 and 2015. GitHub attributes the big rank change, from seventh to second, due to growing Android popularity, which in turn results in demands for business and enterprise version control.

Other noticeable trends can be explained by specifics to GitHub. The trend line for Ruby on Rails, for example, is likely due to the fact the programming language has been on GitHub since 2008.

The rank is represented by languages used in public and private repositories, excluding forks. It is calculated by a GitHub project called Linguist [3].

Some facts about GITHUB

1. GitHub, Inc. was originally known as Logical Awesome.
2. Software engineers pay monthly fees for the rest of their lives in order to create free software out of other free software.
3. Linus Torvalds has himself hosted the Linux kernel source tree on GitHub. And he works very actively on it.
4. Approximately two-thirds of the employees at GitHub work remotely.
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УДК 339.9:338.439.053.23

3D PRINTING NOWADAYS **Bondarenko K. O., Rode D. M. (Kharkiv)** **Language supervisor: Sharun Yu.F.**

Summary: This article focuses on basic technologies, related to 3D printers. In particular, article includes the description of main aspects of modeling objects, as well as the most common methods of printing them. A great attention is paid for the scope of application of these devices. Final part contains tips on purchasing of printers and, like an example, a short technical overview of two the most popular non-commercial devices nowadays.

Key words: additive manufacturing, 3D printers, 3D printing, 3d scanners.

Анотація: У даній статті розглядаються основні технології, пов'язані з 3D принтерами. Зокрема, стаття включає опис ключових аспектів моделювання об'єктів, а також найбільш поширених методів їх друку. Велику увагу приділено питанню про сферу застосування даних пристроїв. У заключній частині статті містяться поради з придбання принтерів і, як приклад, короткий технічний огляд двох найбільш популярних на сьогоднішній день непромислових пристроїв.

Ключові слова: аддитивне виробництво, 3D принтери, 3D друк, 3D сканери.

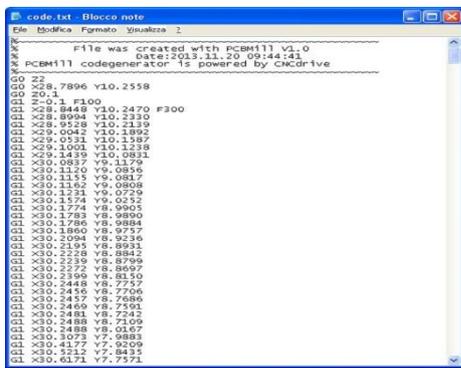
Аннотация: В статье рассматриваются основные технологии, связанные с 3D принтерами. Автор описывает ключевые аспекты моделирования объектов, а также наиболее распространённые методы их печати. Большое внимание уделено вопросу о сфере применения данных устройств. Показаны советы по приобретению принтеров и краткий технический обзор двух наиболее популярных на сегодняшний день непромышленных устройств.

Ключевые слова: аддитивное производство, 3D принтеры, 3D печать, 3D сканеры.

We have set out to create a brief, yet informative guide on 3D printing, how it works, and the various technologies involved. We hope it will teach you a little bit about the technology and perhaps act as a springboard for your creativity to run wild.

Invented by a man named Chuck Hull back in 1986, 3D printing is a process of taking a digital 3D model and turning that digital file into a physical object [1].

The creation of a 3D printed object is achieved using additive processes. In an additive process an object is created by laying down successive layers of material until the entire object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object [2].



```
code.txt - Blocco note
File was created with PCBMill v1.0
Date: 2013.11.20 09:44:41
PCBMill codegenerator is powered by CNCdrive
G0 Z8.7896 Y10.2558
G0 Z0.1 F100
G1 X28.8448 Y10.2470 F300
G1 X28.8904 Y10.2130
G1 X28.9528 Y10.2139
G1 X29.0042 Y10.1892
G1 X29.0531 Y10.1587
G1 X29.1003 Y10.1238
G1 X29.1439 Y10.0831
G1 X30.0837 Y9.1179
G1 X30.1120 Y9.0856
G1 X30.1135 Y9.0817
G1 X30.1162 Y9.0808
G1 X30.1174 Y9.0759
G1 X30.1774 Y9.0905
G1 X30.1788 Y9.0889
G1 X30.1786 Y9.0884
G1 X30.1860 Y9.9757
G1 X30.2094 Y9.9236
G1 X30.2195 Y9.8931
G1 X30.2228 Y9.8842
G1 X30.2239 Y9.8799
G1 X30.2272 Y9.8697
G1 X30.2399 Y9.8150
G1 X30.2448 Y9.7757
G1 X30.2456 Y9.7706
G1 X30.2457 Y9.7686
G1 X30.2469 Y9.7551
G1 X30.2481 Y9.7242
G1 X30.2488 Y9.7109
G1 X30.2488 Y9.0167
G1 X30.3073 Y7.9883
G1 X30.4177 Y7.9209
G1 X30.5232 Y7.8439
G1 X30.6171 Y7.7371
```

How Do 3D Printers Work?

It all starts with making a virtual design of the object you want to create. This virtual design is made in a CAD (Computer Aided Design) file using a 3D modeling program (for the creation of a totally new object) or with the use of a 3D scanner (to copy an existing object). A 3D scanner makes a 3D digital copy of an object. 3d scanners use different technologies to generate a 3d model such as time-of-flight, structured/modulated light, volumetric scanning and many more [2].

Computers are not like humans; they can't just look at a 3D model and simply tell their friend 'Mr. 3D Printer' what to print. A lot of 1s and 0s are involved, meaning lots and lots of computer codes. Once a 3D model is designed or simply downloaded off a repository

like Thingiverse, the file must be converted into something called G-code. G-code is a numerical control computer language used mainly for computer aided manufacturing [1].

G-code is a language in which people tell computerized machine tools how to do something. The "how" is defined by instructions on where to move, how fast to move, and what path to move [4].

Once the G-code is created it can be sent to the 3D printer, providing a blueprint as to what its next several thousand moves will consist of. These steps all contribute to the complete fabrication of a physical object. There are other computer languages out there, but for now G-code is by far the most important [1].

Let us now examine different technologies which are used in 3D printing:

Fused Deposition Modeling (FDM)/Fused Filament Fabrication (FFF).

This method is really a type of extrusion which is usually used to make ABS or other plastic models. It can be also used with eutectic metals and even edible substances. Machines utilizing FDM can be relatively inexpensive. There are even do-it-yourself kits for those who don't think accuracy matters. Some of you may be familiar with MakerBot, a common FDM machine [3].

Stereolithography (SLA).

This technology involves a vat of liquid ultraviolet curable photopolymer resin and an ultraviolet laser to build the object's layers one at a time. For each layer, the laser beam traces a cross-section of the part pattern on the surface of the liquid resin. Exposure to the ultraviolet laser light cures and solidifies the pattern traced on the resin and links it to the layer below [2].

Typically SLA machines are able to achieve far better accuracy and less of a layered appearance than FDM/FFF technology can [1].

Selective Laser Sintering (SLS)/Selective Laser Melting (SLM)/Direct Metal Laser Sintering (DMLS).

All these technologies are very similar, yet have significant differences. Both SLS and DMLS are in fact the same technology. The difference in terminology is based on the materials used. DMLS specifically refers to the layer-by-layer sintering of metal powders by using a laser beam, while SLS is simply the same process but with non-metal materials such as plastics, ceramics, glass, etc. [1].

On the other hand, when dealing with metals consisting of one material, for instance titanium, SLM is the way to go as a laser is able to completely melt the molecules together [2].

All three processes are currently expensive, and don't fit to the budgets of most individuals and even small businesses.

PolyJetting.

In this process, material is applied in droplets through a small diameter nozzle, similar to the way a common inkjet paper printer works, but it is applied layer-by-layer to a build platform making a 3D object and then hardened by UV light [2]. A technology invented by the Israeli company Objet. Stratasys currently uses such technologies within their popular Connex family of machines.

Every week it seems as if new approaches are presented for 3D printing. There are new technologies which have been recently unveiled like that of HP's Multi Jet Fusion, as well as Carbon3D's CLIP technology. As we move into the next several years it is interesting to see which of such technologies will take hold and which may fail [1].

What Is 3D Printing Used for and Who Needs it?

Initially 3D printing was primarily a technology for prototyping, now this is quickly changing. 3D printing is being used by virtually every major industry on the planet in one way or another.

Medicine. 3D printed models of human organs have been a frequent tool for surgeons over the last two to three years, as they provide a more intricate view of the issues at hand. Surgeons can actually touch and feel physical replicas of the patient's organs, bone structures, or whatever else they are about to work on.

Additionally, there is a research underway by companies like Organovo to 3D print partial human organs such as the liver and kidney. Organovo is already 3D printing live human liver tissue for pharmaceutical toxicology testing. They do so by using a process similar to an FDM desktop 3D printer that you might find in a home, but instead of thermoplastics and heat, they use hydrogels infused with living cells.

It's very likely that we will be 3D printing entire human organs for transplantation [1].

Besides 3D printing hands and arms, as well as legs, we have also seen 3D printed prosthetics for animals of all kinds, including a titanium jaw for a turtle, a portion of upper beak for a toucan, and legs for ducks, geese and even canines [5].

Aerospace. Because of the unique geometries offered by additive manufacturing, militaries around the world, as well as agencies such as NASA and the ESA, along with numerous aircraft manufacturers are turning to 3D printing in order to reduce the overall weight of their aircraft. Complex geometries and new materials offer superior strength with less mass, potentially saving organizations like NASA boatloads of fuel, and thus money, during the launching of spacecraft and/or rockets out of our atmosphere [1].

Prototyping. Manufacturing facilities across the globe are using 3D printing as a way to reduce costs, save time, and produce better products. By having no need in outsource the prototyping of parts, companies are able to quickly iterate upon designs on the fly, oftentimes saving weeks of waiting for third parties to return molds or prototypes. From automobile manufacturers to electronics companies and anyone in between, 3D printing is an invaluable technology [1]. Paul Doe, chief designer at motorsport technology designers Prodrive, says 3D printing is already transforming the way the company does business. His previous experience with the technology had been making prototypes and the main reason Prodrive initially bought its 3D printer in 2009 was to make non-functional prototypes. "But our use of the machine changed quite a lot within 18 months to actually making production parts," he says. "We discovered the technology was good in terms of strength, when we were using technology to make parts to test on the car" [6].

Art/Education. 3D printing is able to bring the imagination to life. Artists are not only able to jot their ideas down on a computer screen, they are able to physically bring those ideas into reality via digital models. What this technology does is it unleashes a whole new medium for creativity, not only for artists but for children and young adults who are now able to better visualize concepts, create functional products, and learn via hands-on experience [1].

3D printing provides several features that can revolutionize education, here are some of them:

1. It provides teachers with 3 dimensional visual aids that they can use in their classroom.
2. 3D printers make it easy for teachers to seize the interest of their students compared to just showing the pictorial representations of objects.
3. It enhances hands-on learning and learning by doing. Using this prototyping technology, students will be able to produce realistic 3 dimensional mini-models. (Great for engineering, architecture, and multi-media arts students).
4. It provides more room for interactive class activities. In biology, for instance, teachers can create a 3D model of the human heart, head, skeleton...etc. to teach students about the human body.

Given all these attributes, 3D printing seems to make breakthrough innovation that will definitely assist in the fulfillment of a productive educational experience [7].

Where to buy a printer. The most popular models.

Nowadays there are a lot of online stores, where you can purchase a 3D printer. But the main obstacle on the way of spreading hi-tech is its price. You also should be ready for regular investments because of expenditure of materials and spare parts. Before buying a printer, you should get some information about required software too. Below is a brief overview on the two popular models of 3D printers.

MakerBot Replicator Mini.

This is one of our favorites, not only because it's ranked high by users overall, but because it's small, elegant, and will enable you to open up access to the entire MakerBot ecosystem. If you want quality and the backing of a \$2.5+ billion company (Stratasys) behind your printer, the Mini may be for you. Equipped with an on-board camera to monitor your prints, and incredibly easy software for transforming your models into physical objects, the Mini's main shortcoming is its ability to only print with PLA, as well as its somewhat limited build volume of just 100 x 100 x 125 mm. If you are fine printing with PLA, which will still



provide quite a range of material options, and you aren't looking to print large objects, the MakerBot Mini is likely a great bet, priced at just \$1,375.

Pros: Ecosystem, ease of use, connectivity. Cons: Noise, print speed.

Ultimaker 2.

Ultimaker is ranked up there with MakerBot as one of the top selling desktop 3D printer brands, and for good reason. The company has prided themselves on delivering high quality 3D printers which also look nice sitting on your table or desk. With layer resolutions as fine as 20 microns, and a build envelope of 223 x 223 x 205 mm, this machine is great for everyday home use. It will print with PLA, ABS, and U-Pet materials, is very easy to calibrate and get started, and is priced at \$2,499. Pros: Ecosystem, print quality. Cons: Cost to run, price [8].



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SOLAR ENERGY AS RENEWABLE SOURCE OF ENERGY

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Summary: The article deals with the essence of the global issue of alternative energy sources. The results of the study are as follows: solar energy occupies the leading position being clean and combinable with other sources; renewable energy is directly connected with climate change; development of alternative sources favors provision of energy to the developing countries.

Key words: alternative sources of energy, electromagnetic radiation, renewable energy, solar energy, solar radiation.

Анотація: Стаття присвячена розгляду суті глобального питання альтернативних джерел енергії. У результаті дослідження було виявлено, що сонячна енергія наразі займає провідну позицію, оскільки вона є чистою, та легко комбінується з іншими джерелами; поновлювані джерела енергії безпосередньо пов'язані зі зміною клімату; розвиток альтернативних джерел енергії сприяє постачанню енергії країнам, що розвиваються.

Ключові слова: альтернативні джерела енергії, електромагнітне випромінювання, поновлюване джерело енергії, сонячне випромінювання, сонячна енергія.

Аннотация: Статья посвящена рассмотрению сущности глобального вопроса альтернативных источников энергии. В результате исследования было выявлено, что солнечная энергия в данный момент занимает лидирующую позицию, поскольку она является чистой и одновременно легко комбинируется с другими источниками; возобновляемые источники энергии непосредственно связаны с изменением климата; развитие альтернативных источников энергии способствует снабжению энергией развивающихся стран.

Ключевые слова: альтернативные источники энергии, возобновляемые источники энергии, солнечное излучение, солнечная энергия, электромагнитное излучение.

Since the fossil fuel was discovered, wars mostly haven't stopped because one of the main reasons for wars is thirst for energy. As one of the ways to stop wars and military conflicts around the world, mankind has to develop new or "alternative" sources of energy which in the first place will be considered safe. Should it be a success, the present generation will escape energy crisis in the upcoming years and manage to do a great favor

for the future generations. Moreover, they will be proud to be a part of the Clean Energy Revolution. Once atomic energy was thought to be the answer to the world's energy problems because nuclear plants do not pollute the atmosphere and nuclear wastes can be managed properly. However, in April 1986 a tragic accident at the Chernobyl nuclear power station near the city of Kiev caused an explosion which released a dangerous radioactive cloud that killed dozens and injured thousands of people in Europe. This nuclear accident set world opinion against the proliferation of nuclear power plants and spurred the search for other alternative energy sources.

Alternative energy encompasses all sources that do not consume fossil fuel. They are widely available and environmentally friendly thus causing very little or almost no pollution. There have been several alternative energy projects running in various countries to reduce the world's dependence on traditional fossil fuels. Among them we can mention:

1. the World's Largest Hydroelectric Dam: China's Three Gorges Dam (China);
2. the World's Largest Wave Power Plant: Aguçadoura Wave Farm (Portugal);
3. the World's Largest Dry Biomass-Fired Power Plant: OyAlholmens Kraft (Portugal);
4. the World's Largest Solar Thermal Plant: Solar Energy Generating Systems (Southern California, the USA);
5. theWorld's Biggest Offshore Wind Farm (England) [1].

Solar power and wind were the leading technologies by far, with solar power accounting for more than 55% of new investment in renewable power, and wind power taking 36.8%. Both saw significant increases over 2013: solar power investments rose 25% (to USD 149.5 billion), and wind advanced 11% (to USD 99.5 billion). Overall, in 2014, more than a quarter of new investment in renewable energy went to small-scale projects (particularly solar PV) [2].

Nowadays solar energy as alternative source of energy is being widely discussed on all levels. At the United Nations Sustainable Development Summit, they claim that in 2015, energy stands at the center of global efforts to induce a paradigm shift towards low-carbon energy systems, green economies, poverty eradication and ultimately sustainable development [3]. According to UNEP's 9th "Global Trends in Renewable Energy Investment 2015", wind, solar, biomass and waste-to-power, geothermal, small hydro and marine power contributed an estimated 9.1% of world electricity generation in 2014, compared to 8.5% in 2013. This would be equivalent to a saving of 1.3 gigatonnes of CO₂ taking place as a result of the installed capacity of those renewable sources [4].

This article considers the questions of solar energy as the sun is one of the most powerful sources of alternative energy. Sunlight, or solar energy, can be used for heating, lighting and cooling homes and other buildings, generating electricity, water heating, and a variety of industrial processes. Most forms of renewable energy come either directly or indirectly from the sun. For example, heat from the sun causes the wind to blow, contributes to the growth of trees and other plants that are used for biomass energy, and plays an essential role in the cycle of evaporation and precipitation that makes hydropower possible. The sun supplies energy in the form of radiation, without which life on Earth could not exist. This energy is generated in the sun's core through the fusion of hydrogen atoms into helium and a part of the mass of the hydrogen is converted into energy. The sunlight that strikes the Earth's surface produces enough energy in one square meter to operate a 40-watt light bulb, consequently, only 0.01 per cent of sunlight energy is necessary to cover mankind's total energy needs. However, converting this energy into a usable form, such as electricity, is often difficult and inefficient.

One method of direct conversion sunlight into electricity is the use of solar cells, which have an optimum efficiency of about 20%. Being very expensive makes this method uneconomical on a large scale. Another way is to focus the sunlight into a powerful narrow beam by using heliostat mirrors, which automatically track the sun as it moves across the sky; the most obvious drawback of such solar generating stations is that they do not operate efficiently on a cloudy day and are of no use at night. Therefore, solar power plants must be located in areas where the sun shines for long periods all year round, e.g. in deserts, moreover, the land is relatively inexpensive there. Solar power stations still cannot compete economically with conventional fossil fuel generating stations. In the future, however, they might win the leading position when fossil fuels become scarce.

In physics radiation is the emission or transmission of energy in the form of waves or particles through space or through a material medium. This includes:

- electro-magnetic radiation (also known as "continuum radiation") such as radio waves, visible light, x-rays, and γ -rays;
- particle radiation such as α , β , and neutron radiation (discrete rest energy per particle).

The electromagnetic radiation reaching the Earth from the Sun is known as solar radiation which is formed by the atoms. Solar radiation is mostly concentrated in the visible-light part of the electromagnetic spectrum. Visible light represents 43% of the total radiation emitted by the sun. Solar radiation includes other wavelengths

of radiation as well. Half of the energy emitted by the Sun is spread over wavelengths longer than those of visible light, with most of this radiation being infrared radiation. Wavelengths shorter than visible light, like ultraviolet radiation, account for 7% of the total radiation emitted by the sun. Answering the question of how the Earth and objects on it are being heat, Tom Zepf of the physics department at Creighton University in Omaha, notes “Sunlight heats a material such as water or brick primarily because the long wavelength, or infrared, portion of the sun's radiation resonates well with molecules in the material, thereby setting them into motion. So the energy transfer that causes the temperature of the substance to rise takes place at the molecular rather than the electronic level” [1].

Radiation is often categorized as either ionizing or non-ionizing depending on the energy of the radiated particles. Ionizing radiation carries more than 10 eV (Electronvolt), which is enough to ionize atoms and molecules, and break chemical bonds. This is an important distinction due to the large difference in harmfulness to living organisms. A common source of ionizing radiation is radioactive materials that emit α , β , or γ radiation, consisting of helium nuclei, electrons or positrons, and photons, respectively. Other sources include X-rays from medical radiography examinations and muons, mesons, positrons, neutrons and other particles that constitute the secondary cosmic rays that are produced after primary cosmic rays interact with Earth's atmosphere. The word radiation arises from the phenomenon of waves *radiating* from a source. This aspect leads to a system of measurements and physical units that are applicable to all types of radiation. As such radiation expands when it passes through space, and as its energy is conserved (in vacuum), the intensity of all types of radiation from a point source follows an inverse-square law in relation to the distance from its source. This law does not apply close to an extended source of radiation or for focused beams.

The importance of solar radiation as one of the alternative energy sources lies in the fact that most of the renewable energy potential stems from it or its indirect forms. As examples we can give:

- hydro power: Around 1/3 of the terrestrial solar energy is consumed by the hydrological cycle of evaporation and precipitation, feeding rivers, which can drive turbines;
- wind and wave energy: Temperature differences on the earth's surface cause winds, and ultimately waves;
- bio-energy: Plants convert solar radiation into carbohydrates (photosynthesis), which can be used as “bio”- fuels [5].

The solar radiation that is not consumed by the indirect uses is available for conversion in solar thermal, ocean thermal or photovoltaic devices.

In conclusion we would like to draw attention to the main advantages and disadvantages of solar energy. Among the former, one should mention that it is clean, it can operate both independently and together with traditional energy sources, and it is remarkably renewable. While the latter are that it is more expensive than traditional energy, and its availability varies from day to day, and from season to season.

There is growing awareness that increased use of renewable energy is vitally important when speaking about climate change and providing energy access to the billions of people who are still deprived of energy sources. Unsustainable energy production and consumption can harm not only human health and quality of life but also affect ecosystems. Therefore, sustainable energy can contribute to poverty reduction, social progress, economic growth, and environmental sustainability.

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MODERN AUTOMOBILE INDUSTRY: PROBLEMS AND STRATEGIES

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Summary: This article deals with basic concepts of recycling and its role in the automotive industry as well as designs for recycling, formulating databases and creating a recycling network in this industry.

Key words: automotive industry, environmental pollution, recycling, waste control.

Анотація: У статті розглядаються основні концепції повторного використання матеріалів та його роль в автомобільній промисловості, а також проекти переробки, створення баз даних та мережі переробки в цій галузі.

Ключові слова: автомобілебудування, забруднення навколишнього середовища, контроль відходів, повторне використання матеріалів.

Аннотация: В статье рассматриваются основные концепции повторного использования материалов и его роль в автомобильной промышленности, а также проекты переработки, создание баз данных и сети переработки в этой области.

Ключевые слова: автомобилестроение, загрязнение окружающей среды, контроль отходов, повторное использование материалов.

Rapid development and population growth in developing countries in the last two decades have left a legacy of widespread environmental pollutions. Environmental improvement, waste control and solid waste recycling can be a kind of fight to this problem. Today, according to the U.S. Environmental Protection Agency (EPA) about 6 percent of the world's waste are vehicles, and it has been estimated that about 14 million vehicles in Europe and 40 million worldwide become out of use each year. So, recycling is one of the biggest challenges in the automotive industry. A wide section of the metal components of cars has an ability to be recycled, while among them only a small share of them is recovered and the rest are dumped in landfills.

A different approach is where reverse distribution is a continuous embedded process in which the organization (manufacturer or distributor) takes responsibility for the delivery of new products as well as their take-back [2, p. 27]. Solid waste recycling, which consists of waste collection and treatment to use them as raw materials in the same type of products or similar ones [1, p. 1879], is one of the approaches that can be responsive and provide an excellent framework to many current environmental problems [4, p. 91].

During recent decades the automobile industry as one of the leading and progressive industries, has been posed in various fields of industry – economic, social and environmental [3, p. 541].

Although nowadays the continuation of life without cars in different dimensions could not be imagined, given the presence of different aspects of technology and skilled manpower at different levels and experts associated with this industry and value added directly and indirectly from its performance in recent decades, automotive industry has also significant social and environmental impacts.

Recycle strategy is defined as a set of activities done by a group to determine rules and useful period for recycle after using cars in the industry [5, p. 603]. This could include developing new technologies to facilitate the use of recycled materials, designing cars with regard to the recovery time, increased use of recycled materials in building and designing cars and defined car parts by their ability to be recycled.

Comprehensive recycling policy is one of the best approaches that can be used in the automotive group to increase recycling rate and development of recycling strategies. Minimum 3 cores could be considered for recycling strategy:

- 1 – design for recycling;
- 2 – the role of raw materials;
- 3 – securities and recycling centers.

Product design considering recycle not only includes raw material selection and applying technology and time, but also upgrades single parts and components of cars. Therefore, automotive group should try to build cars from different pieces of recycled materials which is an economic and environmentally friendly method. Specific processes can be used to build recyclable parts. The following standards must be observed in components and parts that are designed to recycle:

- using pure and recyclable plastic materials;
- reducing density of plastic material;
- using composite materials that are recycled easily;
- using appropriate connecting methods such as Plug-in instead of screws;
- using good quality second-hand materials or recycled ones.

By using specific process, waste production can be separated into primary compounds, such as plastic shell, foam rubber and plastic substrate. Considering the initial weight, about 60 percent of materials are from thermoplastic that can be recycled by about 99.5 percent purity.

Using second-hand or recycled materials can preserve resources and reduce wastes. Hard plastic of the non-melting solid components is another topic in recycling that should be considered.

To understand the environmental effects of automobile parts from the early stages of production, using life cycle assessment can help. For example, the contradiction between the selected materials and applicability of components made of them, bring advantages for the group. Using light weight materials can reduce fuel

consumption in vehicles. Applying special materials or technology only by considering certain environmental conditions will be possible.

Construction and operation of a recycling research center can play the role of a center for automobile recycling issues and a database management system for the whole automotive group to access suitable information. Such a central unit can act as a completely controlled one for recycling and as a laboratory for fundamental research as the primary issues, and, in addition, it can be a special education center. This center should provide good ideas for the full recovery cycle and also draw attention to modernization and logistic issues for recycling.

Product design by considering recyclability and life cycle analysis cannot be possible without adequate and appropriate knowledge and experience. All recycling data and information should be compiled in a database. This information will help to recycle different types of vehicles made in accordance with environmental standards. All recycling guidelines with charts, pictures, models, profiles, recovery time and weight of auto parts should exist in database.

In developing countries, according to the environmental obligations based on maintaining natural resources, automotive group should create a recycling network. These centers not only recycle old cars, but also try to help other centers to reuse or recycle car parts.

Developing guidelines for recycling process is the main requirement for this system. The following steps are recommended as initial ones:

- the owner gives his or her vehicle into one of the certified recycling companies;
- each car that is delivered will be identified and recorded, then all the cases which may be dangerous (such as air bags) will be investigated and their operation will be stopped;
- vehicle recycling will begin by removing fluids such as oil, gas and ventilation system liquids;
- the engines which are in compliance with the Security Specialty points can be renovated or their parts without losing their original quality can be used again;
- recycling car parts must be made as parts or raw materials;
- glass and plastic materials should be recycled separately and with specific methods;
- in grinding workshops crushing machines converts car bodies to small pieces; the process for metal and non-metal parts should be done separately;
- as far as possible, even a small percentage of vehicle weight is discarded, during recycling cycle.

Despite the multiple crises around the world, environmental pollution and degradation have led to the fact that environmental issues become more and more important. Let's look at the different types of pollution such as air, water, soil and even sound in industry and indicate environmental problems in this economic sector. Automotive industry in all parts of its life cycle, from the exploitation of natural resources, manufacturing, production and consumption has direct and indirect interaction with the environment. Therefore, today, with the aim of environmental protection in the production process and economic development in communities, recycling solid waste that reuse them, could resolve a great number of the environmental problems in automotive industry in developing countries. So, recycling strategies development as one of the key elements in this section can favour sustainable development and reduce costs in automotive industry.

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PROGRAMMING LANGUAGES

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Summary: The aim of this article is to provide a reader with some information about programming languages that will help him to make a conclusion what language is the best one. The results show that all languages have a lot in common, so it is difficult to say which language is better.

Key words: computer program, best programming languages, machine languages.

Аннотация: Целью данной статьи является предоставление читателю некоторой информации о языках программирования, которые помогут ему сделать вывод, какой язык является одним из лучших. Результаты показывают, что все языки имеют много общего, поэтому трудно сказать, какой язык лучше.

Ключевые слова: компьютерная программа, лучшие языки программирования, машинные языки.

Анотація: Метою даної статті є надання читачеві деякої інформації про мови програмування, які допоможуть йому зробити висновок, яка мова є однією з найкращих. Результати показують, що всі мови мають багато спільного, тому важко сказати, яка мова краще.

Ключові слова: комп'ютерна програма, кращі мови програмування, машинні мови.

A computer program is a sequence of instructions that direct the flow of electrical impulses within a computer system. These impulses affect the computer's memory and interact with the display screen, keyboard, mouse, and perhaps even other computers across a network in such a way as to produce the "magic" that permits humans to perform useful tasks, solve high-level problems, and play games. One program allows a computer to assume the role of a financial calculator, while another transforms the machine into a worthy chess opponent [1, p. 2].

The concepts of computer programming are logical and mathematical in nature. In theory, computer programs can be developed without the use of a computer. Programmers can discuss the viability of a program and reason about its correctness and efficiency by examining abstract symbols that correspond to the features of real-world programming languages but appear in no real-world programming language [1, p. 3]. While such exercises can be very valuable, in practice computer programmers are not isolated from their machines. Software is written to be used on real computer systems. Computing professionals known as software engineers develop software to drive particular systems. These systems are defined by their striking hardware and operating system. Developers use definite tools like compilers, debuggers, and profilers.

Coded language is used by programmers to write instructions that a computer can understand to do what the programmer (or the computer user) wants. The most basic (called low-level) computer language is the machine language that uses binary ('1' and '0') code which a computer can run or execute very fast without using any translator or interpreter program, but is boring and complex [5]. The high-level languages (such as Basic, C, Java) are much simpler (more 'English-like') to use but need to use another program (a compiler or an interpreter) to convert the high-level code into the machine code, and are therefore slower.

There are dozens of programming languages and new ones are being continuously developed.

The term programming language usually refers to high-level languages, such as BASIC, C, C++, COBOL, FORTRAN, Ada, and Pascal. Each language has a unique set of keywords (words that it understands) and a special syntax for organizing program instructions.

High-level programming languages, when simple compared to human languages, are more complex than the languages the computer actually understands, called machine languages. Each different type of CPU has its own unique machine language.

The languages between machine languages and high-level languages are called assembly ones. Assembly languages are similar to machine languages, but they are much easier to program in because they allow a programmer to substitute names for numbers. Machine languages consist of numbers only.

The languages above high-level languages called the fourth-generation ones are usually abbreviated as 4GL. 4GLs are far removed from machine languages and represent the class of computer languages closest to human ones.

Regardless of what language you use, you eventually need to convert your program into a machine language so that the computer can understand it. There are two ways to do this:

- 1) To compile the program;
- 2) To interpret the program.

The question which language is the best is the one that consumes a lot of time and energy among computer professionals. Every language has its strengths and weaknesses. For example, FORTRAN is a particularly good language for processing numerical data, but it is not quite suitable for organizing large programs. Pascal is very good for writing well-structured and readable programs, but it is not as flexible as the C programming language. C++ embodies powerful object-oriented features, but it is complicated and difficult to learn.

The choice of which language to use depends on the type of computer the program is to run on, what sort of program it is, and the expertise of the programmer.

1. Java

What it is: Java is a class-based, object-oriented programming language developed by Sun Microsystems in the 1990s. It is one of the most in-demand programming languages, a standard for enterprise software, web-based content, games and mobile apps, as well as the Android operating system. Java is designed to work across multiple software platforms, meaning a program written on Mac OS X, for example, could also run on Windows [2, p. 13-18].

2. C Language

What it is: A general-purpose, imperative programming language developed in the early '70s, C is the oldest and most widely used language, providing the building blocks for other popular languages, such as C#, Java, JavaScript and Python. C is mostly used for implementing operating systems and embedded applications. As it provides the foundation for many other languages, it is advisable to learn C and C++ before moving on to others.

3. C++

What it is: C++ is an intermediate-level language with object-oriented programming features, originally designed to enhance the C language. C++ powers major software like Firefox, Winamp and Adobe programs. It is used to develop systems software, application software, high-performance server and client applications and video games.

4. C#

What it is: Pronounced "C-sharp," C# is a multi-paradigm language developed by Microsoft as part of its .NET initiative. Combining principles from C and C++, C# is a general-purpose language used to develop software for Microsoft and Windows platforms [4, p. 5-10].

5. Objective-C

What it is: Objective-C is a general-purpose, object-oriented programming language used by the Apple operating system. It powers Apple's OS X and iOS, as well as its APIs, and can be used to create iPhone apps, which have generated a huge demand for this once-outmoded programming language.

6. PHP

What it is: PHP (Hypertext Processor) is a free, server-side scripting language designed for dynamic websites and app development. It can be directly embedded into an HTML source document rather than an external file, which has made it a popular programming language for web developers. PHP powers more than 200 million websites, including Wordpress, Digg and Facebook.

7. Python

What it is: Python is a high-level, server-side scripting language for websites and mobile apps. It is considered as a fairly easy language for beginners due to its readability and compact syntax, meaning developers can use fewer lines of code to express a concept than they would use in other languages. It powers the web apps for Instagram, Pinterest and Rdio through its associated web framework, Django, and is used by Google, Yahoo! and NASA [3, p.37-53].

8. Ruby

What it is: A dynamic, object-oriented scripting language for developing websites and mobile apps, Ruby was designed to be simple and easy to write. It powers the Ruby on Rails (or Rails) framework, which is used on Scribd, GitHub, Groupon and Shopify. Like Python, Ruby is referred to as a fairly user-friendly language for beginners.

9. JavaScript

What it is: JavaScript is a client and server-side scripting language developed by Netscape that derives much of its syntax from C. It can be used across multiple web browsers and is considered essential for developing interactive or animated web functions. It is also used in game development and writing desktop applications. JavaScript interpreters are embedded in Google's Chrome extensions, Apple's Safari extensions, Adobe Acrobat and Reader, and Adobe's Creative Suite.

10. SQL

What it is: Structured Query Language (SQL) is a special purpose language for managing data in relational database management systems. It is most commonly used for its "Query" function, which searches informational databases. SQL was standardized by the American National Standards Institute (ANSI) and the International Organization for Standardization (ISO) in the 1980s.

The conclusion should be made that only a few people will succeed in learning the language for the study itself - a boring academic exercise. It is better to learn a language that will help you to solve the real problem. Do not worry if the technology is outdated and is not included in the top ten - all languages are conceptually similar and your skills can be of use.

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BIOPHYSICS IS FUTURE OF SCIENCE

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Summary: The article is devoted to biophysics, a new field of science and technology actively developing in recent decades. Periods in development of biophysics and the crucial role of biophysical processes are considered. Spheres of biophysical technology applications are defined.

Key words: biophysics, cosmo-geophysical, heliobiology.

Анотація: Статтю присвячено розгляду нового напрямку в науці і технології – біофізиці, яка активно розвивається в останні десятиріччя. Висвітлюються етапи розвитку біофізики, а також сутнісна роль біофізичних процесів у нашому організмі. Визначаються сфери застосування біофізичних технологій у повсякденному житті та науці.

Ключові слова: біофізика, геліобіологія, космо-геофізичний.

Аннотация: Статья посвящена рассмотрению нового направления в науке и технологии – биофизике, которое активно развивается в последние десятилетия. Представлены этапы развития биофизики, а также существенная роль биофизических процессов в нашем организме. Определяются сферы применения биофизических технологий в повседневной жизни и науке.

Ключевые слова: биофизика, гелиобиология, космо-геофизический.

Our time can be characterized by a rapid development of various fields of science that began to arise as a result of the synthesis of classical science and other disciplines such as physics, chemistry, biology. One of the products of such a synthesis is a combination of biological science and physics which is contracted to biophysics.

Biophysics (also *biological physics*) is an interdisciplinary science that applies theories and methods of the physical sciences to questions of biology. Biophysics research today comprises a number of specific biological studies which do not share a unique identifying factor or subject themselves to clear and concise definitions. This is the result of biophysics' relatively recent appearance as a scientific discipline. Despite this the science is developing rapidly opening us new horizons for the development of the science in general [1].

At the heart of this science there are the laws of physics, chemistry and biology. To determine which of these sciences dominates is not possible as each one contributes equally. Biophysics studies physical and chemical processes that occur in living systems at the level of atoms, molecules, cells, tissues and organs. That is, it studies living things in terms of the physical processes that occur in them.

Present-day spheres of research in biophysics are the influence of cosmo-geophysical factors on the course of physical and biochemical reactions and biological processes.

Biophysics can be subdivided into following sections: bioacoustics, bioelectricity, biomechanics, bioenergetics, biooptics, medical physics.

Biophysics as a science originated relatively recently – in 1945 when Erwin Schrödinger published his work "What is Life? The Physical Aspect of the Living Cell" where several important issues such as the thermodynamic basis of life, the common structural features of living organisms, the compliance of biological phenomena to the laws of quantum mechanics were considered. It was he who first noticed and pointed out that many physical laws manifest themselves in vital activities of living beings [6].

The main result of this period of biophysics is experimental evidence for the applicability of fundamental laws of physics to biological objects.

An interesting section of Biophysics is "heliobiology." Heliobiology is a section of biophysics which studied the effect of solar activity on the terrestrial organisms. A Soviet scientist A. L. Chizhevskiy can be considered a founder of heliobiology. Heliobiology shows that changes in the solar activity affect the growth rate of annual tree rings, the yield of crops, breeding and migration of insects, fish and animals as well as the emergence and exacerbation of a number of serious and fatal diseases in humans and animals [3].

For the study of cell structures and biomolecules optical and diffraction methods are used in biophysics. Through the development and structural studies of all types of microscopy in biophysics the scientists can examine and determine the structure of many proteins. The scientists identified the protein that is responsible for changing healthy cells into cancer cells, and the protein that is involved in replication of the immunodeficiency virus was also studied [2].

Nowadays, applying an electron microscope in studying cells can be helpful in discovering a new world of ultramicroscopic cell structures. Intracellular membrane tubules, ducts, bubbles were found in the cell. All these structures a million times thinner than a human hair play a certain role in every-day life of the cell [5].

The amount of these structural elements is very large, they provide cell breathing and receiving energy which is required for cell functioning. It means that in a cell of a living organism the absorption of nutrients, excretion of waste substances, respiration and cell division occurs. Such cells are found in all tissues and organs of our body and demonstrate the unique abilities that must be carefully studied. The example of a wonderful physiological device can be the retina of the human eye – it determines the strength and quality of the light [4].

All that is seen, heard and identified by cells is reported by electric impulses to the brain. Such amazing peculiarities of cells, organs and an organism as a whole are studied by biophysics, a new branch of physics that deals with control and regulation processes.

As any science biophysics relies not only upon analysis but also synthesis. The knowledge gained in the study of parts of a living system is the basis for the knowledge of life in general.

In the world there are animals the detailed study of which makes it possible to improve our technology. Here are some of them.

One of these animals is a squid. It is the largest invertebrate inhabitant of the ocean which is able to move around on the principle of jet propulsion. It absorbs water and then pushes it through the funnel with great force and thus moves with great speed that reaches 70 km / hr. By pressing in its tentacles to the body it takes a streamlined shape. The analysis of physiological properties of a squid can be helpful in designing underwater vessels which are to be maneuverable and move at a high speed at great depths.

Another living creature demonstrating interesting features is a dragonfly. It is able to hover in the air, move laterally and perform aerobatics. Moreover, it performs all the maneuvers at very high speed. It is important to point out that the lift force of a dragonfly is much more than the lift force of a modern airplane. Taking into account aerodynamic features of a dragonfly scientists want to increase the effectiveness and safety of all aircrafts. The airplanes to be built and developed to meet all abilities of a dragonfly can take off from the place, perform steep turns and aerobatics, and will be less susceptible to wind which is the cause of accidents in the sky [7].

To conclude it may be said that our time is the time of great scientific achievements in all fields of knowledge. Understanding the importance and mechanics of biophysical processes can be a challenging step towards an overwhelming breakthrough in biophysics.

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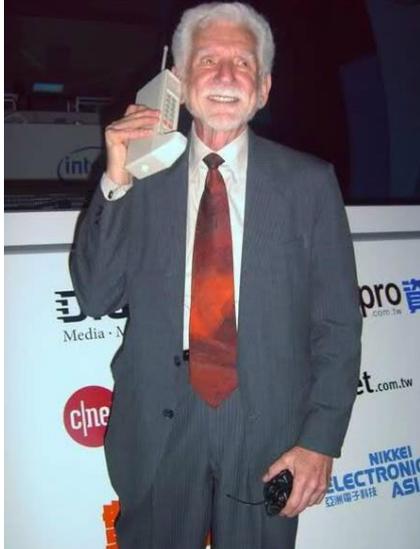
CELL PHONES

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Summary: The article considers the concept of a mobile phone, the principle of the work and the history of the device development. The paper reviews smartphones, their features and advantages, one of which is multifunctionality; describes the types of cell phones and their functions.

Key words: automatic telephone exchange (ATE), cell phones, operating system (OS), smart phones.



*Figure 1. Inventor DynaTAC 8000X
Martin Cooper made the first call
from a mobile phone in 1973.*

Анотація: У статті висвітлено поняття мобільний телефон, принцип роботи та історію розробки цього девайсу. Описано принцип роботи смартфонів, їх особливості і переваги, одна з яких — багатофункціональність; розповідається про типи стільникових телефонів і їх функції.

Ключові слова: автоматична телефонна станція (АТС), мобільні телефони, операційна система (ОС), смартфони.

Аннотация: В статье дано понятие мобильного телефона, принцип работы и историю разработки этого девайса. В статье описан принцип работы смартфонов, их особенности и преимущества, одно из которых - многофункциональность; рассказывается о типах сотовых телефонов и их функциях.

Ключевые слова: автоматическая телефонная станция (АТС), мобильные телефоны, операционная система (ОС), смартфоны.

Introduction

Nowadays it is more and more difficult to imagine our life without a mobile phone. And if earlier to have a cell phone was equal to financial solvency and prestige, everyone in a big city now can have it. It has become a common thing in our everyday life, so it seems to have been around for ages. But it is not so. A little more than 60 years have passed since the invention of the first mobile phone.

A mobile phone operates in cellular networks. It uses a radio band transceiver and traditional telephone switching for telephone services within the territory of network coverage.

Today cell communication is the most common of all types of mobile connection, so a mobile phone is often called a cell phone. Satellite phones, cordless phones and magisterial connection devices can be referred to as mobile phones as well.

How A Cell Phone Operates

Cellular Phones are connected not by means of wires, as in a conventional telephone system, but using radio waves. To make a call on a mobile phone means to simply dial the number. Then the radio message arrives to the base station controlled by the cellular telephone company. The station processes all calls within a given radius or area. After that the call is directed into a free radio channel. Besides, the station sends a signal to the automatic telephone exchange (ATE) of cellular communications.

On the station to serve all calls within a given radius or area, the controller addresses the call into a free radio channel. Moreover, it sends a signal to the automatic telephone exchange. ATE monitors the movement of the phone on the first station area. If during a call the device passes the area and occurs in the next one, the call is automatically transferred to the base station to cover the new area.

During a call, the phone connects to the ATE to define the location of the mobile phone, inquires about a free radio channel from the chain base station and connects with the required number. Then the mobile phone is ringing. When a person to be called to, picks up the phone, the circuit is closed.

Each base station receives the signals emitted within the radius of three to six miles. Base stations which boundaries coincide are to operate on different frequency channels to avoid some noise. But even within the same city quite distant from each other stations can easily work on the same channel. Local telephone systems are based on wires passing under and above the ground and connected to the automatic station.

History Of Cell Phones

The idea of a cellular telephone network appeared in AT&T Bell Labs Company in 1946. At that time the company created the world's first radio telephone service: this was something between a telephone and a radio — via radio station a signal could be sent to the ATE and a normal phone call could be made. A call to the radiotelephone was made in much more complicated way. To speak simultaneously was impossible. In order to speak it was necessary to press the button and release it to hear the message in response. The capabilities of the devices were limited. Disruptions and short radio range prevented smooth communication.

At that time Motorola was known for its portable radio and did not even think about cell phones. Everything changed when a new engineer Martin Cooper came into the company in 1954. He was engaged in the development of new portable devices. In 1967 his department created the first portable radio for Chicago police. Almost 20 years after beginning his career at Motorola, M. Cooper realized that he could create a relatively small cell phone. Its development required 15 years and a huge amount of money — \$ 100 million.

The preparations of field trials, to have been scheduled for April 3, 1973, began. By that day on the top of a 50-storeyed Alliance Capital Building in New York City the first base station (BS) was installed. The first prototype of the BS could serve not more than 30 users and connect them with landlines.

The cell phone itself was called Dyna-Tac. It was a tube receiver about 1.15 kg weight and dimensions of 22.5x12.5x3.75 cm. There were 12 keys on the front panel, 10 of which were for digits and one of the rest keys to call and the other one to stop calling. There was no display and any additional functions. The battery allowed you to talk over the Dyna-Tac a full 35 minutes, but it took more than 10 hours to be charged. It happened on April 3 when M. Cooper took this very phone to call Joel Engel, head of research department of Bell Laboratories. Undoubtedly it was a triumph for both - Cooper and Motorola. Having finished talking and having arranged a press conference in the same building, the engineers and developers realized that they had made a revolution in the world of communications. Recognition by Bell Laboratories was one of the most significant evidence of their success. Years later, Richard Frankel, head of Bell Laboratories system development, said of the Dyna-Tac: "It was a real triumph. At that time, we used phones of 14 kg weight in the machines. Their ability to hold everything you need in 1 kg was a big breakthrough."

However, the first commercial cell phone appeared on the market a decade after – on March 6, 1983. It weighed much less than a prototype, just a pound, and its price was three and a half thousand dollars.

Motorola pioneered the mobile phone mass production and has become a trend-setter in the world of wireless telephony for a long time. The success of mobile phones was stunning. Phone companies could not provide everyone with phones, as their capacity was limited by a very few number of both frequencies and cellular transmitters, and power of ATE. For example, Bell System company, which created its own model of a cell phone six months later than Motorola, in 1978 in New York, had 545 customers and had 3.700 people in their waiting list to buy. All over the United States 20.000 customers of Bell System were enlisted for the purchase, but they were informed that the waiting period could take 5–10 years.

However, in 1983 there were an estimated 1 million users, in 1990 — 11 million. The development of mobile technology has made the service much cheaper, more high-quality and affordable. As a result, according to the International Telecommunication Union, in 1995 there were an estimated 90.7 million cell phone owners, for the following six years, their number has grown more than 10 times — up to 956.4 million. As of September 2003, there were an estimated 1.29 billion "handset" users. Their number is expected to exceed to 2.15 billion in 2007.

Cell Phone Types

Camera phone is a mobile phone with the function of the camera and/or camcorder. At present this name is almost out of use.

Multimedia Phone is a specialized mobile phone with enhanced playback of audio and video files. The term like "camera phone" is out of use.

Smartphone is a mobile phone with a full-fledged operating system (Symbian OS, Windows Mobile, Palm OS, GNU/Linux, Android, Apple iOS, MeeGo, etc). Those phones allow you to install any new program supported by the operating system and extend its functionality. There are viruses which can affect smartphones while the possibility of introducing any destructive code into regular phones is rather low due to their closed operating system.

Communicator is a pocket personal computer (PPC) with the mobile phone functions. Like smartphones they are running the operating systems which are open to the development of third-party applications. The features smart phones and communicators possess depend on the programs installed and hardware selected.

Business Phones are phones with specialized features for business users. These phones allow you to view text documents and spreadsheets, work with e-mail, synchronize your organizer data with a corporate server and so on.

The disposable phone is a phone that has basic functionality (often without display and even the SIM-card format) designed to make calls until the balance is used or until the battery is discharged, and it is recyclable.

Phone for the elderly people is a phone that has basic functionality, button SOS, large buttons, large print on the screen (often monochrome).



Figure 2. Motorola DynaTAC — the first mobile phone with FCC certification

Modern Cell Phones: Smartphones

Smart phones are very different from their predecessors. Their functionality is not limited to calls, SMS and other primitive features. Typically modern telephones have a camera or two cameras (in this case one of them is called the primary, and the second — the front, as it is located on the front panel of the phone), accelerometers, speakers, Wi-Fi sensors and other useful devices.

Smart phones can be compared to PC, since they can do almost everything a full-fledged computer can do. OS (Operating System), that controls this device, is installed on these phones. Currently, the most popular mobile operating systems are Android (Google), iOS (Apple) and Windows Phone (Microsoft). All of them are very young, if compared with the OS for the PC. However, there are many applications for these devices that are being created by developers from all over the world. Users can buy and download these applications from online stores provided by the developers of the OS (Play Market — Android, AppStore — iOS).

Smart phones can serve as cameras and video cameras, thanks to the camera; as e-books due to the availability of the software; MP3, MP4 player thanks to the availability of the software, as speakers or headset, etc. They also help to kill time, due to the games, which are now very much in use, as the popularity of the game development on mobile devices has been increasing year by year.

The conclusion should be made that mobile phones, including smart phones, play an important role in the modern world. The invention of a cell phone made life easier for millions of people on our planet and made it possible to communicate in different parts of the world.

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УДК 656=111

THE SEGWAY AS A POSSIBLE MEANS OF TRANSPORTATION IN UKRAINE

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Summary: One of the key issues of the economic sector of Ukraine is the development of its transport system within the framework of European energy-saving and environmental standards. The paper analyzes characteristics of an innovation of the 21st century, the Segway, that can effectively contribute to road traffic emissions reduction and energy saving. The use of this vehicle as an everyday road transport in city centers and residential areas in Ukraine can help decrease the impact of transport on global warming and decrease its dependence on fossil fuels. It can also decrease the negative impact of traffic noise.

Key words: energy-saving transport, environmentally friendly transport, European standards, Ukraine's transport system, the Segway.

Анотація: Одним з ключових питань економічного сектору України є розвиток її транспортної системи в межах Європейських стандартів щодо збереження енергії та екологічної безпеки. У статті надані характеристики інноваційного транспортного засобу 21-го століття, сігвея, який може ефективно сприяти зниженню викидів дорожніх транспортних засобів і збереженню енергії. Повсякденне використання цього засобу в центрах і житлових мікрорайонах міст України може допомогти знизити вплив транспорту на глобальне потепління і зменшити залежність транспорту від викопних видів палива. Використання сігвеев також знижує рівень шумового забруднення від транспортного руху.

Ключові слова: екологічно безпечний транспорт, енергоефективний транспорт, сігвей, транспортна система України, Європейські стандарти.

Аннотация: Одним из ключевых вопросов экономического сектора Украины является развитие ее транспортной системы в рамках Европейских стандартов относительно сбережения энергии и экологической безопасности. В статье представлены характеристики инновационного транспортного средства 21-го века, сигвея, использование которого может эффективно способствовать снижению выбросов дорожных транспортных средств и сбережению энергии. Повседневное использование этого транспортного средства в центрах и жилых микрорайонах городов Украины может помочь снизить влияние транспорта на глобальное потепление и уменьшить зависимость транспорта от ископаемых видов топлива. Использование сигвеев также снижает уровень шумового загрязнения, вызванного движением транспорта.

Ключевые слова: Европейские стандарты, транспортная система Украины, экологически безопасный транспорт, энергетически эффективный транспорт, сигвей.

On 27 June 2014, European Union Heads of State and Government and Ukrainian President Petro Poroshenko signed the EU-Ukraine Association Agreement in Brussels. According to this agreement, Ukraine has to uphold Western European standards not only in the political, social and financial sphere, but also in the economic sector. One of the key issues of the economic sector is now the development of the Ukraine's transport system within the framework of energy-saving technologies and environmental safety [1].

The rapid implementation of these strategies is also dictated by the first global agreement to fight climate change that was adopted on December 12, 2015 by world leaders at the Climate Change Conference in Paris. Nearly 200 nations adopted this historic pact with an emphasis on cutting greenhouse gas emissions to put a cap on the rising global temperatures. The [long-term goal](#) of the Paris climate agreement is to make sure that global temperatures do not rise more than 2 degrees Celsius, or 3.6 degrees Fahrenheit. Since the start of the industrial age, global temperatures have already increased by about 1 degree Celsius, or 1.8 degrees Fahrenheit. In order to achieve this goal, nearly 200 nations plan reduce the amount of greenhouse gases they emit into the Earth's atmosphere. Scientists believe that the increase of greenhouse gases in our atmosphere since the start of the industrial age has contributed to the increase in the average global temperature. Burning coal, oil and gas are some of the most widely practiced methods for producing energy around the world, but they emit an abundance of greenhouse gases in the process. To meet the goal that was set in the Paris climate agreement, different and more efficient methods of producing energy need to be adopted around the globe [2].

In order to cope with these problems, Ukrainian transport specialists and decision makers should study the European Union's transport strategies.

The European Union has planned to reduce greenhouse gas emissions up to 70% until 2050. The policy strategy suggests in early years to focus on road transport efficiency and then, in medium time horizon, on alternative energy technologies (electricity and hydrogen both from renewable sources of energy) [3].

What else can help create a more effective and environmentally friendly transportation system in Ukraine? One decision is to enhance opportunities to ride bikes, which has become a national policy in many Western countries. Another means that can effectively contribute to road traffic emissions reduction and energy saving is the Segway, an innovation of the 21st century.

The Segway was designed by a famous American inventor Dean Camen in 2001 and eventually became known as the Segway PT. It is an electric, self-balancing human transporter with a computer-controlled gyroscopic stabilization and control system.

The rider stands on a platform, which has accumulators, steering electronics and stabilization measuring equipment. On both sides of the platform, there are two wheels about 45 centimeters in diameter mounted in a single wheel suspension with an electric motor in each wheel hub [4].

A grip pole with integrated steering electronics allows the rider to hold and balance. The electronics is continuously controlling the gravity center of the rider and the vehicle in order to balance the vehicle. When the rider leans slightly forward, the vehicle moves forward, when he/she leans backward, the vehicle slows down. All technical components are laid out redundantly, to ensure that the Segway can be stopped safely, in case any component fails.

By steering the two wheels against each other the Segway can turn on the spot, so backward riding is basically not necessary. The vehicle weighs 38 kilograms and has a carrying capacity for useful load up to 118 kilograms and a maximum speed of 20 kilometers per hour. The Segway's travel distance depends on the type of accumulator, on the load and on the terrain and can extend to 25 kilometers. The vehicle can be used in three riding stages, which are steered by three electric keys of different colors. The black key is meant for beginners, because it only allows a slow speed up to 9.6 kilometers per hour. More experienced riders can reach a maximum speed of about 12.9 kilometers per hour using the yellow key. The red key is meant for experienced riders and allows quick turnings and riding at a speed up to 20 kilometers per hour. This graduation guarantees an effective speed limit.

The Segway is now becoming part of road transport in many countries. For instance, in the USA, where these vehicles have been sold since 2002, a federal law determines that the Segway is an "electric personal assistive mobility device" and therefore can be used on sidewalks and private grounds. However, it is up to the single states and local authorities to introduce special regulations. In most states, the Segway can be used unrestrictedly on sidewalks and cycle tracks. Some states allow additionally its use on roads, often on those with speed limit. Up to now, the use of the Segway in public transport is possible in 9 European countries: in Spain, the Netherlands, Hungary, Portugal, Greece, France, Italy, Austria and the Czech Republic. In Italy, the Segway can additionally be used on cycle tracks up to a speed of 20 km/h. In Austria, it is regarded as a bicycle and can

only be used on the corresponding traffic facilities. In Germany, Belgium, Great Britain and Switzerland corresponding decisions are in process. A considerable number of these vehicles are being used by institutions, the police and safety guards, but the number of private users is also rising.

The main disadvantage of the Segway is that it is rather slow and has a limited travel distance. Besides, long and motionless standing on the platform of the Segway can cause physical fatigue. Other factors that can limit the Segway's use are cold, windy or rainy weather and snowy or icy pavement.

Among the positive arguments are the following:

- 1) The Segway is environmentally friendly, because it is noiseless and runs on electricity.
- 2) It is safe – the number of known accidents with the Segway is very limited.

3) It is easy to operate – it does not take long to learn the basic riding skills and the handling of the Segway seems easy and intuitive. According to some riding tests, after about 3 hours of exercise, the riding performance of all participants proved to be unexpectedly good [5].

The Segway is a new and unusual device that has raised attention and curiosity amongst Ukrainian road users. It is now being used as a fun device in recreational areas of big Ukrainian cities. However, it can become an everyday public means of transportation in the near future, in particular, in city centers and residential areas. The use of the Segway as an everyday road transport can help decrease the impact of transport on global warming and decrease its dependence on fossil fuels. It can also decrease the negative impact of traffic noise and emissions on human health. In order to integrate the Segway into the road traffic in Ukraine, it is necessary to solve the following problems:

- 1) to consider regulations for the Segway classification, licensing, and insurance
- 2) to establish traffic rules for Segway riders
- 3) to find out what traffic facilities are suitable for the Segway.

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УДК 004.942

VOXEL AND VECTOR TECHNIQUES IN OBJECT MODELING.

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Summary: The article describes vector and voxel techniques in volumetric object modelling. A short description of both techniques is given and their behaviors are analyzed. The areas of application for both techniques are demonstrated and standard tasks are discussed.

Key words: modelling, voxel, vector graphics.

Анотація: Стаття присвячена розгляду воксельного та векторного підходів до моделювання просторових тіл. Наведено невеликий опис обох підходів, їхні особливості проаналізовано. Показані основні галузі застосування та наведено типові застосування.

Ключові слова: векторна графіка, вокселі, моделювання.

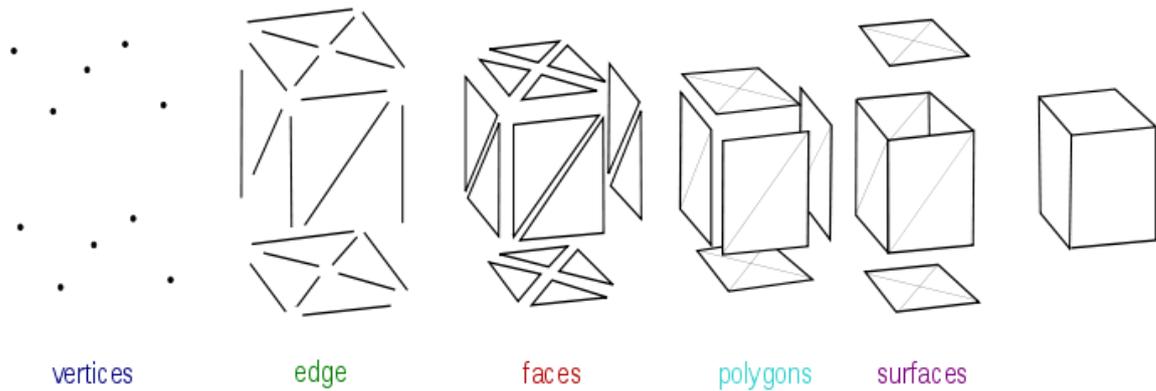
Аннотация: Статья посвящена рассмотрению воксельного и векторного подходов к моделированию объемных тел. Показаны короткие описания обоих подходов, проанализированы их особенности. Показаны основные области применения и рассмотрены типичные задачи.

Ключевые слова: векторная графика, воксели, моделирование.

Nowadays there are some well-developed methods of digital representation of three-dimensional objects, which are widely used for a variety of purposes. The main tasks include the display of three-dimensional scenes with photographic quality images and calculation of physical and chemical characteristics of three-dimensional objects with complicated structure (with possibility to display results of calculation on the surface of bodies, or on the different sections of the body). In terms of required computing resources the problem of photorealistic rendering is somewhat simpler than calculation problem of complex volumetric bodies' properties. For photorealistic rendering it is necessary to process the information on the object surface. For the problems which

require calculations, it is necessary to store data about internal structure of the object. Almost each surface can be turned into a square, but the volumetric object cannot. At the same diameter of rasterization, a square needs an amount of data proportional to the square of diameter, but the volumetric object needs an amount of data proportional to the cube of diameter. This relationship is also true even for scenes containing translucent body, because at the rendering tasks of translucent body, they usually have a constant refraction factor.

The well-known method stimulates the body via surface. Often surface is defined by a mesh in space, which consists of vertices, edges and faces. We will call that technique a vector technique.



Pic.1 The representation of cuboid, the main elements of mesh.

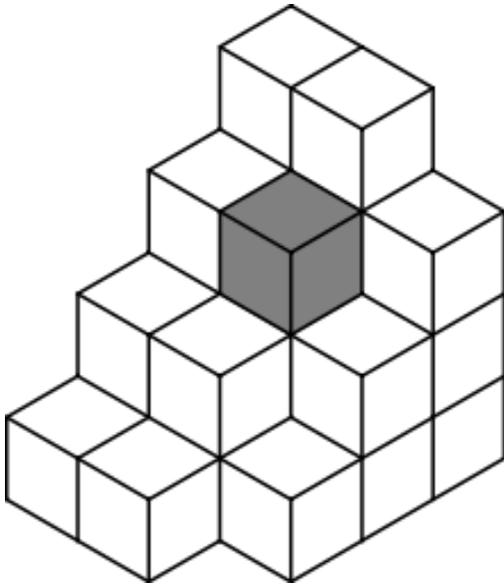
To simulate the properties of objects depending only on the surface of an object it would be logical to use the vector technique. For example, the task of producing a 2D image of the solid body is solved by means of the vector graphics, there is a set of algorithms that allow to get photorealistic images, or generate with less quality, but with much less resources. Modern renders can support many surface properties such as color, reflecting the quality of the surface, microrelief, transparency, and others.

In addition, there are software packages that solve the problem of kinematics, mechanics, inverse kinematics problem (they are in demand in the computer animation), such as simulation of motion of bodies under the gravity. There are algorithms simulating liquid surface with little disturbance.

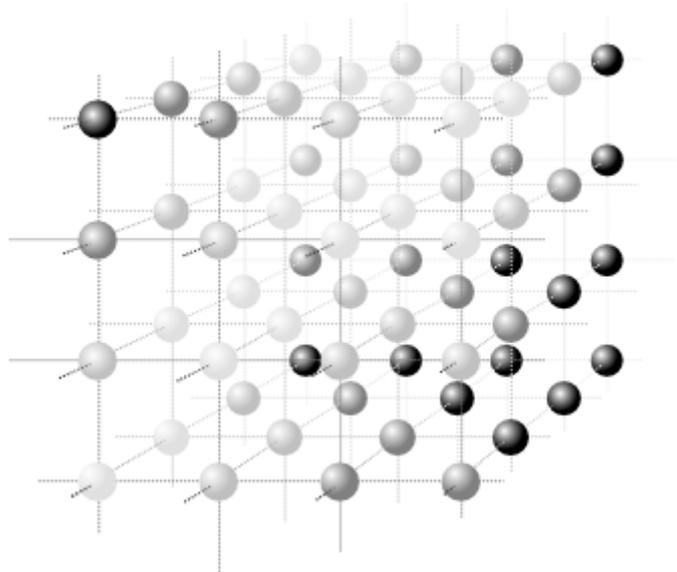
The advantages of this technique are a small amount of memory required to store the surface, a small amount of computation required for the solution. The hardware can support operations with vector graphics. The majority of modern graphics cards specializes in rendering polygons, also can work as accelerators for physics simulations or powerful processors to perform operations on numbers with floating point (for example, the technology NVIDIA CUDA).

Voxel object representation technique is well-behaved approach when you need to describe the external characteristics of the object. However, it does not give the natural way to store information about the internal structure of the object being modeled.

Another way to model the volumetric object is based on representation of that object as the set of sub-volumes tightly packed into it. These elementary volumes we will call voxels (by analogy with the term pixel, used to denote an elementary surface element).



Pic.2 The simplest representation of the voxel structure



Pic.3. The points represent the values associated with the volume

Voxel technique is mostly designed to solve those problems which cannot be solved by the vector technique. It should be used to simulate those characteristics, which cannot be represented by the surface properties, such as mechanical stress or the temperature distribution inside solid body. To calculate what is in the middle of the body, it is necessary to store the information about it. Vector model does not provide the storage possibilities of the interior of the body, while the voxel does.

Depending on the desired smoothness properties of the object representation, its properties are mapped with a number of points which are used as interpolation or approximation function nodes. Those functions describe the properties of the object. In the simplest case, we can use a single point for each voxel, located in the elementary volume's center of mass. That kind of modelling is commonly used in real – time computations due to simplicity. Such voxel structure can be stored as three dimensional array of values. Also, voxels can be rendered as colored cubes. Each cube represents a value of point in its center. In Pic. 2 we can see the described cubes. Pic. 3 shows the pattern which aligns the points (each point is located in the center of the cube).

In real problems, the number of points is determined by the degree of the polynomial, which we need to build on node points. In this way we are tessellating the space at the finite amount of subvolumes, which contains a certain number of node points.

The problem of visualization is solved for regular voxel grids. In addition, specially designed volumetric displays that use real physical principles to create a three-dimensional image are developed. Such devices are capable of displaying all the voxel grids.

The key advantages of that technique is wider opportunities for modelling and solving calculation problems related to intrinsic properties. In addition, voxels allow a natural way to visualize three-dimensional translucent structures.

The disadvantages of this method are a large amount of memory is required to describe the structure, and almost all algorithms have a large computational complexity. The hardware is a support of voxels mainly absent (except for volumetric displays), which impacts negatively on performance.

Let us consider some typical problems which can be solved with those two techniques.

Consider a surface given as a set of polygons. We will call such surface a mesh, and we can "turn" it into a rectangle. This action is called mapping, the rule by which the polygons are turned is called a map. Using a map, we can overlay certain images on the mesh. This way we can set the properties of the surface: color (diffuse map), reflection (Reflect, Bump, and Gloss maps), and transparency (Opacity map). Noteworthy maps that are used to create a microrelief (surface irregularities which are very small compared to the size of the body) – a normal displacement. Such programs as AUTODESK 3DS MAX, Blender, Cinema 4D contain tools for creating meshgrids, maps, and for their preview. Software for creation of photorealistic image is called renderer, it uses algorithms like scanline rendering, raycasting, raytracing. These are the Mental ray, V-ray, Maxwell render.

Another typical problem is the physical simulation of the motion of the bodies; the bodies are set in predetermined meshes. Their physical properties such as mass, elasticity or coefficient of friction are given. We

can manage additional relations between the objects – for example, it is possible to bond the two bodies with the joint, give the acceleration to the bodies, and others. The so-called physics engine solves these tasks, the most popular of them – NVIDIA PhysX and Havoc, they support the simulation of the real time and have high performance.

In addition, the vector technique can be used to produce a vector model of a real object using 3D-scanners. These devices designed to measure the distance to certain points of the object. When the device gets all data about the points, the computer programs begin the construction of the model. Thus, it is possible to obtain a digital image of the real objects' externals with a certain accuracy.

A typical application of voxel technology is a computer tomography. During the tomography, scanner analyses layers of an object by making measurements at equidistant planes. For each plane resistance to X-rays from different directions is being measured, and based on this, an image is constructed. The image shows the structure of the object. It can be studied, analyzed, but without additional calculations, we cannot see the volumetric image. Here we can apply a voxel approach – from a variety of images, we can build a voxel grid, and there solutions of rendering problems can be used.

Spatial tasks, related with mechanics and gas dynamics, are usually formulated in the form of boundary value problems for the equations in particular derivatives and integral equations. Complex boundary conditions force us to use computational methods instead of analytical ones. Finite element method is often used, which allows the interpretation of solution of the mathematical problem in terms of a voxel model. This allows the usage of algorithms for voxel rendering, to visualize solutions.

The trivial solution is to move to a vector model, using the algorithm “marching cubes”. It generates a surface (or surfaces), which are represented in a vector format. Then we can use visualization of the surface. This method has many drawbacks: it does not allow transparency, and reinterprets thin parts not correctly. A better solution is the development of algorithms that can visualize voxel grids. First, consider the projection on a flat screen. We can simply visualize each voxel as a circle the radius of which decreases with distance, drawing them from the farthest to the nearest. Thus, we can get some projection of the grid, but it is not physically correct.

Directly from the rendering equation (equation determines the amount of light emitted in a direction) another solution may be derived, which gives a physically correct image – raycasting technique which can be described in the following way:

We define the point at which the observer is situated, the observer's orientation, the screen, which will be used to project the model, and one or more light sources. As a result, the algorithm produces the desired on-screen image of the voxel grid. Through each position on the screen casting of the ray is performed. For each voxel which intersects the ray, rendering equation is being solved. Then all the received solutions are averaged and assigned to the value of pixel of the desired image.

Based on the above facts it can be concluded that voxel technology is good for the tasks that require a three-dimensional description of the internal structure of objects, and require extensive computational cost. Vector technology is good in applications where properties of three-dimensional object can be determined by the properties of its surface. The vector method has an advantage in performance comparing to the voxel method and offers more modeling capabilities.

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MOTION OF A PERFECT FLUID IN THE RELATIVISTIC FRAME OF REFERENCE

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Summary: The main idea of the article is to consider an ideal fluid in terms of the theory of relativity. As a result, studies have provided a complete system of equations of an ideal fluid and the Lorentz transformations for the thermodynamic potentials and parameters, which can then be applied to specific problems.

Key words: perfect fluid, relativistic hydrodynamics, thermodynamics of relativistic fluid.

Анотація: Мета статті полягає у розгляді ідеальної рідини в рамках теорії відносності. В результаті досліджень були отримані перетворення Лоренца для термодинамічних потенціалів та параметрів, а також повна система рівнянь ідеальної рідини, які згодом можна буде використовувати для конкретних задач.

Ключові слова: ідеальна рідина, релятивістська гідродинаміка, термодинаміка ідеальної рідини.

Аннотация: Целью статьи является рассмотрение идеальной жидкости в рамках теории относительности. В результате исследований были получены преобразования Лоренца для термодинамических потенциалов и параметров, а также полная система уравнений идеальной жидкости, которые в дальнейшем можно применять к конкретным задачам.

Ключевые слова: идеальная жидкость, релятивистская гидродинамика, термодинамика релятивистской жидкости.

Every time we hear about the theory of relativity, different things about space come to our mind. It is natural because space is considered to be an ideal place to obtain high velocity. Thus space can be described in the model of a perfect fluid.

“A great many macroscopic physical systems, including perhaps the universe itself, may be approximately regarded as perfect fluid” [1, p. 61]. “The necessity of allowing for relativistic effects in hydrodynamics may not only be due to high velocity of the macroscopic flow (comparable with that of light). The equations of hydrodynamics are considerably modified also when this velocity is not high but those of microscopic motion of the fluid particles are large” [3, p. 692]. The following statements suggest that the relativistic generalization of hydrodynamics and thermodynamics should be applied in different areas of science and technology – from space flights and to the consideration of the universe as a perfect fluid.

The objective of this work is not to build an exact model of the relativistic motion of fluids, but rather to assess how this model differs from the classical fluid mechanics, where the velocity of the fluid components is too small compared to the velocity of light.

Stress-energy tensor (SET) is a symmetric second-order tensor describing the density and the flow of energy and momentum of the matter fields.

Stress–energy tensor can be represented as a symmetric matrix:

$$T^{ik} = \begin{pmatrix} w & S_x/c & S_y/c & S_z/c \\ S_x/c & -\sigma_{xx} & -\sigma_{xy} & -\sigma_{zx} \\ S_y/c & -\sigma_{xy} & -\sigma_{yy} & -\sigma_{yz} \\ S_z/c & -\sigma_{xz} & -\sigma_{yz} & -\sigma_{zz} \end{pmatrix}$$

where w is a volumetric energy density, \vec{S} – vector of the energy flux density (Pointing vector), $\sigma_{\alpha\beta}$ – stress tensor, which can be expressed in terms of the momentum flux tensor: $\Pi_{\beta}^{\alpha} = -\sigma_{\beta}^{\alpha}$.

For macroscopic objects, which can be considered as solid, the characteristic feature is the average of certain parameters (generalized coordinates – quantities that can uniquely describe the state of the body or bodies) on time. Therefore, a phenomenological approach can be used in such cases, and conservation laws can be obtained not in the Lagrangian formalism. This is true for those branches of physics, in which we want to establish the equations of motion and conservation laws – hydrodynamics and thermodynamics.

The relativistic ideal fluid is a liquid that is inside the frame of reference moving at great velocity; or a liquid, that has high velocity of microscopic motion of its constituent parts. Also it is worth noting that the dissipation processes in the relativistic perfect fluids are not taken into account.

Let us consider a volume element of a perfect fluid or gas, (in terms of the hydrodynamics both fluid and gas can be summarized under the word fluid) in intrinsic frame of reference. We consider it necessary to remind that intrinsic frame of reference is such an inertial reference system, in which the body (particle) is at rest.

In the intrinsic frame of reference the law of Pascal is valid for a fluid element – pressure P , rendered by the body section, is equal in all directions and everywhere perpendicular to the ground, on which it is produced [4, p.121]. That is why:

$$T^{ik} = \begin{pmatrix} w & 0 & 0 & 0 \\ 0 & P & 0 & 0 \\ 0 & 0 & P & 0 \\ 0 & 0 & 0 & P \end{pmatrix},$$

where w is a volumetric density of intrinsic energy.

Now we can proceed with another inertial frame of reference. Let the elementary volume be at rest on the system $K^{(0)}$. Let there also be the laboratory frame K , and let the orientation of the system's axes coincide. The system $K^{(0)}$ is moving along the X axis of the K system at the velocity V . To go from $K^{(0)}$ to K , we use the property that each second order tensor is the product of the corresponding components of four-vectors, so the Lorentz's transformation for tensor has the form, identical to the product of the component of four-vectors:

$$w = \frac{1}{1-\frac{v^2}{c^2}} (w^{(0)} + \frac{v_\alpha v_\beta}{c^2} P^{(0)}), \quad S_x = \frac{v}{1-\frac{v^2}{c^2}} (w^{(0)} + P^{(0)}), \quad S_y = S_z = 0,$$

$$\sigma_{xx} = -\frac{1}{1-\frac{v^2}{c^2}} (P^{(0)} + \frac{v^2}{c^2} w^{(0)}), \quad \sigma_{yy} = \sigma_{zz} = -P^{(0)}, \quad \sigma_{xy} = \sigma_{xz} = \sigma_{yz} = 0.$$

The formulas of transition show that the pressure is, generally, the relativistic invariant. The additional term in σ_{xx} is obviously connected with the fact, that the volume element is moving along the X axis. $P = P^{(0)}$.

For an arbitrary direction of the velocity \vec{v} of the system, $K^{(0)}$ is relative to the laboratory equations:

$$w = \frac{1}{1-\frac{v^2}{c^2}} \left(w^{(0)} + \frac{v^2}{c^2} P \right), \quad \vec{S} = \frac{\vec{v}}{1-\frac{v^2}{c^2}} (w^{(0)} + P),$$

$$\sigma_{\alpha\beta} = -\frac{1}{1-\frac{v^2}{c^2}} \frac{v_\alpha v_\beta}{c^2} (P^{(0)} + w^{(0)}) - P \delta_{\alpha\beta}$$

We can claim that the stress-energy tensor of a perfect fluid in any inertial reference system can be defined as:

$$T^{ik} = (w + P)u^i u^k - P g^{ik}$$

where $u^i = (\gamma, \gamma \frac{\vec{v}}{c})$ – four-vector of the velocity, $g^{ik} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix}$ – metric tensor of

the Minkovsky space-time, $\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$ – Lorentz factor.

Let us consider the expression for the intrinsic energy:

$$w = \frac{1}{1-\frac{v^2}{c^2}} \left(w^{(0)} + \frac{v^2}{c^2} P \right)$$

If u is the average density of the intrinsic energy, it is easy to obtain an expression for the internal energy of a volume by the integration over the whole volume.

We can recall that from the perspective of a stationary observer longitudinal dimensions of the moving body with a constant velocity undergo the so-called “length contraction”.

$$\Delta x = \sqrt{1-\frac{v^2}{c^2}} \Delta x^{(0)} \rightarrow V = \sqrt{1-\frac{v^2}{c^2}} V^{(0)}$$

$$U = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \left(U^{(0)} + \frac{v^2}{c^2} PV^{(0)} \right)$$

where U – intrinsic energy, measured in the laboratory system.

This is the transformation of the intrinsic energy.

According to the principle of relativity, all physical processes in inertial reference systems are the same. Therefore, the first law of thermodynamics should be valid for the both local and for the laboratory frame of reference:

$$dU = \delta Q - \delta A \leftrightarrow dU^{(0)} = \delta Q^{(0)} - \delta A^{(0)}$$

If we want to determine how the heat energy transforms, it is more convenient to go to another thermodynamic potential, namely enthalpy [2, p. 489]. The enthalpy change at a constant pressure is known to be equal to the thermal energy:

$$\begin{aligned} dH_p = dU_p + PdV &= \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \left(dU^{(0)} + PdV^{(0)} \right) = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} dH_p^{(0)} \\ &= \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \delta Q^{(0)} = \delta Q \end{aligned}$$

We repeat the arguments of Planck, who rightly described the transformation of entropy from the intrinsic to laboratory system. Let us imagine that the transition from the system of the body at rest to the laboratory system can be carried out adiabatically – without releasing of the heat, and, therefore, without changing of the entropy (if the process is also reversible). Therefore, entropy is a relativistic invariant [5, p. 103].

$$dS = dS^{(0)} = \frac{\delta Q}{T} = \frac{\delta Q^{(0)}}{T^{(0)}} \leftrightarrow T = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} T^{(0)}$$

This result can also be obtained from the statistical definition of the entropy.

To complete the picture, we need to determine the transformation of thermodynamics work. It can be found in the first law of thermodynamics, but it is also possible to refer to the Helmholtz free energy, which is basically equivalent. The loss of free energy at a constant temperature is the thermodynamics work done by the gas.

$$\begin{aligned} dF_T = dU_T - d(TS)_T &= \gamma \left(-\delta A^{(0)} + \frac{v^2}{c^2} d(PV^{(0)}) \right) \\ \delta A &= \gamma \left(\delta A^{(0)} - \frac{v^2}{c^2} d(PV^{(0)}) \right) \end{aligned}$$

Let us return to the equations of a perfect fluid. As it is known, the equations of motion are presented in the equations:

$$\begin{aligned} \frac{\partial T_i^k}{\partial x^k} &= 0 \\ \frac{\partial}{\partial x^k} T_i^k &= hu^k \frac{\partial u_i}{\partial x^k} + u_i \frac{\partial hu^k}{\partial x^k} - \frac{\partial P}{\partial x^i} \end{aligned}$$

Enthalpy of a unit volume is equal to:

$$h = w + P$$

Under the h an appropriate value in the rest frame will realize.

Let us make the scalar product of our equation and u^i .

$$u^i h u^k \frac{\partial u_i}{\partial x^k} + u^i u_i \frac{\partial h u^k}{\partial x^k} - u^i \frac{\partial P}{\partial x^i} = \frac{\partial h u^k}{\partial x^k} - u^i \frac{\partial P}{\partial x^i} = 0$$

To formulate the equation expressing the law of conservation of the number of particles per unit volume, we introduce the four-vector current of particles. It is necessary to mention that the conservation of the number of particles is not true at elevated temperatures, as in this case the production of new particles is possible [2, p. 694].

The continuity equation is expressed by the vanishing of the divergence of four-vector current:

$$\frac{\partial n u^i}{\partial x^i} = 0$$

In the first term in the equation above we can clearly distinguish the four-current of the particles and use the continuity equation:

$$\frac{\partial h u^k}{\partial x^k} - u^i \frac{\partial P}{\partial x^i} = \frac{\partial \frac{h}{n} n u^k}{\partial x^k} - u^i \frac{\partial P}{\partial x^i} = n u^k \frac{\partial h}{\partial x^k n} - u^i \frac{\partial P}{\partial x^i} = 0$$

For a unit volume of the fluid, the change in enthalpy per particle will be:

$$d \frac{h}{n} = T d \frac{s}{n} + \frac{1}{n} dP$$

where s – density of enthalpy, T – temperature.

$$n u^k \frac{\partial h}{\partial x^k n} - u^i \frac{\partial P}{\partial x^i} = T n u^k \frac{\partial s}{\partial x^k n} \leftrightarrow n u^k \frac{\partial s}{\partial x^k n} = \frac{\partial}{\partial x^k} \left(\frac{s}{n} n u^k \right) = \frac{\partial}{\partial x^k} s u^k$$

Let us make a combination of the stress-energy tensor and four-velocity in the following form:

$$\frac{\partial}{\partial x^k} T_i^k - u^k u_i \frac{\partial}{\partial x^m} T_k^m = h u^k \frac{\partial u_i}{\partial x^k} - \frac{\partial P}{\partial x^i} + u^k u_i \frac{\partial P}{\partial x^k} \frac{\partial}{\partial x^k} T_i^k - u^k u_i \frac{\partial}{\partial x^m} T_k^m$$

The equation of motion can be completely written as following:

$$h u^k \frac{\partial u_i}{\partial x^k} = \frac{\partial P}{\partial x^i} - u^k u_i \frac{\partial P}{\partial x^k}$$

We need to go from four-dimension equations to three-dimensional ones because in the future we will be able to make the limiting transition to classical mechanics and to compare the obtained equation with the Euler equations for an ideal liquid.

Equation of motion:

$$h u^k \frac{\partial u_i}{\partial x^k} = \frac{\partial P}{\partial x^i} - u^k u_i \frac{\partial P}{\partial x^k}$$

The time component should be considered separately. For convenience, we pass from the Euler's variables to the Lagrange ones.

The time part of equation:

$$h \frac{\gamma}{c} \frac{d}{dt} \gamma = \frac{1}{c} \frac{\partial P}{\partial t} - \gamma \frac{dP}{c dt} \leftrightarrow h \gamma \frac{d}{dt} \gamma = \frac{\partial P}{\partial t} - \gamma^2 \frac{dP}{dt}$$

The spatial part:

$$h \frac{\gamma}{c} \frac{d}{dt} \left(-\gamma \frac{\vec{v}}{c} \right) = \nabla P + \gamma \frac{\vec{v}}{c} \frac{dP}{c dt} \leftrightarrow h \frac{\gamma}{c^2} \frac{d}{dt} \gamma \vec{v} = -\nabla P - \frac{\gamma^2}{c^2} \vec{v} \frac{dP}{dt}$$

We express the total time derivative of the pressure from the expression for the time part and substitute in the spatial part:

$$\gamma^2 \frac{dP}{dt} = \frac{\partial P}{\partial t} - h \gamma \frac{d}{dt} \gamma \leftrightarrow h \frac{\gamma}{c^2} \left(\gamma \frac{d}{dt} \vec{v} + \frac{d}{dt} \gamma - \frac{d}{dt} \gamma \right) = -\nabla P - \frac{\vec{v}}{c^2} \frac{\partial P}{\partial t}$$

$$h \frac{\gamma^2}{c^2} \frac{d}{dt} \vec{v} = -\nabla P - \frac{\vec{v}}{c^2} \frac{\partial P}{\partial t}$$

We can present the resulting equations in the three-dimension form in Euler's variables:

$$\left\{ \begin{array}{l} \frac{\partial}{\partial t} n\gamma + \text{div}(\gamma n\vec{v}) = 0 \\ \frac{\partial}{\partial t} s\gamma + \text{div}(\gamma s\vec{v}) = 0 \\ h \frac{\gamma^2}{c^2} \left(\frac{\partial \vec{v}}{\partial t} + (\vec{v}\nabla)\vec{v} \right) = -\nabla P - \frac{\vec{v}}{c^2} \frac{\partial P}{\partial t} \end{array} \right.$$

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УДК 524

EXTRATERRESTRIAL THERMONUCLEAR EXPLOSION

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Summary: This article describes a thermonuclear explosion on a planet in the constellation of Centaurus. The products of the explosion, which fell onto the ground, were quantified. The analysis of the possibility of their detection was conducted.

Key words: extraterrestrial thermonuclear explosion, detection of particles.

Анотація: У статті описаний термоядерний вибух на планеті в сузір'ї Центавра. Кількісно оцінені продукти цього вибуху, що потрапили на землю. Проведено аналіз можливості їх виявлення.

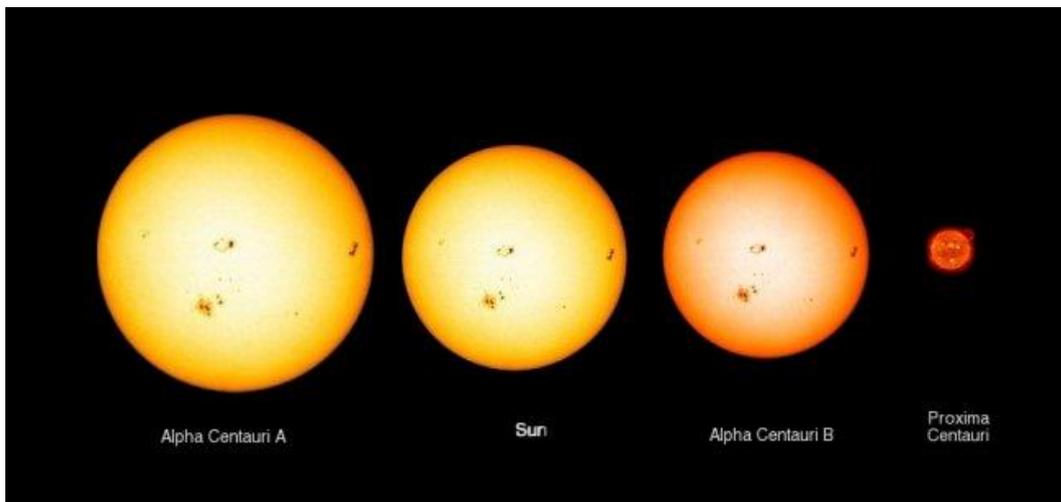
Ключові слова: іншопланетний термоядерний вибух, детектування частинок.

Аннотация: В статье описан термоядерный взрыв на планете в созвездии Центавра. Количественно оценены продукты этого взрыва, попавшие на землю. Проведен анализ возможности их обнаружения.

Ключевые слова: инопланетный термоядерный взрыв, детектирование частиц.

Alpha Centauri is a star system in the constellation of Centaurus, which is the closest to the sun. It consists of three components: a close binary system α Centauri A and α Centauri B (they are seen as one star with the naked eye) and a red dwarf Alpha Centauri C, or Proxima Centauri, which is invisible with the naked eye

(the latter is usually treated separately)
(Fig. 1).



Component A is slightly larger and brighter than the sun, component B is somewhat smaller and fainter. They revolve around a common center of mass in a highly elongated orbit with a period of 79 years. Proxima Centauri is a red dwarf, it is 8 times lighter than the Sun and its luminosity is 18 000 times lower than that of the Sun. It revolves around two larger stars with a period of about 500,000 years. [1]

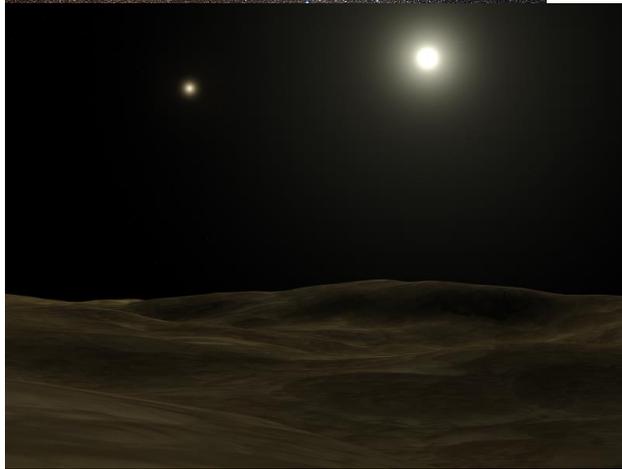


Fig. 2 View of Alpha Centauri from the Digitised Sky Survey 2.

The name it received is a Latin word «proxima» meaning «immediate», as currently it is the closest star to the sun.

So, as the two main stars α Centauri A and α Centauri B are similar in characteristics to the sun, astronomers are particularly interested in the search for planets in this system.

Fig. 3 View from a hypothetical planet orbiting Alpha Centauri A, according to the the artist. Alpha Centauri B is a bright star on the left.



Computer modeling has shown the possibility of the formation of a planet within 1.1 a. e. (160 million km) from α Centauri B. The bodies around A may revolve in a little larger distances due to the stronger gravity of A. In addition, the absence of brown dwarfs and gas giants around A and B, on the contrary, increase the chances of detecting Earth-like planets. In 2002 the current technology didn't allow detecting Earth-like planets around Alpha Centauri, but, if they are not found, it does not mean they don't exist.

In order to conduct the quantitative analysis, we assume that in the Centauri stellar system there are planets similar to the Earth, and that there is a civilization there. Thus, like any civilization, they may have some sorts of conflicts, so it is possible that this planet is

undergoing a nuclear war right now, which can result in a thermonuclear explosion that lasts one second at the altitude of 100 km on the other side of the planet facing the earth. The explosive power was approximately equal to two king-bombs (100 megatons of TNT, 4.184×10^{16} joules of energy released in the result of the explosion). These conditions are not chosen randomly. They are ideal for the attempt to make an observation of the explosion, and if this attempt does not succeed, then we can say that in other cases (in another more distant system or if the bomb explosive power is lower) the blast will not be seen at all.

To understand whether we would notice the explosion from the Earth, one must first understand what are the reaction products of a nuclear explosion, and which of them can be detected.

Table 1. The distribution of energy in a nuclear explosion [2]

Shares of energy of impact factors of a nuclear explosion							
	X-rays	Light	The heat of the fireball and cloud	The shock wave in the air	Deformation and soil emissions	Penetrating radiation	Radioactive substances
The explosion above the ground	64%	24%	-	-	-	6%	6%
The explosion on the ground	-	34%	19%	34%	1%	5%	6%

What can't be observed:

- Shock waves.

The shock wave is a sharp change of pressure in the slice that moves at supersonic speeds (350 m/s for air) and extends to the distance of 25 km from the explosion site.

- The deformation and release of soil.

In the result of a nuclear explosion a crater of no more than 70 meters in diameter is formed.

- Radioactive substances.

During the explosion, radioactive substances are raised high in the air and dispersed over a large area, forming radioactive contamination after a nuclear explosion [3].

- Penetrating radiation (ionizing radiation) is a gamma-radiation and a stream of neutrons emitted from the core of a nuclear explosion within splits of seconds.

In the gas of heavy hydrogen isotopes such as deuterium and tritium at a high temperature a fusion reaction takes place, releasing about 17.6 MeV = $2.8 \cdot 10^{-12}$ J. of energy. If in the result of each reaction one gamma quantum is released, there will be:

$$N = \frac{E_{\text{explosion}}}{E_{\text{reaction}}} = 1.6 \cdot 10^{28} \text{ quanta.}$$

To find out how many of them will fall onto the ground, we find the solid angle of the Earth relative to the explosion:

$$\Omega = \frac{S}{R^2} = \frac{\pi R_{\text{Earth}}^2}{R^2}$$

R-distance from Earth to Alpha Centauri: $R_{\text{Earth}} = 6371 \text{ km}$

$$R = 43 \text{ 608 billion km.}$$

$$\Omega = 6,7 \cdot 10^{-20} \text{ sr}$$

So, the planet Earth after a nuclear explosion will get:

$$\frac{\Omega}{4\pi} = \frac{n}{N}$$

$$n = 8.5 \cdot 10^7 \text{ gamma rays .}$$

It's approximately:

$$u = \frac{n}{\frac{S_{\text{Earth}}}{2}}$$

$$S_{\text{Earth}} = 510 \text{ 100 000 km}^2$$

$$u \approx 0.0003 \text{ gamma rays / km}^2 \cdot \text{s}$$

These are 3 gamma quanta for 10,000 square kilometers. None of the existing detectors can detect such small amounts of gamma rays.

To determine how many photons will hit the ground, we find the energy that is transformed into light emission after the explosion:

Suppose a light beam is transformed into ~ 35% of energy, then

$$\lambda \approx 5 \cdot 10^{-7} \text{ m - wavelength;}$$

$$c = 299 \text{ 792 458 m/s - speed of light;}$$

$$h = 6,626 \times 10^{-34} \text{ J} \cdot \text{s - Planck's constant;}$$

$$= \frac{E_{\text{light}}}{E_{\text{photon}}} = \frac{E_{\text{light}}}{h\nu} = \frac{E_{\text{light}}}{\frac{hc}{\lambda}} = 3.5 \cdot 10^{34} \text{ photons}$$

Per an area unit of the Earth it will give:

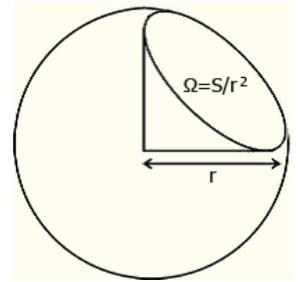
$$u = 745 \text{ photons / m}^2 \cdot \text{s}$$

Even the best telescope cannot detect so few photons. But what about the X-ray method?

Assuming that the wavelength of X-ray radiation during a nuclear explosion is equal to

$$\lambda = 1.2 \cdot 10^{-6} \text{ m}$$

In analogy with light we find that:



$$u = 3000 \text{ quanta} / m^2 \cdot s$$

fall onto the ground.

Such a small amount of X-ray quanta cannot be determined. Thus, if our nearest star system undergoes a nuclear explosion, we won't know about it. The only way to observe it is to reduce the distance between the Earth and the explosion by several times. Perhaps, mankind will never find extraterrestrial life!

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УДК 523.44

MODELING OF ASTEROID SHAPES

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Summary: In this article we consider different methods of modeling asteroid shapes, especially lightcurve inversion technique, and scattering laws used for it. We also introduce our program, which constructs lightcurves for a given asteroid a shape model. It can be used to comparing shape model with observational data.

Key words: asteroids, photometric techniques, light scattering.

Анотація: У даній статті ми розглядаємо різні методи моделювання форми астероїдів, особливо докладно — метод інверсії кривих блиску, а також закони розсіяння світла, які для цього використовуються. Також пропонуємо нашу програму для побудови кривих блиску за відомою модельною формою астероїда. Ця програма може бути використана для порівняння моделі з даними спостерігачів.

Ключові слова: астероїди, фотометричні методи, розсіяння світла.

Аннотация: В данной статье мы рассматриваем разные методы моделирования формы астероидов, особенно подробно — метод инверсии кривых блеска, а также законы рассеяния света, которые для этого используются. Также представляем нашу программу для построения кривых блеска для заданной модельной формы астероида. Эта программа может быть использована для сравнения модели с наблюдательными данными.

Ключевые слова: астероиды, фотометрические методы, рассеяние света.

Introduction

To determine diameter and shape of asteroids a lot of methods are used, such as: lightcurve inverse technique, star occultations by asteroids, radiolocation method, and finally direct on-site inspection. Let us look through some of them and consider the first one in depth.

1. Occultation method.

In this method a group of observers fixes motion of the asteroid shadow on the Earth's surface. Each observer measures the lapse of time during which the star's brightness decreases due to the asteroid passing. This time is in direct relation with the diameter and the shape of the asteroid [1]. For such kinds of observations CCD cameras are usually used, but direct visual observation is also possible. In the last case individual reaction time for each observer can cause a significant systematic error.

The first star occultation event was observed by P. Bjorklund and S. Muller in Sweden on February, 19 1958. That night asteroid Juno occulted star SAO 112328.

2. RADAR method.

The transmitter broadcasts a wave packet toward the asteroid. It is reflected from the surface and, according to the shape of the asteroid, comes back with some time delay. Furthermore, as far as the asteroid rotates, we can detect the Doppler-effect from its different parts, and thus determine its rotation period. The waves reflected from the part of the asteroid which rotates toward the observer increase their frequency, and the ones from the part which rotates from the observer decrease their frequency [3].

To detect such phenomena radio telescopes with extremely high resolution are required. The errors should not exceed nanoseconds for time delay measurement, and hundredth of hertz for Doppler shift.

The great advantage of this method is its independence of passive light sources. The radar creates its

own illumination and makes it possible to observe an asteroid regardless of the position of the sun.

Lightcurve inversion technique

There are two ways of shape modeling [4]: octantoids based on spherical harmonics and subdivision surfaces. The octanoid's starlike surface is given by the following parameterization:

$$p(\varphi, \vartheta) = \begin{cases} x(\varphi, \vartheta) = e^{a(\varphi, \vartheta)} \sin \theta \cos \varphi \\ y(\varphi, \vartheta) = e^{a(\varphi, \vartheta) + b(\varphi, \vartheta)} \sin \vartheta \sin \varphi \\ z(\varphi, \vartheta) = e^{a(\varphi, \vartheta) + c(\varphi, \vartheta)} \cos \vartheta, \end{cases}$$

where a , b and c are linear combinations of the spherical harmonic functions $Y_l^m(\varphi, \vartheta)$ with coefficients a_{lm} , b_{lm} and c_{lm} , respectively. Then these coefficients are altered in order to minimize χ^2 -function with certain regularization function. Let it be, for example:

$$\eta = \sum_{l,m} l(b_{lm}^2 + c_{lm}^2)$$

which reflects the shape's deviation from starlike form. After that we can expect to get a surface that will satisfy the observed lightcurves.

The second possibility is using subdivision surface. At first we should choose an initial set of vertices and corresponding triangles (control mesh), which have to fit the observed lightcurve. Then apply to it the Loop scheme with a few steps. In this case another regularization function should be used to prevent degenerate facets:

$$\gamma = \sum_i (A_i - \bar{A})^2,$$

where A_i is the area of facet i and \bar{A} is the mean facet area of the polyhedron.

Beside it, lightcurves can be applied to the determination of pole and rotation period of the asteroid.

Scattering law

A scattering law for lightcurve inversion model should be simple enough, i.e. we avoid too detailed physical parameters and try to focus on general photometric properties of the surface. For this purpose the combination of Lommel–Seeliger and Lambert law is usually chosen [2]. It is realistic enough, but simpler than e.g. Hapke model, which in addition gives unrealistic parameter values in inverse problems.

According to this law, the surface reflectance S as a function of the angle of incidence i and the angle of emergence e is then

$$S(\mu, \mu_0, \alpha) = f(\alpha)[S_{LS}(\mu, \mu_0) + cS_L(\mu, \mu_0)],$$

where $\mu_0 = \cos i$, $\mu = \cos e$, the Lommel–Seeliger single scattering term is $S_{LS}(\mu, \mu_0) = (\mu\mu_0)/(\mu + \mu_0)$, the Lambert multiple scattering term is $S_L(\mu, \mu_0) = \mu\mu_0 \cdot f(\alpha)$ determines dependence of reflectance on the phase angle α .

Building lightcurves

We are going to introduce you our program for checking compliance of asteroid shape model with real observation data. Four input parameters are required: the asteroid form itself, its pole, rotation period (we took them from [6]), and ephemeris (could be taken from website [5]). The output is a lightcurve for the asteroid's luminosity and rendering of the asteroid for specified location of the observer and light source. In our program we use Lambert's scattering law as the simplest one.

1. A few words about general program's algorithm.

1. Transform input vectors to the Sun and the Earth \mathbf{r}_{ecl} from geocentric ecliptic frame with the origin translated to the asteroid to those ones in asteroid's own frame \mathbf{r}_{ast} (z axis is co-directional with asteroid's axis of rotation):

$$\mathbf{r}_{\text{ast}} = M_z(\alpha) M_x(\delta) M_z(\varphi_0) \mathbf{r}_{\text{ecl}}$$

Here $M_i(\psi)$ is a rotation matrix responsible for the rotation through angle ψ in the positive direction about axis i . α and δ are the right ascension and declination of the asteroid's pole in geocentric ecliptic frame, φ_0 is the initial phase of rotation.

2. Calculate normal unit vectors \mathbf{n}_i for each facet of the asteroid.
3. Calculate the asteroid's illumination detectable for the observer due to Lambert's scattering law:

$$E = A \sum_i S_i(\mathbf{n}_i \mathbf{e})(\mathbf{n}_i \mathbf{s}) * H(\mathbf{n}_i \mathbf{e})H(\mathbf{n}_i \mathbf{s})$$

Here n_i and S_i are unit normal vector and area of facet i respectively. e and s are directions to the Earth and to the Sun in the asteroid's own coordinate frame, H is The heavy side step function introduced in order to eliminate the parts of the asteroid unlighted and invisible for the observer parts of the asteroid, A is to be done a normalization constant. Summation is over all facets.

4. Divide rotation period into a certain number of points and calculate illumination for all these positions to build the lightcurve.
5. Render asteroid directly from .obj file.

2. There are a few examples of output data for the asteroid:

Fig1. Examples of lightcurves for asteroid Geographos, created by our program.

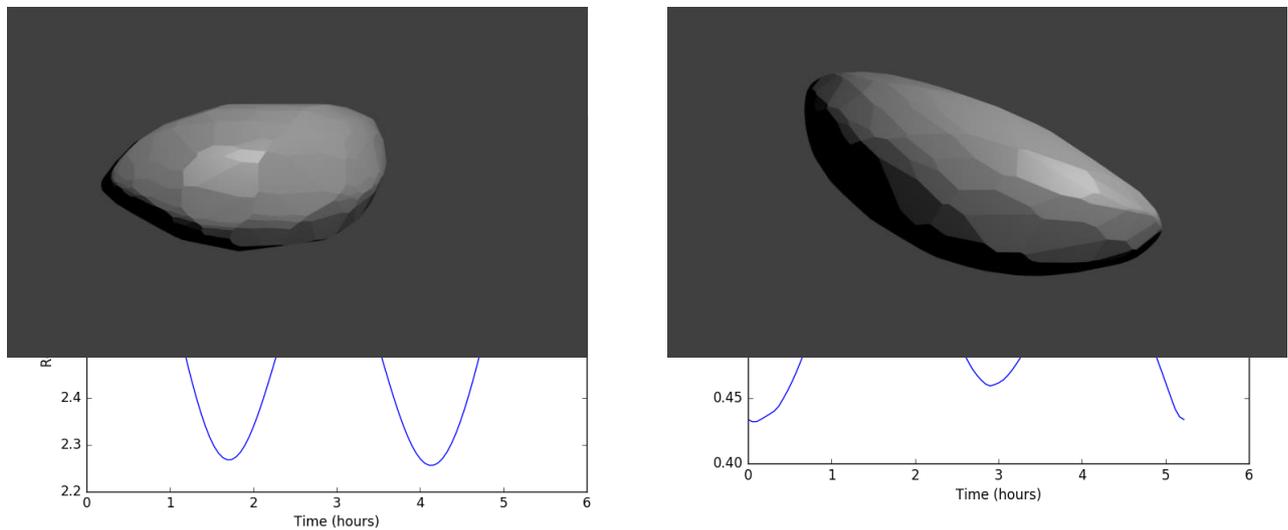


Fig2. Shape of Geographos, taken from DAMIT database.

Conclusions

Lightcurve inversion technique is a powerful tool for obtaining asteroid's shapes and rotation parameters. Period of rotation can be obtained with such high accuracy that we are able to detect even lesser deviations caused by Yarkovsky-O-Keefe-Radzinskii-Paddach effect (YORP) effect. At the same time, determination of asteroid's pole and shape has much less precision.

Knowledge of motion and shapes of asteroids gives us important information about genesis and evolution of planets in the Solar system. Our program can be used for analysis of observational data, and, as we hope, serve as the first step to solving an inverse problem of asteroid's shape reconstruction.

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MERGER OF SUPERMASSIVE BLACK HOLES

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Summary: Understanding how supermassive black holes merge provides a crucial clue to the relation between their properties and properties of their host galaxies. Convergence of supermassive black holes goes first via dynamical friction, and then via gravitational waves. We review both these processes, and estimate merger times.

Key words: black holes, stellar dynamics, gravitational waves.

Аннотация: Понимание слияния сверхмассивных черных дыр содержит ключ к соотношению между их свойствами и свойствами содержащих их галактик. Сближение сверхмассивных черных дыр происходит сначала с помощью динамического трения, а затем с помощью гравитационных волн. Мы рассматриваем оба эти процесса и оцениваем время слияния.

Ключевые слова: черные дыры, звездная динамика, гравитационные волны.

Анотація: Розуміння злиття надмасивних чорних дір містить ключ до співвідношення між їх властивостями і властивостями галактик які їх містять. Зближення надмасивних чорних дір відбувається спочатку за допомогою динамічного тертя, а потім за допомогою гравітаційних хвиль. Ми розглядаємо обидва ці процеси і оцінюємо час злиття.

Ключові слова: чорні діри, зоряна динаміка, гравітаційні хвилі.

Introduction

Black holes are remnants of former stars, so dense that nothing – not even light – is able to escape their powerful gravitational pull.

The evolution of study of Black Holes is an evolution of science and imagination. Yet in 18th century John Michell and Pierre-Simon Laplace considered in the realm of Newtonian gravity bodies, whose escape speed was bigger than the speed of light. But such strong gravitation fields were beyond the limits of applicability of Newtonian theory, and required a more general theory for their description. Albert Einstein created such a theory in 1915, and expressed gravity as a curvature of spacetime. A year later Karl Schwarzschild discovered that spacetime might be curved so severely that a massive object could be hidden from sight under event horizon. In the second half of the 20th century a possibility emerged to observe radiation coming from the vicinity of Black Holes. Unexpectedly Black Holes appeared to be the most luminous objects in the universe [7].

Astrophysics predicts black holes as final stage of stellar evolution. When a massive star runs out of nuclear fuel, the internal pressure of the star sinks. Gravity overcomes the pressure, the star shrinks smaller and smaller, and the gravity in its interior becomes ever stronger due to Newton's inverse square law. Ultimately, when the star has shrunk to a few tens of kilometers in size, its gravity gets so huge that the star turns into a black hole.

A black hole of a much bigger mass is hosted in the center of our Galaxy. The Galactic center is located in the direction of the constellation Sagittarius. This is a very complex region of the Milky Way with many overlapping structures, immersed in thick dust. It is best seen in radio waves or infrared light, for which dust is more transparent. The most luminous radio source in this area is called Sagittarius A*, or Sgr A*. Using adaptive optics and a high-resolution infrared camera, astronomers have repeatedly observed the stars orbiting around Sgr A*. Orbits of these nearby stars indicate that the weight of Sgr A* is about 4 million solar masses! The only type of object that astronomers believe can have such an enormous mass is a black hole. Obviously, one supernova could never produce such a big black hole, so the object was probably formed via different processes. Sgr A* is an example of a class of objects called super-massive black holes, or SMBHs [6].

Black holes are not born huge, but instead gradually grow engulfing stars and interstellar gas. Black hole's gravity attracts gas, and the gas spirals into a black hole, creating a gas disk. Friction of gas layers rotating at different speeds results in heating of the accretion disk, and it becomes so hot that it starts to emit X-rays. Such active objects in centers of galaxies are called active galactic nuclei [8].

Galaxies are neither isolated nor stationary. They always merge, and then black holes residing in their centers also have to merge. First black holes move to the center of the galaxy among stars and lose angular momentum due to dynamic friction force. When black holes come closer to each other, dynamical friction gets weaker, and these are gravitational waves, which have to finish the merger. Below we will discuss both these processes, dynamical friction and gravitational waves [5].

Dynamical friction

For the first time the effect of dynamic friction was considered by Chandrasekhar in his work [1]. He considered motion of a heavy particle of mass M through an infinite homogeneous medium environment of light collisionless particles. This heavy particle alters the path of light particles by its gravitational field, giving them some of its momentum, and thus experiencing a mean drag force:

$$M \frac{dV}{dt} = - \frac{4\pi G^2 M^2}{V^2} \ln \Lambda \rho,$$

where V is the speed the heavy particle, ρ is the density of particles with the speed lower than V , which at high velocities approximates the total density, and $\Lambda = p_{\max}/p_{\min}$ is the Coulomb logarithm. The values of

p_{\max} and p_{\min} characterize the maximum and minimum distance of interaction between light and heavy particles. Typically $p_{\max} = \sim L$, where L is the size of the system, and $p_{\min} = \max(Gm/V^2, l)$, where l is the dimension of the object, and m is the weight of light particles [2].

Dynamic friction can be qualitatively understood as the emergence of an overdensity tail behind a massive object. This tail's gravity pulls back the moving object and reduces its speed.

This reduction of the speed is expressed by the following formula:

$$\frac{dr}{dt} = -\frac{3\pi M \ln \Lambda}{4r^2} \sqrt{\frac{3G}{\rho\pi^3}}.$$

The negative sign draws our attention that the black hole is braking, and its orbital radius is decreasing.

We solve this differential equation and get the time, which it takes for the black hole to approach the galactic center:

$$t = -\frac{4r^3}{9\pi M \ln \Lambda} \sqrt{\frac{\rho\pi^3}{3G}}$$

While falling onto the center of the galaxy a black hole scatters stars. Because of this, the star density in its vicinity starts to decrease. When the mass of stars between two black holes gets less than the mass of the black holes themselves, dynamic friction force substantially decreases, and our calculations are no longer applicable. Then another process must switch on, the gravitational waves.

Gravitational waves

Gravitational waves are ripples of space-time curvature, created by masses moving with variable acceleration. They have not been observed directly, but there is already a robust indirect experimental evidence of their existence. In 1975 Russell Alan Hulse and Joseph Hooton Taylor discovered a close binary pulsar, whose orbit was later proved to gradually reduce, as energy was carried away from it by gravitational waves. The orbit's shrinkage rate is in a good agreement with the prediction of the general theory of relativity [3].

A similar prediction can be also done for a close binary black hole. Power emitted by two black holes on circular orbits around their center of mass is

$$P = -\frac{32G^4 (m_1 m_2)^2 (m_1 + m_2)}{5 c^5 r^5},$$

where m_1 and m_2 are masses of the black holes, r is the distance between them, c is the speed of light in vacuum, and G is the gravitational constant. The negative sign in the equation means that energy is being lost by the system [3].

The energy loss causes the distance between the black holes to decrease in accordance with the equation:

$$\frac{dr}{dt} = -\frac{64G^3 (m_1 m_2)(m_1 + m_2)}{5 c^5 r^3}.$$

We integrate this differential equation, and obtain time of merger of the black holes:

$$t = \frac{5 c^5}{256G^3 (m_1 m_2)(m_1 + m_2)} r^4,$$

where r is the initial distance between the orbiting bodies. This is the time for the radius of the orbit to shrink to zero. This consideration gets inaccurate as the orbital speed becomes a significant fraction of the speed of light, but even for supermassive black holes it does not happen until the last few seconds before the merger.

Discussion

We have considered two processes of the merger of black holes. The first of the processes is dynamical friction, which operates over long distances, and the second process is gravitational waves, which works on short distances. But at the distance of a few parsecs neither of these two processes works well, and it remains unclear how black holes overcome this distance to ultimately merge under the influence of gravitational waves. This mystery is called "Final parsec problem". Modern N-body simulations give a clue to overcoming this problem [4].

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ALTERNATIVE ENERGY

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Summary: This article deals with the history of the alternative energy sources exploitation. The problems of generating bioenergy, wind energy, solar energy and hydro energy in Ukraine are considered as well.

Key words: solar electricity, wind power, hydro power, bioenergy, renewable energy.

Анотація: Ця стаття розглядає історію використання джерел альтернативної енергії. Проблеми генерування біоенергії, енергії вітру, сонячної енергії, гідроенергії в Україні також розглядаються.

Ключові слова: сонячна електрика, енергія вітру, гідроенергія, біоенергія, поновлювані джерела енергії.

Аннотация: Эта статья имеет дело с историей использования альтернативных источников энергии. Проблемы производства биоэнергии, энергии ветра, солнечной энергии, гидроэнергии в Украине также рассмотрены.

Ключевые слова: солнечное электричество, энергия ветра, гидроэнергия, биоэнергия, возобновляемые источники энергии.

Every day the world produces carbon dioxide that is released to the earth's atmosphere. This increased content of carbon dioxide is the main cause of the so-called "Global Warming Effect". One of the answers to global warming is to replace and retrofit current technologies with alternatives that have comparable or better performance, but do not emit carbon dioxide.

Alternative energy refers to energy sources that have no undesired consequences. Alternative energy sources are renewable and are thought to be "free" energy sources. They all have lower carbon emissions compared to conventional energy sources and include biomass energy, wind energy, solar energy, hydroelectric energy sources. Combined with the use of recycling, the use of clean alternative energies such as the home use of solar power systems will help ensure humankind survival into the 21st century and beyond [1].

Nowadays solar energy is considered to be one of the most perspective alternative sources of energy.

In 1897, Frank Shuman, a U.S. inventor, engineer and solar energy pioneer built a small demonstration solar engine that worked by reflecting solar energy onto square boxes filled with ether, which has a lower boiling point than water, and were fitted internally with black pipes which in turn powered a steam engine. In 1908 he formed the Sun Power Company with the intent of building larger solar power plants. Shuman built the world's first solar thermal power station in Maadi, Egypt in 1913. Although the outbreak of World War I and the discovery of cheap oil in the 1930s discouraged the advancement of solar energy, Shuman's vision and basic design were resurrected in the 1970s with a new wave of interest in solar thermal energy [3].

World's largest solar power plants, MW: Golmud, China – 200; Perovo, Ukraine – 100; Sarnia, Canada – 97; Montalto di Castro, Italy – 84; Finsterwalde, Germany – 80; Okhotnikowo, Ukraine – 80; San Bellino, Italy – 71; Wittrock, Germany – 70 [2].

The total capacity of solar power plants in some European countries: Germany – 24700 MW, Italy – 12500 MW, Spain – 4200 MW, France – 2500 MW, Czech Republic – 1959 MW, Belgium – 1500 MW, United

Kingdom – 750 MW, Greece – 550 MW, Slovakia – 500 MW, Ukraine – 188 MW [2].

The production of solar electricity in Ukraine generally takes place in the southern regions of the country, mainly in the Crimea. The largest solar power plants, which can supply more than 15% of the total power demand of the region, are located there. All plants were installed in 2011. Two of them are among the top-10 largest solar power plants in the world. Despite the leadership of Ukraine in terms of installed capacities per plant, the share of solar power generation in Ukraine in comparison with the EU is very low [2].

For the first time wind energy was used as far back as Ancient Greece. The wind wheel of the Greek engineer Heron of Alexandria in the 1st century AD is the earliest known instance of using a wind-driven wheel to power a machine.

The first windmill used for the production of electricity was built in Scotland in July 1887 by Prof James Blyth of Anderson's College, Glasgow (the precursor of Strathclyde University).

In 1891 Danish scientist, Poul la Cour, constructed a wind turbine to generate electricity, which was used to produce hydrogen by [electrolysis](#) to be stored for use in experiments and to light the Askov High school. He later solved the problem of producing a steady supply of power by inventing a regulator, the Kratostrate, and in 1895 converted his windmill into a prototype electrical power plant that was used to light the village of Askov [5].

Wind power plants capacities in some European countries, MW:

Germany – 29.060; Spain – 21.674; France – 6.800; Italy – 6.747; UK - 6.540; Poland – 1.616; Romania – 982; Czech Republic – 217; Ukraine – 150 [2].

Electricity production from wind is also a prospective field of alternative energy development in Ukraine. According to the Wind Energy Association, wind energy potential in Ukraine is estimated at 30,000 GWh. Some researchers believe that Ukraine is among the top-four European countries, most suitable for generating electricity from wind. The installed capacities at the end of 2011 totaled 89 MW and the amount of electricity generated from wind was 151 MW. For comparison, the capacity of wind power plants in the EU in 2011 equaled about 94 GW [2].

Intensification of the process of modern wind power plants construction in Ukraine started in 2011 with the construction of the Novoazovsk wind power plant (Donetsk region). Major wind power plant facilities are located in Mykolayiv and Donetsk regions and in the Crimea.

In January 2012, 37.5 MW of modern wind power plant Novoazovsk were put into operation, out of 107.5 MW planned. Also, in 2011 wind power plant Wind Park Ochakiv with capacity of 25 MW and 3 MW wind power plant in the Kherson region (Vindkraft, Ukraine) were put into operation. Thus, in 2011, about 65.5 MW of modern wind power plants were constructed in Ukraine, and the total capacity of all Ukrainian wind power plants increased to 150 MW.

About 50% of Ukraine's territory is suitable for installation of wind power plants and commercial generation of electricity from wind. In particular, the most prospective regions are the Black Sea coast, the southern steppe regions, and the Carpathian Mountains [2].

In 1753, French engineer Bernard Forest de Bélidor published *Architecture Hydraulique* which described vertical- and horizontal-axis hydraulic machines. By the late 19th century, the electrical generator was developed and could now be coupled with hydraulics. The growing demand for the Industrial Revolution would drive the development as well [6].

At present water as a source of energy is widely used all over the world.

The share of electricity produced by hydroelectric power plants, including large, in the general structure of electricity production in Ukraine is about 5.6% (against 44% in the European Union), while the share of electricity production by small hydroelectric power plants is about 2% of the total production of electricity by hydropower plants [2].

According to the Ukrainian legislation, small hydroelectric power plants comprise small electric power stations which have installed hydro power generation capacity not exceeding 10 MW. At the end of 2011 there were about 70 small hydroelectric power plants in Ukraine with total capacity of about 100 MW. They produce from 200 to 400 million kWh of electricity per year, which amounts to 0.15-0.25% of total electricity consumption in the country. The majority of the plants is outdated and need modernization [2].

The information provided by the State Agency on Energy Efficiency shows that installed capacities of small hydroelectric power plants at the end of 2011 amounted to 71 MW, and that their electric energy production for the year amounted to 203.5 million kWh. Major hydroelectric power plant facilities are located in the following regions of Ukraine: Vinnytsia, Kirovohrad, Mykolayiv and Ternopil regions [2].

Ukraine has great potential for the development of small hydroelectric power plants, but it requires some investments in this sector. The total length of Ukrainian rivers is about 136 thousand km. For the construction of power plants even very small rivers — up to 10 km (which are the majority in Ukraine) — can

be used. On such rivers micro hydroelectric power plants with capacity of up to 5 MW and small hydroelectric power plants with capacity of up to 5-25 MW can be constructed. According to the calculations of the “Ukrhydroenergo” association, technically feasible potential of small hydroelectric power plants in Ukraine amounts to about 8.4 billion kWh or about 4.5% of total electricity consumption in 2010 [2].

Bioenergy is renewable energy made available from materials derived from biological sources. Biomass is any organic material which has stored sunlight in the form of chemical energy. As a fuel it may include wood, wood waste, straw, manure, sugarcane, and many other byproducts from a variety of agricultural processes. By 2010, there was 35 GW (47,000,000 hp) of globally installed bioenergy capacity for electricity generation [4].

Bioenergy in its narrow sense of the word it is a synonym to biofuel, which is fuel derived from biological sources. In the broad sense it includes biomass, the biological material used as a biofuel, as well as the social, economic, scientific and technical fields associated with using biological sources for energy. This is a common misconception, as bioenergy is the energy extracted from the biomass, as the biomass is the fuel and the bioenergy is the energy contained in the fuel.

Ukraine has impressive amounts of biomass available for energy production. Feasible amount of biomass available is estimated at 27 m tons of fuel per year.

According to the State Statistics Committee of Ukraine, the energy potential of biomass accumulated by the agricultural complexes is estimated at more than 7.5 m tons of fuel per year. This could supply up to 10% of the total energy demand of Ukraine [2].

Although Ukraine has diversified energy resources, only coal and nuclear are significant at present, and as demand had risen, it has been necessary to import fuels to meet the total energy demand. The fossil resources, both indigenous and imported, have become expensive and also have undesirably high emissions. So generating electricity from alternative energy sources has become a high priority in the national energy policy strategies as a means to improve its energy security and curb dependence on imported fossil resources. As shown above Ukraine has great potential of alternative energy development.

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NEGATIVE INFLUENCE OF MATHEMATICS ON SCIENCE IN GENERAL

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Summary: The article deals with the influence of mathematics on science. The results of the study are as follows: a hallmark of Mathematical Challenges was a diversity of views of mathematics and its connections with other areas. It should be stressed that in its relations with science mathematics depends on an intellectual effort outside of mathematics for the crucial specification of the approximation which mathematics is to take literally. Conclusions are drawn the mathematical technique can only reach far if it starts from a point close to the simple essentials of a problem which has simple essentials.

Key words: diversity, influence, hallmark, literally, mathematical technique, science.

Анотація: Стаття присвячена розгляду впливу математики на науку. У результаті дослідження було виявлено, що відмітною рисою математичних проблем є різноманітність уявлень про математику та її зв'язків з іншими галузями. Варто підкреслити, що у взаєминах з наукою математика залежить від інтелектуального зусилля поза математики, для ключової деталізації приблизної відповідності, яку математика сприймає буквально. Зроблено висновки, що математична техніка може досягти більшого тільки, якщо вона почне з пункту, близького до суті проблеми, який має прості основи.

Ключові слова: буквально, відмітна риса, вплив, математична техніка, наука, різноманітність.

Аннотация: Статья посвящена рассмотрению влияния математики на науку. В результате исследования было выявлено, что отличительной чертой математических проблем является разнообразие представлений о математике и ее связях с другими областями. Стоит подчеркнуть, что во взаимоотношениях с наукой математика зависит от интеллектуального усилия вне математики, для

ключевой детализации приблизительного соответствия, которое математика понимает буквально. Сделаны выводы, что математическая техника может достичь большего только, если она начнет с пункта, близкого к сути проблемы, который имеет простые основы.

Ключевые слова: буквально, влияние, математическая техника, наука, отличительная черта, разнообразие.

Mathematical knowledge is generally assumed to be absolute and undeniably firm. The characteristic inadequacies which we wish to discuss are more readily apparent.

Computer programmers often make a certain remark about computing machines, which may perhaps be taken as a complaint: that computing machines, with a perfect lack of discrimination, will do any foolish thing they are told to do. The reason for this lies of course in the narrow fixation of the computing machine 'intelligence' upon the basely typographical details of its own perceptions – its inability to be guided by any large context.

In a psychological description of the computer intelligence, three related adjectives push themselves forward: single-mindedness, literal-mindedness, simple-mindedness. Recognizing this, we should at the same time recognize that this single-mindedness, literal-mindedness, simple-mindedness also characterizes theoretical mathematics, though to a lesser extent.

It is a continual result of the fact that science tries to deal with reality that even the most precise sciences normally work with more or less ill-understood approximations toward which the scientist must maintain an appropriate scepticism. Thus, for instance, it may come as a shock to the mathematician to learn that the Schrodinger equation for the hydrogen atom, which he is able to solve only after a considerable effort of functional analysis and special function theory, is not a literally correct description of the atom. This corrected equation is itself only an ill-understood approximation to an infinite set of quantum field-theoretical equations. The physicist, looking at the original Schrodinger equation, learns to sense in it the presence of many invisible and visible terms and this sense inspires an entirely appropriate disregard for the purely technical features of the equation which he sees. This very healthy self-scepticism is foreign to the mathematical approach.

Mathematics must deal with well-defined situations. Thus, in its relations with science mathematics depends on an intellectual effort outside of mathematics for the crucial specification of the approximation which mathematics is to take literally. Give a mathematician a situation which is the least bit ill-defined—he/she will first of all make it well defined.

In this way, mathematics has often succeeded in proving, for instance, that the fundamental objects of the scientist's calculations do not exist. The sorry history of the Dirac Delta function should teach us the pitfalls of rigor. Used repeatedly by Heaviside in the last century, used constantly and systematically by physicists since the 1920's, this function remained for mathematicians a monstrosity and an amusing example of the physicists' naiveté until it was realized that the Dirac Delta function was not literally a function but a generalized function. It is not hard to surmise that this history will be repeated for many of the notions of mathematical physics which are currently regarded as mathematically questionable. The physicist rightly dreads precise argument, since an argument which is only convincing if precise loses all its force if the assumptions upon which it is based are slightly changed, while an argument which is convincing though imprecise may well be stable under small perturbations of its underlying axioms.

Mathematics is able to deal successfully only with the simplest of situations, more precisely, with a complex situation only to the extent that rare good fortune makes this complex situation hinge upon a few dominant simple factors.

Thus, the mathematical technique can only reach far if it starts from a point close to the simple essentials of a problem which has simple essentials. That form of wisdom which is the opposite of single-mindedness, the ability to keep many threads in hand, to draw for an argument from many disparate sources, is quite foreign to mathematics. This inability accounts for much of the difficulty which mathematics experiences in attempting to penetrate the social sciences. We may perhaps attempt a mathematical economics – but how difficult would be a mathematical history! Mathematics adjusts only with reluctance to the external, and vitally necessary, approximating of the scientists, and shudders each time a batch of small terms is cavalierly erased. Only with difficulty does it find its way to the scientist's ready grasp of the relative importance of many factors. Quite typically, science leaps ahead and mathematics plods behind.

Related to this deficiency of mathematics, and perhaps more productive or rueful consequence, is the simple-mindedness of mathematics – its willingness, like that of a computing machine, to elaborate upon any idea, however absurd.

Empirical research in philosophy of mathematics is rare. The truth of mathematical statements and the status of mathematical knowledge according to Kantian conviction should not depend on contingent facts about

humans or human society. On the other hand, some of the central questions of philosophy of mathematics have an empirical core, and some of the statements that one finds in philosophical texts about mathematics are empirical claims. In analytic philosophy and in particular in philosophical logic, the analysis of phenomena is often done by a technique that one could call conceptual modelling, philosophical modelling, or logical modelling, in analogy to the well-known applied mathematics technique of mathematical modelling. This technique consists of a number of natural steps, one of which is to confront the philosophical model with the phenomena. We claim that in many areas of philosophy, especially in the case of philosophy of mathematics, this step is underdeveloped, and we propose to consider collecting data that allow us to identify stable philosophical phenomena in mathematical practice.

The mathematical-intellectual effort of applying the theorem fixes in us the particular point of view of the theory with which we deal, making us blind to whatever appears neither as a dependent nor as an independent parameter in its mathematical formulation. The result, perhaps most common in the social sciences, is bad theory with a mathematical passport. The intellectual attractiveness of a mathematical argument, as well as the considerable mental labor involved in following it, makes mathematics a powerful tool of intellectual prestidigitation – a glittering deception in which some are entrapped, and some entrappers.

The phenomenon to be observed here is that of an involved mathematical argument hiding the fact that we understand only poorly what it is based on. This shows, in sophisticated form, the manner in which mathematics, concentrating our attention, makes us blind to its own omissions—what I have already called the single-mindedness of mathematics. Typically, mathematics knows better what to do than why to do it. Probability theory is a famous example. An example which is perhaps of far greater significance is the quantum theory. The mathematical structure of operators in Hilbert space and unitary transformations is clear enough, as are certain features of the interpretation of this mathematics to give physical assertions, particularly assertions about general scattering experiments. But the larger question here, a systematic elaboration of the world-picture which quantum theory provides, is still unanswered.

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УДК 541-135

INVESTIGATING MICROSTRUCTURE AND DYNAMICS OF SOLVATIONS SHELLS OF ZINC IN ACETONITRILE AND ZINC + PERCHLORATE ANION IN ACETONITRILE BY MEANS OF MOLECULAR MODELLING

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Summary: Investigating solvation shells of electrolytes in non-water solvents is one of the most actual issue of modern physical chemistry. This analysis allow to obtain required information about microstructure and dynamic of solvation shells, which in its turn is of crucial importance in potential application in accumulators and supercapacitors.

Key words: acetonitrile, molecular modelling, Zinc.

Анотація: Вивчення сольватних оболонок електролітів в неводних розчинах є однією з найбільш актуальних проблем фізичної хімії на сьогодні. Такий аналіз дозволяє отримати необхідну інформацію про мікроструктуру та динаміку сольватних оболонок, що у свою чергу дозволяє визначити границі потенційного застосування систем у якості акумуляторів та суперконденсаторів.

Ключові слова: ацетонітрил, молекулярне моделювання, цинк.

Аннотация: Исследование сольватных оболочек электролитов в неводных растворах есть одной из наиболее актуальных проблем физической химии на сегодняшний день. Данный анализ позволяет получить необходимую информацию о микроструктуре и динамике сольватных оболочек, что в свою очередь важно для потенциального применения таких систем в аккумуляторах и суперконденсаторах.

Ключевые слова: ацетонитрил, молекулярное моделирование, цинк.

Zinc is very important microelement for all living organisms. Daily needs of human organism in Zn is 1.0 – 1.4 mg. This value increases during growth and during pregnancy. Biological role of Zinc is explained by the vital functions of endocrine glands, where this metal is constantly being concentrated. Zinc is indispensable microcomponent for over that 40 fermentative systems including: carbonic anhydrase, phosphatase, aldolase, dehydrogenase of lactic and malic acids, carboxypeptidase that catalyzes pepsin enzyme.

The main indicators of Zinc insufficiency in human organism are: decreasing of immune function, distorted perception of taste and smell, reduced vision in the dark and memory impairment. Balanced content of Zinc in human organism allow to prevent possibility of pneumonia, malaria and other infectious diseases.

Acetonitrile is one of the most widely spread solvents in industry. Acetonitrile is polar aprotic organic solvent, a colourless liquid with weak ether smell. It can be mixed with such solvents as water, ethanol, acetone, carbon tetrachloride and others. Acetonitrile forms azeotrope mixtures with water (44.0 % of acetonitrile, boiling point at 72.5°C), ethylacetate (23.0 % of acetonitrile, boiling point at 74.8°C) and other aliphatic hydrocarbons.

Wide application of acetonitrile is caused by the availability of its synthesis and high precision in determining solvent's physical properties. Thus, acetonitrile is used in extracting of butadiene from the mixture of hydrocarbons, as an agent in excretion of toluene and raw materials for pharmaceutical industry. However, due to the unique set of physical and chemical properties acetonitrile is extremely useful in chemical sources of electric current and supercapacitors. Acetonitrile's application is possible in pure state as well as in mixtures with other organic solvents.

Molecular modelling is a powerful instrument that is based upon integrating motion equations of particles. Nowadays it is one of the most precise and available method in studying microstructure and dynamics of ion – ion and ion – molecular interactions.

Molecular modelling was carried out at 25°C in a cubic cell with periodic boundary conditions. The length of the cell's edge was chosen in accordance with experimental data about density of solvent in particular environment. Cut – off radiuses for modelling systems was set to be a half of the cell's edge length.

Molecular modelling was performed in NVT ensemble by means of MDNAES software package. In modelling Berendsen thermostat was applied with relaxation time of 0.1 ps and time step of 0.5 fs.

Modelling process had included following steps: 1) system initiation; 2) system equilibration; 3) calculating structural properties; 4) calculating dynamical properties.

Taking into consideration complexity of acetonitrile model chosen, in order to mitigate critical heating of system with subsequent explosion, on the initiation step time of thermostat relaxation was reduced 50 times and was 0.002 ps. After successful initiation, for all other steps of modelling time of thermostat relaxation was 0.1 ps.

The presence of thermodynamical equilibrium in modelling systems was confirmed by entering the linear region of total energy and logarithm of squared dipole moment dependencies as a function of time (ps) [1, p. 58].

In total three systems were investigated in current research: 1 Zinc cation in 215 Acetonitrile molecules (system I); 1 Zinc cation + 1 perchlorate anion in 214 Acetonitrile molecules (system II) and pure acetonitrile: 216 molecules of solvent (system III).

It is worth mentioning that while modelling system (II) it was very important to indicate forming contact ion pair between Zinc cation and Perchlorate anion at equilibrium stage. This indication was performed by momentary snapshot configuration and then its visualization. Here presence of contact ion pair was clearly indicated.

Investigating structural properties of system studied had started with analysing radial density function distribution. Here determination of borders for first solvation shell and second solvation shell was performed taking into account first minimums on corresponding radial density functions. This evidence was of crucial importance because subsequent investigation of dynamical properties was done within these limits of solvation shells.

It was found that six molecules of acetonitrile are included in first solvation shell of Zinc cation thus forming octahedral coordination sphere (system I). It was also observed that during the formation of contact ion pair (system II), one of the acetonitrile molecules in first solvation shell of Zinc cation is being replaced with perchlorate anion. This evidence can also be indicated in decreasing running coordination number within the limits of first solvation shell. In system (I) this number had been found to be equal 6, whereas in system (II) this number was decreased to 5. However, octahedral coordination sphere is being saved in both: system (I) and (II).

In system (III), where 216 molecules of acetonitrile were studied the same octahedral coordination sphere was found, however here the boundaries of coordination sphere are more blurred comparing to systems (I) and (II).

Study of dynamical properties was done by analysing autocorrelation functions of linear and angle velocity of particles as well as respective spectra [2, p. 432]. The values for residence time in solvation shells and dipole moment reorientation was performed analysing corresponding autocorrelation functions. It was found that perchlorate anion strengthens first solvation shell of Zinc cation.

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УДК 511.11

COMPLEX NUMBERS **Paholy M. V. (Kharkiv)** **Language supervisor: Stupnitskaya N. N.**

Summary: The article deals with the problem of complex numbers. The detail description of complex numbers is shown; the operations on complex numbers are represented; the trigonometric form of complex number is given. The results of the study are as follows: there are different spheres of applying of complex numbers.

Key words: applying, complex number, operations on complex numbers, the trigonometric form.

Анотація: Стаття присвячена розгляду проблеми комплексних чисел. У статті представлено детальний опис комплексних чисел, продемонстровано дії над комплексними числами; представлена тригонометрична форма комплексного числа. У результаті дослідження були представлені сфери застосування комплексних чисел.

Ключові слова: дії над комплексними числами, застосування, комплексне число, тригонометрична форма.

Аннотация: Статья посвящена рассмотрению проблемы комплексных чисел. В статье представлено детальное описание комплексных чисел; продемонстрированы действия над комплексными числами; представлена тригонометрическая форма комплексного числа. В результате исследования были представлены сферы применения комплексных чисел.

Ключевые слова: действия над комплексными числами, комплексное число, применение, тригонометрическая форма.

Italian algebraist J. Cardano in 1545 proposed to introduce a number of new nature. He showed that the system of equations has no solutions in the set of real numbers, has a solution, only need to arrange to act on such expressions by the rules of ordinary algebra [4]. In the 18th century – Euler suggested using the first letter of the French word *imaginaire* (imaginary) to represent numbers (imaginary unit) [1].

Complex numbers are not numbers in the elementary sense of the word used in the calculations and measurements. But they are mathematical objects which have some peculiarities.

The standard form of a complex number is $a + bi$, where a and b are real numbers and they can be like positive, negative, zero, integers, fractions, decimals, it doesn't matter. When in the standard form a is called the real part of the complex number and b is called the imaginary part of the complex number a symbol i specified by $i^2 = -1$, is called the imaginary unit. Here are some examples of complex numbers.

$3+5i$, $\sqrt{6}-10i$, , 113

The last two probably need a little more explanation. It is completely possible that a or b could be zero and so in $16i$ the real part is zero. When the real part is zero we often will call the complex number a purely imaginary number. In the last example (113) the imaginary part is zero and we actually have a real number. So,

thinking of numbers from this point of view we can see that the real numbers are simply a subset of the complex numbers.

The conjugate of the complex number $a+bi$ is the complex number $a-bi$. In other words, it is the original complex number with the changed sign on the imaginary part. Here are some examples of complex numbers and their conjugates.

and
 $12+5i$ and $12+5i$
 $i-1$ and $i+1$
 $45i$ and $-45i$
 111 and 111

The real and imaginary parts of a complex number $z = a + bi$ and $\text{Re } z$ i $\text{Im } z$ respectively

$$a = \text{Re } z, \quad b = \text{Im } z.$$

Complex numbers $z_1 = a_1 + b_1i$ and $z_2 = a_2 + b_2i$ are considered equal if their levels of real and imaginary parts $a_1 = a_2, b_1 = b_2$. A complex number $z = a + bi$ deemed to be zero if its real and imaginary parts are zero ($a = b = 0$). Complex number $z = a + bi$ at $b = 0$ considered to coincide with the real number a ($a + 0i = a$), when $a = 0$ is considered to be purely imaginary and affects bi ($0 + bi = bi$).

The sum of complex numbers $z_1 = a_1 + b_1i$ and $z_2 = a_2 + b_2i$ is the complex number Z , which the real part is equal to the sum of the real part and an imaginary part – imaginary parts of the sum that is,

$$z = (a_1 + a_2) + (b_1 + b_2)i$$

Addition:

$$(a+bi)+(c+di)=(a+c)+(b+d)i$$

Example:

$$(-1+4i)+(3-7i)=(-1+3)+(3-7i)=2-3i$$

Subtraction:

$$(a+bi)-(c+di)=(a-c)+(b-d)i$$

Example:

$$(3+5i)-(1-4i)=(3-1)+(5+4)i=2+9i$$

Multiplication:

$$(a+bi)(c+di)=(ac-bd)+(ad+bc)i$$

Example:

$$(2+5i)(3+i)=(6-5)+(2+15)i=1+17i$$

Division:

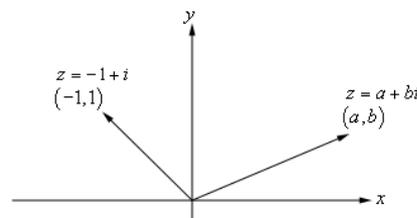
$$\frac{a + bi}{c + di} = \frac{ac + bd}{c^2 + d^2} + \frac{bc - ad}{c^2 + d^2}i$$

Example:

$$\frac{4 + 5i}{3 + 2i} = \frac{22 + 7i}{13}$$

Before we get into the alternate forms we should take a very brief look at a natural geometric interpretation to a complex numbers since this will lead us into our first alternate form.

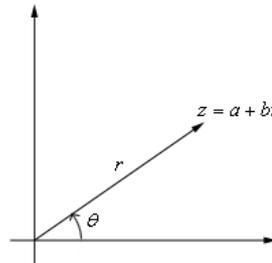
Consider the complex number $z=a+bi$. We can think of this complex number as either the point (a, b) in the standard Cartesian coordinate system or as the vector that starts at the origin and ends at the point (a, b) . An example of this is shown in the figure below.



In this interpretation we call the x -axis the **real axis** and the y -axis the **imaginary axis**. We often call the xy -plane in this interpretation the **complex plane**.

Let's now take a look at the first alternate form for a complex number. If we think of the non-zero complex number $z=a+bi$ as the point (a,b) in the xy -plane we also know that we can represent this point by the

polar coordinates (r, θ) , where r is the distance of the point from the origin and θ is the angle, in radians, from the positive x -axis to the ray connecting the origin to the point.



When working with complex numbers we assume that r is positive and that θ can be any of the possible (both positive and negative) angles that end at the ray. Note that it means that there is literally an infinite number of choices for θ .

We excluded $z=0$ since θ is not defined for the point $(0, 0)$. We will therefore only consider the polar form of non-zero complex numbers.

We have the following *conversion* formulas for converting the polar coordinates (r, θ) into the corresponding Cartesian coordinates of the point, (a, b) .

$$a = r \cos \theta \quad \text{and} \quad b = r \sin \theta$$

If we substitute these into $z=a+bi$ and factor an r out we arrive at the **polar form** of the complex number $z = r(\cos \theta + i \sin \theta)$

Note as well that we also have the following formula from polar coordinates relating r to a and b . $r = \sqrt{a^2 + b^2}$ but, the right side is nothing more than the definition of the modulus and so we see that, $r=|z|$. So, sometimes the polar form will be written as,

$$\theta = \arg z.$$

The angle θ is called the **argument** of z and is denoted by, $\arg z$. The argument of z can be any of the infinite possible values of θ each of which can be found by solving

$$\tan \theta = \frac{b}{a} \quad \text{and making sure that } \theta \text{ is in the correct quadrant.}$$

Using complex numbers in the plane geometry

Specify where the plane for points corresponding complex number z is, for which

$$1 < |z + 2 - 3i| \leq 2$$

Imagine the expression $z + 2 - 3i$ as the difference of two complex numbers:..So, it is clearly that the

$$z + 2 - 3i = z - (-2 + 3i) \quad 1 < |z + 2 - 3i| \leq 2$$

equality is the equation of circle centered at $(-2, 3)$ and a radius of 2.

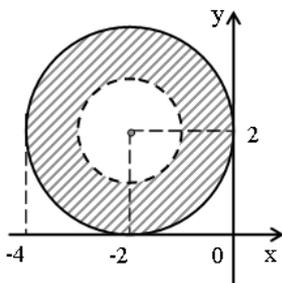
Irregularities $|z + 2 - 3i| \leq 2$ satisfy internal point of said circle with the points lying on the circle
 $1 < |z + 2 - 3i|$

$|z - (-2 + 3i)| = 2$.so, the inequality corresponds exterior circle Within 1 concentrically first.

Since we have been interested in the point that simultaneously satisfy two conditions:

$$1 < |z + 2 - 3i| \leq 2$$

, therefore the desired area is the intersection of two areas found and is a ring containing outer limit point circle. Since the left inequality is strict internal limits range point is not included in the resulting region



In conclusion we may say that the systematic exposition of the issue of solving problems with complex number were shown and the tasks devoted to geometric interpretation of complex numbers were solved.

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SPACE-TIME CORRELATION ACCORDING TO EINSTEIN

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Summary: The article considers the essence of Einstein's theory of relativity. One of the most fundamental developments has been the experimental confirmations of the principle of non-locality in quantum mechanics and the realization of the importance of that principle for a theory of psi phenomena.

Key words: non-locality, psi phenomena, quantum mechanics, relativity, space-time.

Анотація: Стаття присвячена розгляду сутності теорії відносності Ейнштейна. Однією з найголовніших розробок є експериментальне підтвердження принципу нелокальності в квантовій механіці та важливість реалізації цього принципу для теорії пси явищ.

Ключові слова: відносність, квантова механіка, нелокальність, простір-час, пси явище.

Аннотация: Статья посвящена рассмотрению сущности теории относительности Эйнштейна. Одной из самых главных разработок является экспериментальное подтверждение принципа нелокальности в квантовой механике и важность реализации этого принципа для теории пси явлений.

Ключевые слова: квантовая механика, нелокальность, относительность, пространство-время, пси явление.

The special theory of relativity, formulated by Albert Einstein in 1905, is based on the experimentally confirmed idea that the velocity of light is the same universal constant, $c = 3 \times 10^{10}$ cm./sec., for all observers who move uniformly in straight lines relative to each other. Consequently, Einstein's genius deduced that events which are simultaneous to one observer are not simultaneous to the second observer.

In fact, one interpretation of quantum physics is that physical reality does not objectively exist independently of the participating observers [2].

Physicists use a simple geometric picture of the flat space-time of special relativity called a 'Minkowski diagram'. Relativity unites space and time into a unified "four dimensional space-time continuum" in which time appears in the distance formula with a sign different from the sign of space. Events are conceived of as points on the Minkowski diagram. The history of a sequence of events is described by a curve or path on the Minkowski diagram called a world line. Each event is the origin of a future light cone and a past light cone. World lines that are everywhere inside the light cones are called time-like and describe the history of particles moving at velocities less than the velocity of light. World lines that are everywhere on the light cones are called light-like and describe the histories of real photons, neutrinos and gravitons that move at exactly the velocity of light. World lines that are everywhere outside the light cones are called space-like and would correspond to tachyonic processes happening faster than the velocity of light.

Space-like processes, if they exist, could be in two or more widely separated places at the same time. Furthermore, these space-like processes allow the effect to precede the cause for some observers and not for others. They are not allowed in classical physics but are acceptable in quantum physics according to some interpretations. Quantum transitions or 'quantum jumps' may be thought of as space-like processes.

An attempt has been made to use the concept of curved space-time to eliminate some of the apparent paradoxes involved in psi phenomena. A psychologist Gertrude Schmeidler has suggested that the universe may contain an extra dimension that permits "topological folding" to occur so that two regions which are widely separated in an Einsteinian universe might be in immediate contact, much as two points on a towel, which are normally quite a distance apart, may be adjacent when the towel is folded. Thus, apparent instances of ESP across great distances might be explained by postulating that the persons involved are somehow in close proximity in the 'folded' space [4].

A physicist John Archibald Wheeler has theorized that, at a microscopic level, quantum effects might tear the fabric of space-time, producing a structure involving wormholes. He speculated that such wormholes could connect pairs of oppositely charged particles such as electrons and positrons.

An eight-dimensional models of space-time to account for psi (supernatural psychic abilities of people, animals and plants, the phenomena of life after death, and similar phenomena) have also been proposed by physicist Elizabeth Rauscher. She believes that soliton waves in a complex multidimensional space might serve as possible psi signals, as they would be able to propagate over large 'distances' with little attenuation. Rauscher suggests that any space-time dependence that exists for psi effects may be accounted for in terms of signal propagation velocities in complex space-time [1].

The prejudice of classical causality says that an event can only be influenced by other events that are in its past light cone. Events in the future light cone and outside the light cone in the "absolute elsewhere" are said not to influence the event of interest. Classical causality does work on the statistical level in which observations are averaged over sets of events. Almost all of the measurements of atomic physics are adequately described by the statistical limit of the quantum principle.

Nonlocality describes the apparent ability of objects to instantaneously know about each other's state, even when separated by large distances (potentially even billions of light years), almost as if the universe instantaneously arranges its particles in anticipation of future events.

Nonlocality suggests that universe is in fact profoundly different from our habitual understanding of it, and that the 'separate' parts of the universe are actually potentially connected in an intimate and immediate way.

It is known that nonlocality occurs due to the phenomenon of entanglement, whereby the particles that interact with each other become permanently correlated, or dependent on each other's states and properties, to the extent that they effectively lose their individuality and in many ways behave as a single entity. The two concepts of nonlocality and entanglement are facts of quantum systems which have been repeatedly demonstrated in laboratory experiments.

It should be mentioned that despite Einstein's misgivings about entanglement and nonlocality and the practical difficulties of obtaining proof one way or the other, Irish physicist John Bell attempted to force the issue by making it experimental rather than just theoretical. Bell's theorem, published in 1964, and referred to by some as one of the most profound discoveries in all of physics, effectively showed that the results predicted by quantum mechanics (for example, in an experiment like that described by Einstein, Podolsky and Rosen) could not be explained by any theory which preserved locality. The subsequent practical experiments by John

Clauser and Stuart Freedman in 1972 seem (despite Clauser's initial espousal of Einstein's position) to definitively show that the effects of nonlocality are real, and that "spooky actions at a distance" are indeed possible.

In theory, the concepts of entanglement and nonlocality may have applications in communications and even teleportation, although these ideas are still largely hypothetical at this stage. However, Anton Zeilinger's work at two observatories in the Canary Islands has shown promising indications that entangled particles can indeed be reconstituted in a different place (although the leap from this to a teleportation device of the kind envisaged in Star Trek is a profound one) [3].

There has always been Walker's observational theory that equates the conscious mind with the 'hidden variables' of quantum theory. According to the theory, due to the necessarily nonlocal nature of such hidden variables, quantum state collapse by the observer should be independent of space and time; hence, psi phenomena such as telepathy should be independent of space-time separation [6, p. 184].

Channel capacities for various 'regions' of mental activity have been specified. The rate for 'data processing of the brain as a whole at a subconscious level' (S) was found to be equal to 2.4×10^{12} bits/sec. The data rate for conscious activity (C) is equal to 7.5×10^8 bits/sec, and the channel capacity of the "will" (W) is equal to 6×10^4 bits/sec.

Walker's derivation of the above rates is based on the assumption that electron tunneling across synapses is the basis for the transmission of impulses across synapses and that the large-scale integration of brain activity is also mediated by electron tunneling [5].

Hence, one of the most fundamental developments in the past two decades has been the experimental confirmations of the principle of nonlocality in quantum mechanics and the realization of that principle importance for a theory of psi phenomena. This breakthrough seems to suggest that psi phenomena, if they exist, need not be in conflict with established laws of science.

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MODERN CAR NAVIGATORS
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Summary: The article deals with the analysis of the main characteristics of automobile navigators. Nowadays there are a lot of various navigators produced by different companies. The most famous companies engaged in producing automobile navigators are Garmin and TomTom. The similarities and differences of automobile navigators produced by these companies are determined.

Key words: automobile navigators, Garmin, TomTom, the main characteristics of automobile navigators.

Анотація: Стаття присвячена аналізу основних характеристик автомобільних навігаторів. На цей час існує безліч різноманітних навігаторів, що випускаються різними компаніями. Найбільш відомими компаніями, що займаються виробництвом автомобільних навігаторів, є Garmin і TomTom. Визначено подібності та відмінності автомобільних навігаторів, вироблених цими компаніями.

Ключові слова: автомобільні навігатори, Garmin, TomTom, основні характеристики автомобільних навігаторів.

Аннотация: Статья посвящена анализу основных характеристик автомобильных навигаторов. На данный момент существует множество разных навигаторов, выпускаемых различными компаниями. Наиболее известными компаниями, занимающимися производством автомобильных навигаторов, являются Garmin и TomTom. Определены сходства и различия автомобильных навигаторов, производимых данными компаниями.

Ключевые слова: автомобильные навигаторы, Garmin, TomTom, основные характеристик автомобильных навигаторов.

Nowadays there are a lot of electronic devices, which are used in the car, e.g. a car rear view, a universal car charger, a car DVR (driving video recorder), etc. One of them is a GPS navigation device.

A GPS navigator is a device that accurately determines the geographical location by receiving information from GPS satellites [6]. In fact, an automobile navigator is a small computer which is installed inside the car [1]. This device is very useful for those people who know a particular area very badly. In the world the number of navigators has already exceeded one million gadgets. There are many companies which produce automobile navigators all over the world, for example Altina, ComStorm, Garmin, JJ-Connect, Lexand, Pioneer Corporation, TeXet, TomTom and many others. But the most popular of them are Garmin and TomTom.

The world's first mass car navigation device Etak was introduced in 1985. There was no trace of GPS devices then. The Etak worked with the help of a magnetic compass and sensors that were installed in the wheels of the car. The computation of location was carried out by the method of coordinates notation. The users could see only their location on a map. The navigator could not plot the route and even more – show the way.

Maps were stored on audiocassettes, and there could be not one but even a few cassettes. For example, the map of Los Angeles was on four audiocassettes. Before you started, it was necessary to enter the coordinates and drive a bit to do the calibration. When the driver reached the boundary of the loaded area, he had to stop and load the next cassette [2].

The navigator was not a big seller, especially by 2015 standards. But neither was it a dead end. To build it, Etak had to devise technologies and collect data that are still in use today by some of the most familiar navigation apps and devices on the planet. Etak eventually became a part of TomTom, ensuring that its map data, some of which was first digitized back during the Navigator's development in 1984, would live on to this day [3].

Now TomTom steadily holds the leading position in the global electronics market. TomTom's navigators were appreciated by the users in North America and EU countries. Among motorists of Russia and Eastern Europe TomTom's navigators are not less popular than navigational devices of other manufacturers.

The newest and cheapest navigator is the device called the GO 630. This navigator has extended the point streaks. It uses IQ routes technology, voice address input and Bluetooth Hands-Free calling. In addition, the navigator has TomTom Map share technology which allows you to learn about any changes on the road in advance.

Considering the navigator hardware specifications, it has a 4.3" widescreen, lithium-polymer battery (up to 5 hours of autonomous operation), 2GB internal flash memory, optimized integrated microphones and a speaker for high quality hands-free functionality. Its weight is 220 grams and the dimensions are 118x83x24 mm.

Speaking about the most expensive model, which is called the GO 930, it has the highest tracking speed which eliminates the possibility of mistakes during the trip. This model is markedly different from the previous ones because it has a huge number of available maps, improved location based technology, clear visual and

spoken instructions in your own language, extensive traffic information/options, the latest and most accurate maps.

If to speak about GO 930 hardware basic specifications, it has the same characteristics as the previous model, and also some additional ones. There are 4GB internal flash memory, integrated FM transmitters, high sensitivity GPS receiver, RDS-TMC traffic information receiver [5].

Garmin appeared in 1989 in the USA, Kansas. It owes its name to the company founders Gary Burrell and Min Kao (Gary + Min = GarMin). From the first days of its existence, the company was engaged in the production of navigation equipment, carrying out all the stages of production, from design to its full release. At first it was navigational equipment intended only for aviation, but gradually the product range expanded.

Today, Garmin is the world's leader in the development of GPS navigators that are in demand both in the military forces, aviation, maritime forces, and in sport, tourism, daily life. Garmin is also engaged in the production of software for different electronic equipment. Garmin constantly takes into account the demand for its products and responds to the recommendations or requests of its users. They include recommendations of specialists in the field of aviation, sport, as well as recommendations of sportsmen, motorists and tourists. There are many modifications among GPS navigators: from professional navigators with large screens and lots of features and possibilities to amateur ones resembling wrist watches.

The latest navigator for the RV (recreational vehicle) lifestyle is RV 660LMT. This navigator will give you an opportunity to enjoy the freedom of the open road with the convenience of traveling and a helpful guide. RV 660LMT allows you to read a 6.0-inch display that fits comfortably in your car, truck or van. Routes based on RV dimensions and road warnings, include a directory to RV Parks & Services. A 660LMT model offers such innovative functions as Easy Route Shaping, Elevation Profile information, compatible with Smartphone Link App. In addition, this model, thanks to Foursquare technology, can also provide you with the information about bridges height, weight limits, sharp curves, steep grades and even more – about new and popular places.

Hardware specifications of this model are a 6" widescreen, 2GB internal flash memory, lithium-ion battery (up to 1 hour autonomous operation), a multi-touch display, preloaded street maps. It can accept a microSD™ card. RV 660LMT's weight is 268 grams and its dimensions are 118x83x24mm.

Camper 760LMT-D is the first navigator created just for the Camper lifestyle. It offers trip planning and Camper-friendly features, including a 7" display. RV-specific features include state border notices, speed limit changes, sunrises/sunsets and mile marker info and voice-activated navigation. Preloaded with detailed maps, Camper 760LMT-D creates custom routes based on the size and weight of your Camper. Active Lane Guidance with voice prompts indicates the lane you need for your next turn. Camper 760LMT-D includes a directory to ACSI and MHF, including campground search for sites with your preferred amenities and specialized Camper parking. The navigator has an external video input for backup cameras. It also has a convenient search filter, which narrows down campgrounds, allows you always find the best place that you need. You can use Smartphone Link to access weather radar and other live services.

RV 760LMT's hardware specifications are a 7" widescreen, 2GB internal flash memory, lithium-ion battery (up to 1 hour autonomous operation), a multi-touch display, preloaded street maps and it has a receiver for the microSD™ card. Its weight is 352 grams and the dimensions are 118x83x24mm [4].

So, as we can see the navigators of these two companies are similar on the one hand, but on the other hand they are different. And it is great because we can choose what we really need. I would like to add that TomTom devices are more adapted to Europe, while the navigators produced by Garmin are more adapted to America and Canada. In conclusion it is important to say that automobile navigators are necessary to simplify our journey and spare our time, and what navigator to choose is up to you.

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CONELESS SPEAKERS
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Summary: The article deals with the main principles of a conventional loudspeaker operation. The advantages and disadvantages of the conventional methods of sound reproduction are considered. Particular attention is paid to the principles of an ionophone operation. The history of its development and manufacture are considered as well.

Keywords: loudspeaker, ionophone, electric arc, sound reproduction

Анотація: Стаття розглядає основні принципи роботи звичайного гучномовця. Обговорюються переваги і недоліки традиційних методів відтворення звуку. Особлива увага приділяється принципам роботи іонофона. Історія його розробки і виробництва також описується.

Ключові слова: динамік, іонофон, електрична дуга, звуковідтворення

Аннотация: Статья рассматривает основные принципы работы обычного громкоговорителя. Обсуждаются преимущества и недостатки традиционных методов воспроизведения звука. Особое внимание уделяется принципам работы ионофона. История его разработки и производства также описывается.

Ключевые слова: динамик, ионофон, электрическая дуга, звуковоспроизведение

Have you ever thought about how your headphones or a home cinema produce sound? The majority of speakers that you see in your everyday life contain conventional loudspeakers which work as transducers converting alternating current into sound.

Conventional loudspeaker transducer designs use input electrical frequencies to vibrate a diaphragm, which has a significant mass: the constant magnet interacts with a coil coupled to a stiff plastic composite or a paper speaker cone which pushes air at respective frequencies. But the inherent inertia of the diaphragm resists acceleration and all changes of its position. Additionally, speaker cones will eventually suffer tensile fatigue from sonic vibrations. Thus a conventional speaker output, or device fidelity, is distorted by inherent physical limitations of its design. These distortions have long been the limiting factor for commercial reproduction of strong high frequencies. Square wave characteristics are also a problem; the reproduction of square waves is the most stressing factor for a speaker cone [1].

But imagine that we can create a speaker without these limitations and even... without a cone! The mankind is able to create such a speaker moreover such a speaker has already been created. It is called an ionophone or a plasma speaker. The technique is an evolution of William Duddell's "singing arc" invented in 1900 [2].

These limitations do not apply to a plasma speaker, as a member of the family of massless speakers. The low-inertia driver has exceptional transient response in comparison with other designs. This results in an even, linear output which is accurate even at extreme frequencies beyond any audible ranges. Such speakers are notable for their accuracy and clarity, but not for their power. So these designs are more effective as tweeters.

An ionophone or a plasma speaker is a form of a loudspeaker which varies air pressure via high-energy electrical plasma instead of a solid diaphragm. Connected to the output of an audio amplifier, plasma speakers vary the size of a plasma glow discharge, a corona discharge or an electric arc which then act as a massless radiating element creating the compression waves in air that listeners perceive as a sound.

Plasma speakers take an advantage of two unique principles. Firstly, ionization of gases causes their electrical resistance to drop significantly making them extremely efficient conductors, which allows them to vibrate sympathetically with a magnetic field. Secondly, plasma itself is a field of ions and has a relatively negligible mass. Thus as current frequency varies, more resistant air remains mechanically coupled with and driven by the vibration of more conductive and essentially massless plasma, creating a potentially ideal reproduction of a sound source.

There are two types of plasma speakers.

A coronaphone. It uses a vacuum tube or a transistor and a coil without a core to produce a HV corona discharge at a frequency of a few MHz. This type of plasma speakers works in compliance to the AM modulation principle (PWM modulation is rarely used for this type of plasma speakers) and has a coil without a core (the Tesla coil can be used), so the distortion of an input signal is minimal [3]. The amplitude of an output voltage is changed according to the input audio signal. The change of the output HV amplitude results in the change of the plasma cloud volume. The change of the plasma cloud volume generates sound waves. A similar effect is occasionally observed in the vicinity of high-power amplitude-modulated radio transmitters when a corona discharge occurs at the transmitting antenna, where voltages in the tens of thousands are involved. The ionized air is heated in the direct relationship to the modulating signal with surprisingly high fidelity over a

wide area. Due to the destructive effects of the self-sustaining discharge, it cannot be permitted to persist and automatic systems momentarily shut down transmission within a few seconds to quench the "flame".

An arc ionophone or a so-called «singing arc». This type of plasma speakers uses a high voltage electric arc that changes its power according to the input signal. Thus the volume of the ionized channel changes and a sound is produced [3]. As for the sound reproduction principles, it relates to class-D amplifiers. This method is very simple, safe and efficient but has the drawback: to get a high voltage arc the Pulse Width Modulator (PWM controller) or Amplitude Modulator (a vacuum tube or a transistor) and the HV transformer working at a carrier frequency that is beyond the audible range should be used. Because of the high operating frequency of the system the ferrite core is used as a core for the HV transformer. This type of the core in the transformer distorts the input audio signal especially at low frequency ranges.

As a PWM signal is just a sequence of square impulses that simply change their width in a linear dependence on the input signal but not on its repetition, the distortion of an input signal occurs. So low frequency and high fidelity sound reproduction cannot be developed.

A "singing arc" uses an ionized channel to produce a sound. A flame contains ionized gases as well, so a less expensive variation of arc ionophones is a flame speaker which uses a flame for the driver. Some designs dated to the 1950s use combustion of natural gas or candles to produce plasma through which a current flows. These combustion designs do not require high voltages to generate a plasma field [2].

In the 1950s, the pioneering DuKane Corporation produced the air-ionizing Ionovac, marketed in the UK as Ionophones. Currently there remain manufacturers in Germany who use this design, as well as a do-it-yourself design available on the Internet.

In 1978 Plasmatronics produced a commercial plasma speaker that used helium to be ionized. Alan E. Hill of the Air Force Weapons Laboratory in Albuquerque, NM, designed the Plasmatronics Hill Type I, a commercial helium-plasma tweeter. This design is the only one which uses a quieter glow discharge mode instead of more common arcs and corona discharges. But the operation of such speakers requires a continuous supply of helium [3].

To make plasma speakers a widely available product, ExcelPhysics, a Seattle-based company, and Images Scientific Instruments, a New York-based company, have offered their own variant of a plasma speaker as a DIY kit. The ExcelPhysics variant uses a flyback transformer to step up voltage, a 555 timing chip to provide modulation, a 44 kHz carrier frequency, and an audio amplifier [4].

Offering some aspects of perfect sound reproduction, plasma speakers tend not to be used in commercial musical systems. Early plasma speaker designs depend on ionized ambient air which contains nitrogen and oxygen. In an intense electrical field these gases can produce the reactive by-products (ozone and nitrous oxide) which can be hazardous.

Due to investment costs, limits in a frequency range and some safety considerations, plasma speakers are still considered to be experiments and curiosities. But at present I am developing a simple and reliable method which uses a magnetic field and an ionized channel to produce sound waves.

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УДК: 524.83

LAMBDA-CDM MODEL PARADOX OF COSMOLOGICAL HORIZON

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Summary: This article deals with understanding the nature of the universe by analysing discoveries in the cosmological field through the history of its development. We have also defined the concept of paradox of cosmological horizon, compared two models of the universe and explored the nature of this paradox in each of them.

Key words: cosmological horizon, the Inflation model, the Lambda-CDM model, scale factor.

Анотація: Дана стаття присвячена розумінню природи всесвіту за допомогою розгляду відкриттів в області космології, під час її активного розвитку. Так само тут описано визначення парадоксу космологічного горизонту, наведено порівняння двох космологічних моделей і поведінку космологічного горизонту в кожній з них.

Ключові слова: інфляційна модель всесвіту, космологічний горизонт, масштабний фактор, стандартна космологічна модель.

Аннотация: Данная статья посвящена пониманию природы вселенной посредством рассмотрения открытий в области космологии, во время ее активного развития. Также здесь описано определение парадокса космологического горизонта, приведено сравнение двух космологических моделей и поведение космологического горизонта в каждой из них.

Ключевые слова: инфляционная модель вселенной, космологический горизонт, масштабный фактор, стандартная космологическая модель.

Cosmology is the scholarly and scientific study of the origin, evolution, large-scale structures and dynamics, and ultimate fate of the universe, as well as the scientific laws that govern these realities. It rapidly began to make huge progress in XX century because of the earlier development of Einstein's theory of general relativity, extragalactic astronomy and particle physics. The first research in this field based on the theory of general relativity was published in 1917 by Einstein. In this paper he assumed that Universe is homogeneous, isotropic and stationary.

But in 1922 Friedmann introduced the solution of Einstein's equations with an expanding isotropical universe. The confirmation of the theory appeared in 1922, when Hubble discovered a cosmological redshift due to which the Big Bang theory and later, in the end of XX century, Lambda cold dark matter model (Λ CDM) appeared.

This model is a parametrization of the Big Bang cosmological model in which the universe contains a cosmological constant associated with dark energy and cold dark matter. It is frequently referred to as the standard model of Big Bang cosmology, because it is the simplest model that provides a reasonably good account of the following properties of the cosmos:

- the existence and structure of the cosmic microwave background
 - the large-scale structure in the distribution of galaxies
 - the abundances of hydrogen (including deuterium), helium, and lithium
 - the accelerating expansion of the universe observed in the light from distant galaxies and supernovae
- Λ CDM assumes different roles of the components of matter at the different stages of evolution of the

universe. In the time interval from the Planck epoch ($t_{Planck} \approx 10^{-43}$ seconds), to the era when the universe behaviour was determined by the prevailing equation of radiation state:

$$p = \varepsilon/3,$$

where p - pressure, ε - the energy density.

The scale factor $a(t)$, varying along this specific time interval, changes on the law $a(t) \sim t^{1/2}$, and then up to a certain time - $a(t) \sim t^{2/3}$, but starting from the predominance of "dusty" matter happening right now $a(t)$ corresponds to this kind of equation :

$$p = 0$$

In the universe, according to the Λ CDM, there is cosmological horizon - a certain limit, beyond which the events cannot be seen. It results from the expansion of the universe, and the finite speed of light.

As we can see, accelerating universe resembles a black hole and its event horizon, outside of which we cannot receive signals. The light emitted by galaxies that are currently further away from us, comparing to cosmological horizon, will never reach us. We can see the events, which took place in galaxies before crossing the cosmological horizon, but it will be impossible for us to know about subsequent happenings.

The existence of this phenomenon is called the paradox of cosmological horizon.

The size of the observational universe l_h is the distance to the cosmological horizon, which is calculated by the formula:

$$l_h = a(t) \int_0^t \frac{dt'}{a(t')}$$

For simplicity we consider the initial stage of evolution of the universe to be the time when there was only one predominant form of matter. Therefore, we take not an exact formula of $a(t)$ but formula for this state of matter.

It can be concluded that we are able to observe regions (and the objects and particles existing there), which are currently at a distance of $l \leq l_h$ from each other.

In order to explore the paradox of the cosmological horizon more specifically we need to differentiate the functions that describe this phenomenon: $a(t)$ and $l_h(t)$ at the initial time ($t = 0$)

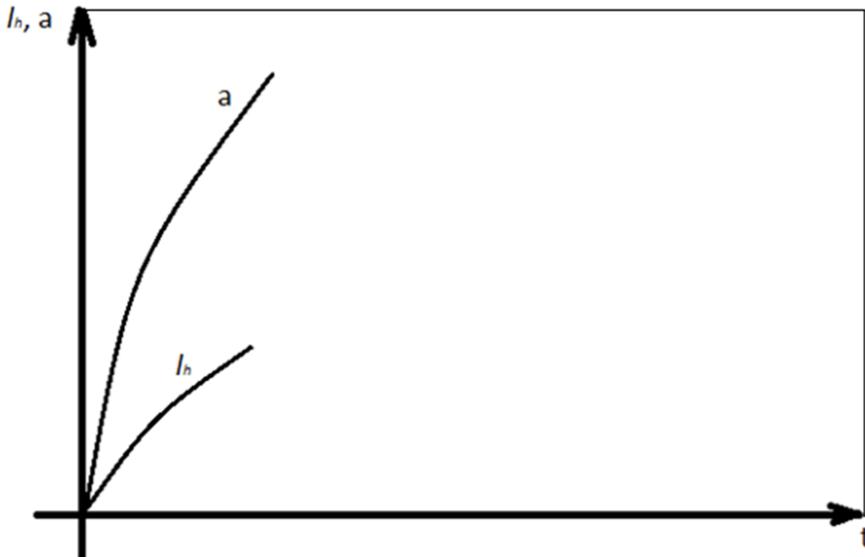
$$a = At^{2/3}$$

$$\dot{a} = \frac{2}{3}A \frac{1}{t^{1/3}} \rightarrow \infty, \quad t \rightarrow 0,$$

where A is some constant

$$l_h = ca(t) \int_0^t \frac{dt'}{a(t')} = 3ct$$

$$\dot{l}_h = 3c$$



Graph1

A schematic graph comparing the scale factor and the length of the event horizon of the universe, in Λ CDM within the initial period of time.

In this case we can see the paradox of the cosmological horizon.

The concept of inflation provides the resolution of this paradox. This theory describes exponential expansion of space in the early universe. The inflationary epoch lasted from 10^{-36} seconds after the Big Bang to sometime between 10^{-33} and 10^{-32} seconds.

Then $a(t)$ is as follows:

$$a = a_0 e^{\frac{c}{a_0} t} = a_0 e^{Ht}$$

and

$$\dot{a} = ce^{\frac{c}{a_0} t}$$

The l_h will be:

$$l_h = ca_0 e^{\frac{c}{a_0} t} \int_0^t \frac{dt'}{a_0 e^{\frac{c}{a_0} t'}}$$

In that case

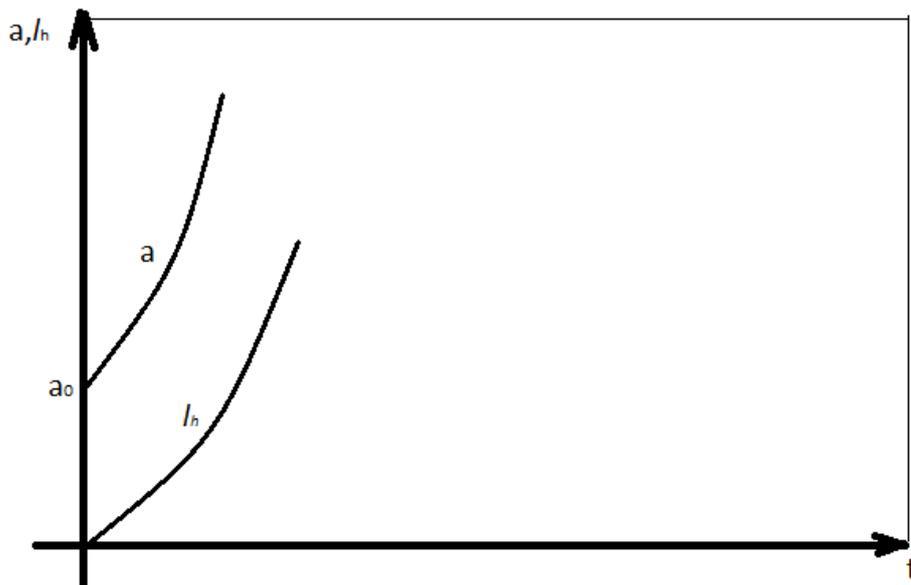
$$\dot{l}_h = a_0 \left(e^{\frac{c}{a_0} t} - 1 \right)$$

Find the ratio of derivatives:

$$\frac{\dot{l}_h}{\dot{a}} = \frac{e^{\frac{c}{a_0} t} - 1}{e^{\frac{c}{a_0} t}} \rightarrow 1, \quad t \rightarrow \infty$$

The ratio $\frac{\dot{l}_h}{\dot{a}}$ approaches unity quite rapidly. So, when $\frac{ct}{a_0} = 7$, the deviation of this value is less than 0.1%

Graph.2



A schematic graph, which compares the scale factor and the length of the event horizon of the universe, in the Inflation model of the universe within the initial period of time

In the Lambda-CDM model, at the time when radiation or dust are predominant in the universe, the scale factor a increases infinitely fast with time t , and, on the contrary, the value l_h increases with finite rate. In this case we definitely observe the paradox of cosmological horizon.

In the Inflation model we can see that the behaviour of $a(t)$ and $l_h(t)$ solve the problem of the paradox of the cosmological horizon because here the ratio of the scale factor and the distance

to the cosmological horizon tends to unity. Also, it should be noted that the inflationary model solves the problem of the flatness of the universe due to the rapid expansion during inflation period.

All values for scale factor are solutions of Einstein's equations of theory of general relativity for homogeneous and isotropic world.

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CAUSTICS OF REGULAR CURVES

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Summary: The article deals with the mathematical problem of regular space curves caustics. In the result of the research the condition of this caustics existing, written as differential equation, which binds local characteristics of a curve with characteristics of reflected rays, is defined, and caustic's equation in vector form is obtained. Practical application of the result is also analyzed in the article.

Key words: caustics, envelope of a family of curves, ruled surface.

Анотація: Стаття присвячена математичній проблемі каустик регулярних просторових кривих. В результаті роботи було виявлено, що умова існування цих каустик записується у вигляді диференційного рівняння, яке пов'язує локальні характеристики кривої з характеристиками відбитих від кривої промінів, та отримано рівняння каустики цієї кривої. Практичне застосування отриманого результату також проаналізовано у статті.

Ключові слова: каустика кривої, лінійчата поверхня, обгортка сімейства кривих.

Аннотация: Статья посвящена математической проблеме каустик регулярных пространственных кривых. В результате работы было выявлено, что условие существования этих каустик записывается в виде дифференциального уравнения, связывающего локальные характеристики кривой с характеристиками отраженных от кривой лучей, и получено уравнение каустики этой кривой. Практическое применение полученного результата также проанализировано в статье.

Ключевые слова: каустика кривой, линейчатая поверхность, огибающая семейства кривых.

Caustics were first introduced and studied by Tschirnhaus in 1682. Other contributors were Huygens, Quetelet, Lagrange and Cayley. The study of caustic persists to the present. A great amount of material on

caustics can be found between the discoveries of Maurolycus and the observation of Thom [2]. In this paper we will discuss caustics of regular curves in space.

Firstly, we define the notion of caustic. A caustic curve is the envelope of light rays, emitted from a radiant point source S after reflection or refraction by a given curve (mirror-curve). The caustics by reflection and refraction are called catacaustic and diacaustic, respectively. Envelope is a curve that is tangential to each one of a family curves [7, p. 15].

Let the source S be infinitely far away from a curve. So we have a bunch of parallel beams formed by some vector \vec{a} . We will explore catacaustic of these beams in three-dimensional space.

Let $\rho = \rho(s)$ be a curve in Euclidean space, where $\rho(s)$ is vector-function of the natural parameter s (formally, it is a vector C). There is a reflection ray in each point K on curve. Direction of reflected ray \vec{b} depends on the point on the mirror-curve and some vector \vec{n} , normal to the curve at that point. We can use Frenet–Serret formulas to describe those two vectors.

The Frenet–Serret formulas apply to curves which are non-degenerate, which roughly means that they have nonzero curvature. Define three vectors T, N, B , where T is tangent unit vector, N – normal unit vector, B – binormal unit vector. These vectors are all perpendicular to each other. The formulas describe the derivatives of T, N, B in terms of each other [4, p. 38].

Vector \vec{n} is normal to the curve, thus it is normal to tangent unit vector T . Hence, it can be described as linear combination of vectors N and B . Let's define angle $\varphi = \varphi(s)$ as such that $\vec{n} = N \cdot \cos(\varphi) + B \cdot \sin(\varphi)$. Vector \vec{n} and point K on curve define the plane π . A light ray, that falls on point K , reflects from the mirror-plane π and direction of reflected ray $\vec{b} = \vec{a} - 2 \langle \vec{a}, \vec{n} \rangle \cdot \vec{n}$, where $\langle \vec{a}, \vec{n} \rangle$ means the scalar product of these two vectors. So, we can obtain vector \vec{b} with knowing \vec{a}, φ and the Frenet–Serret formulas in point K . Strictly speaking, vectors T, N, B, \vec{n} and, henceforth, \vec{b} depend on point K , so on parameter s . So, we can write $T(s), N(s), B(s), \vec{n}(s)$ and $\vec{b}(s)$ respectively, remembering that beam bunch is independent from the point, so as vector \vec{a} .

On the other hand, a curve and reflection rays are forming a ruled surface. There is our curve and a family of lateral straight lines – one for each point of a curve. Hence, there is a surface $r(s, v) = \rho(s) + v \cdot b(s)$. If that ruled surface has an envelope then that one is torsal ruled surface. Thus, that is a developable surface.

A developable surface is a ruled surface having Gaussian curvature $K=0$ everywhere. Developable surfaces therefore include the cone, cylinder, torsal and plane. A developable surface has the property that it can be made out of sheet metal, since such a surface must be obtainable by transformation from a plane (which has Gaussian curvature 0) and every point on such a surface lies on at least one straight line [4, p. 39].

A developable surface has the following differential geometry properties. A developable surface can be mapped isometrically onto a plane. Isometric surfaces have the same Gaussian curvature at corresponding points. Corresponding curves on isometric surfaces have the same geodesic curvature at corresponding points. Every isometric mapping is conformal; i.e. the angle of intersection of every arbitrary pair of intersecting arcs on a developable surface is the same as that of the corresponding inverse image in the plane at the corresponding points. A geodesic on a developable surface maps to a straight line in the plane. We will use these properties in future [6, p. 132].

Gaussian curvature, sometimes also called total curvature, is an intrinsic property of a space independent of the coordinate system used to describe it. The Gaussian curvature of a regular surface in Euclidean three-dimensional space at a point is formally defined as determinant of the shape operator of surface.

Thus, we have a developable surface and its Gaussian curvature equals to zero. We have the following theorem:

Theorem 1:

Ruled surface built on curve $\vec{\rho} = \vec{\rho}(s)$ is developable if and only if triple product $(\vec{\rho}', \vec{b}', \vec{b}) = 0$, where $\vec{b} = \vec{b}(s)$ - is a unit-length vector that traces a curve on the unit sphere and $\vec{\rho}'$ and \vec{b}' means derivative of vector-functions $\rho(s)$ and $\vec{b}(s)$ for parameter s : $\frac{d\vec{\rho}}{ds}$ and $\frac{d\vec{b}}{ds}$

Using this theorem and the Frenet–Serret formulas, we can get a condition for existing a catacaustic derived by our curve. This condition is an differential equation, binding function $\varphi(s)$, which we use to determine vector \vec{n} , with local curve properties, such as torsion and curvature [1, p. 12].

Statement 1:

The envelope of reflected rays from mirror-curve $\vec{\rho} = \vec{\rho}(s)$ and light beams determined by vector \vec{a} exists on some area of the curve if and only if the following differential equation is true for each point of this area:

$$\frac{d\varphi}{ds} = - \frac{k_1 \cdot \langle \vec{a}, T \rangle \cdot \cos \varphi \cdot (\langle \vec{a}, N \rangle \cdot \sin \varphi - \langle \vec{a}, B \rangle \cdot \cos \varphi)}{\langle \vec{a}, N \rangle^2 + \langle \vec{a}, B \rangle^2} - k_2$$

k_1 and k_2 are curvature and torsion of mirror-curve respectively.

This result shows us that the envelope of reflected rays (or, in other words, lateral straight lines of ruled surface) exists not in each point of curve.

We also have another efficient theorem about torsal ruled surface.

Theorem 2:

If $\vec{\rho}' \neq 0$ and $\vec{b}' \neq 0$ then there are only one envelope curve $\vec{\rho}_*$ for family of lateral straight lines that can be determined by equality $\vec{\rho}_* = \vec{\rho} - \frac{\langle \vec{\rho}', \vec{b}' \rangle}{|\vec{b}'|^2} \vec{b}$, where $|\vec{b}'|$ means the length of vector \vec{b}' .

Hence, we can not only indicate areas of basic curve, on which the caustic occurs, we can actually identify its location in space.

Let's discuss the possible ways of applying this result.

Generally speaking, we observe caustics every day. A commonly observed phenomenon is the pattern on the bottom of a cylindrical container resulting from reflected light off of its vertical sides. This brightly lit piecewise smooth curve with a single cusp, sometimes called the “coffee cup caustic” is the envelope of reflected light rays. Each point on the this curve is a focal point for some point on the reflective surface, with the focal point depending on the location of the light source and the curvature of the surface. But this is not the same caustic as in our notion; it is just a family of focal point. We can obtain truly geometry caustic, using our equation.

We can also use it in computer simulation area. The automatic construction of geometric objects from a predetermined property is an important engineering task. We address the problem of constructing a transmissive or reflective surface that, given a predefined light position, creates an a priori defined caustic image. This task of creating a specific caustic occurs in the design of headlights, of parabolic concentrators for solar cells or interior design.

In conclusion it should be noted that the same approach can also be used to reconstruct the surface geometry of a real object given only an image of its caustic. Caustics are often caused by water surfaces, glass objects, such as lenses, or concave mirrors as one finds them in headlights. In photo-realistic image synthesis a common task is to simulate these caustics. And last, but not least, applying is theory of wavefronts. Envelope of wave is, actually, the wave front. In other words, caustic is a curve where indefinitely close waves intersect, i.e. the points of concentration waves. So the results of our research can be also used in this domain.

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PARACONDUCTIVITY OF $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}+\text{HfO}_2$ COMPOUNDS**Savich S. V., Samoilov A. V., Tiutierieva K. V. (Kharkiv)****Scientific supervisor: Vovk R. V.****Language supervisor: Kotova A. V.**

Summary: The conductivity of Hf doped $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ ceramics was studied in the article. It was shown that the introduction of Hf additive leads to the increase in the amount of scattering effective centres of normal carriers. Excessive conductivity of the studied samples near T_c is satisfactorily described by a theoretical model of Aslamazov-Larkin. At the same time Hf additive leads to a significant increase in the absolute value of $\xi_c(0)$ and the shift of 3D-2D crossover point with regard to the temperature.

Key words: 3D-2D crossover, excessive conductivity, pseudo gap, YBaCuO ceramics.

Анотація: У роботі досліджена провідність керамік $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ допированих Hf. Показано, що внесення домішок Hf приводить до зростання кількості ефективних центрів розсіяння нормальних носіїв. Надлишкова провідність досліджених зразків біля T_c задовільно описується теоретичною моделлю Асламазова-Ларкіна. При цьому домішок Hf приводить до значного зростання абсолютного значення величин $\xi_c(0)$ та зміщенню по температурі точки 3D-2D кросовера.

Ключові слова: 3D-2D кросовера, надлишкова провідність, псевдо щілина, YBaCuO кераміки.

Аннотация: В работе исследована проводимость керамик $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ допированных Hf. Показано, что внесение примеси Hf приводит к возрастанию числа эффективных центров рассеяния нормальных носителей. Избыточная проводимость исследованных образцов вблизи T_c удовлетворительно описывается теоретической моделью Асламазова-Ларкина. При этом добавка Hf приводит к значительному возрастанию абсолютного значения величины $\xi_c(0)$ и смещению по температуре точки 3D-2D кросовера.

Ключевые слова: 3D-2D кросовер, избыточная проводимость, псевдо щель, YBaCuO керамики.

A characteristic feature of HTSC-compounds of the 1-2-3 system, is relative simplicity of full or partial substitution of components by their isoelectronic analogues [4, p. 151]. As it was established in a number of studies [6, p. 387-394] such substitution often facilitates slowing of the aging processes in the compounds of such a type and improving of the stability of their technological characteristics. Most clearly it is demonstrated in the case of ceramic samples, which are also currently the most functional in terms of their practical application [5, p.555-560].

At the same time this kind of substitution often leads to the significant evolution of specific physical phenomena observed in the HTSC - materials with regard to the normal (non-superconducting) condition. The latter refers to the pseudogap (PG) and fluctuation (FC) abnormalities, transitions of the metal-insulator type, incoherent electric transport, anisotropy of some physical characteristics, and etc. [1, p. 1281]. According to the modern concepts [1, p. 151-168] these unusual phenomena may serve as a key to understanding of the microscopic nature of the high-temperature superconductors, which remains unknown despite the 29-year history of intense experimental and theoretical research.

Taking into consideration the abovementioned, the influence of Hf impurities on the fluctuation conductivity in HTSC – YBaCuO ceramics at the near critical temperatures was investigated in the study.

Samples of $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ ceramics were synthesized by interaction of Y_2O_3 , BaCO_3 , and CuO (all OS grades) compounds taken in the respective molar ratios in the temperature range 750-900° C. The obtained powder was pressed under pressure of 4 ton/cm² into the disks of 20x4 mm size and sintered at the temperature of 950-970°C within 5 hours followed by cooling to the room temperature with intermediate dwell of 2-3 hours at the temperatures of 890 and 530°C. The obtained tablets represented superconducting ceramics with rhombic symmetry of lattice and $T_c \sim 90$ K. For obtaining samples with addition of hafnium the starting material was added with a various quantity of weight % of Hf_2O_3 . Modes of production and saturation with oxygen were the same as for the undoped ceramics.

For resistive studies the pieces of rectangular shape were sawed from the "tablets". Contacts were applied by rubbing of ceramic India into the surface followed by soldering of copper conductors to these sites. The electrical resistivity was measured by standard 4 contact procedure with direct current up to 10 mA. The sample temperature was determined by a platinum thermal resistor.

Temperature dependences of the stated electrical resistance of $R/R_{300}(T)$ samples are shown in Figure 1. Resistive transitions into the superconducting state of the same samples are shown in the inset. It appears that the dependences are quasimetallic. The parameters of the studies samples are shown in the table. According to the literature data the high values of $T_c=92.1$ K critical temperature correspond to the oxygen content $\delta \leq 0.1$ [7, p. 261-273].

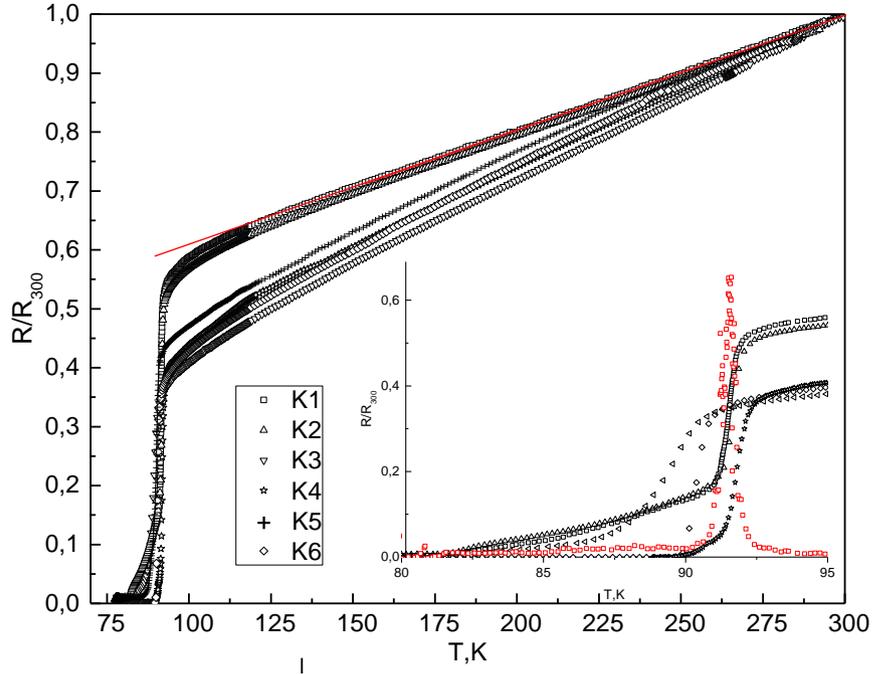


Fig. 1. Dependence of reduced electrical resistance $R/R_{300}(T)$ of ceramic samples with the addition of K1 hafnium. The inset shows the transition to the superconducting state in the coordinates of $R/R_{300}(T)$ and $d(R/R_{300}(T))/dT - T$ in the area of superconducting transition of one sample. Numbering of the curves in the inset corresponds to the numbering in the Fig.

As appears from the Figure 1 $R/R_{300}(T)$ deviation from linear dependence takes place with the decrease of temperature below a certain characteristic value of T^* which shows the appearance of a certain excess conductivity, which according to the theoretical concepts [2, p. 238-239] near T_c is conditioned by processes of fluctuation pairing of the carriers. Their contribution to the conductivity at $T > T_c$ for two (2D) and three-dimensional (3D) cases is determined by the following power dependence (6):

$$\Delta\sigma_{2D} = \frac{e^2}{16\hbar d} \varepsilon^{-1}, \quad (1)$$

$$\Delta\sigma_{3D} = \frac{e^2}{32\hbar\xi_c(0)} \varepsilon^{-1/2}, \quad (2)$$

where $\varepsilon = (T - T_c)/T_c$, e is electron charge, $\xi_c(0)$ – is coherence length along the c axis at $T \rightarrow 0$ and d - is a characteristic size of a two-dimensional layer. In our case T_c was determined at the maximum point in the dependences of $d(R/R_{300})/dT$ in the area of superconducting transition (Fig. 1 Inset).

The temperature dependence of the excess conductivity is usually determined by the equation:

$$\Delta\sigma = \sigma - \sigma_0, \quad (3)$$

where $\sigma_0 = \rho_0^{-1} = (A + BT)^{-1}$ is the conductivity determined by interpolation of the linear section of $\rho(T)$ to the zero value of the temperature and $\sigma = \rho^{-1}$ is an experimentally determined value of conductivity in the normal condition.

Fig. 2 shows the temperature dependences of $\Delta\sigma(T)$ in $\ln \Delta\sigma - \ln \varepsilon$ coordinates. It can be seen that near T_c these curves are approximated satisfactorily by straight lines with a slope of $\text{tg } \alpha \sim 0.5$ corresponding to the exponent parameter of $-1/2$ in the equation (2), which obviously evidences about 3D character of the fluctuation conductivity in this temperature interval. Upon further temperature increase the rate of $\Delta\sigma$ decrease substantially increases ($\text{tg } \alpha \sim 1$) which in its turn can be interpreted as an indication for change of fluctuation conductivity dimensionality. As it follows from Eqs. (1) and (2) at the point of 2D-3D crossover:

$$\xi_c(0)\varepsilon_0^{-1/2} = d/2. \quad (4)$$

In this case having determined ε_0 value and using literature data on the dependence of the interplane distance on δ [3, p. 44-62] ($d \approx 11.7 \text{ \AA}$), it may be possible to calculate the values of $\xi_c(0)$. The concentration dependences

of the coherence length $\xi_c(0)$ are shown in the inset to the Figure 2.

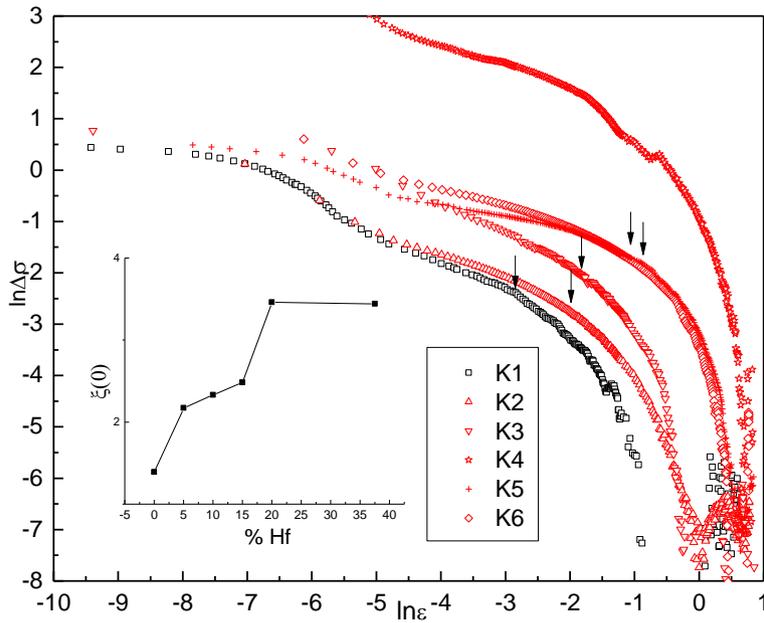


Fig. 2. Temperature dependences of the excess conductivity for K1 - K6 samples in $\ln\Delta\sigma\text{-}\ln\varepsilon$. Designation of the curves corresponds to the designations in the Fig.1. Straight lines show an approximation to the inclination angle $\text{tg}\alpha_1\approx-0.5$ (3D - mode) and $\text{tg}\alpha_2\approx-1.0$ (2D - mode). Arrows show the point of 2D-3D crossover. The inset shows the dependences of coherence length $\xi_c(0)$ on the percentage of hafnium in the samples.

The calculations showed that with introduction of Hf additives a change in the value of coherence length from $\xi_c(0)=1,39\text{\AA}$ in YBaCuO to $\xi_c(0)=3,44\text{\AA}$ in Hf doped samples takes place by 37.5% and 3D-2D crossover point significantly shifts with regard to the temperature (see Table and Fig. 2).

In conclusion, we briefly resume the main results obtained in this paper. Excessive conductivity $\Delta\sigma(T)$ of Hf-doped YBaCuO samples in the case nearing T_c is satisfactorily described in the framework of a theoretical model of Aslamazov-Larkin. Doping of YBaCuO single crystals by hafnium leads to a more than twofold increase in the absolute value of $\xi_c(0)$ and significant shift of 3D-2D crossover point with regard to the temperature.

Table

Samples	% Hf	T_c , K	T^* , K	Δ^*_{ab} , meV	$\text{Ln}(\varepsilon_0)$	ε_0	$\xi_c(0)$, \AA
K1	0	91,47	154	0,1006	-2,87	0,0567	1,39297
K2	5	91,62	160	0,06776	-1,98	0,13807	2,17372
K3	10	89,5	165	0,0675	-1,84	0,15882	2,33134
K4	15	91,65	250	0,05647	-1,714	0,18014	2,48294
K5	20	90,17	240	0,0306	-1,05	0,34994	3,4606
K6	37,5	90,38	237	0,03897	-1,06	0,34646	3,44334

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PRIME NUMBER – WHAT IS IT?

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Summary: As the title implies the article describes prime numbers. It is described in detail what is the prime number. A mention should be made about the set of a prime numbers. Much attention is drawn to the some open questions about these numbers. It is introduced some new definitions. It is investigated some properties of prime numbers. The article is of interest to people that are interested in number theory.

Key word: new definitions, number theory, prime number, questions about prime numbers.

Анотація: Як видно із назви, стаття описую прості числа. Детально описано, які це прості числа. Згадується множина простих чисел. Багато уваги приділено відкритим питанням про ці числа. Введено декілька нових понять. Досліджено деякі властивості простих чисел. Стаття буде цікава людям, які цікавляться теорією чисел.

Ключові слова: нові визначення, просте число, питання про прості числа, теорія чисел.

Аннотация: Как видно из названия, статья описывает простые числа. Подробно описано, какие это простые числа. Упомянется множество простых чисел. Много внимания уделено открытым вопросам, которые связаны с простыми числами. Введено несколько новых понятий. Исследовано некоторые свойства простых чисел. Статья будет интересна людям, которые интересуются теорией чисел.

Ключевые слова: новые определения, простое число, вопросы о простых числах, теория чисел.

A prime number it is a positive integer that has exactly two distinct natural number divisors one and itself. In other words, the number p is a prime if it is greater than 1 and that is divisible only by 1 and p (to itself). For example, 5 is a prime number, 16 isn't.

We denote the set P as a set of all primes.

Representation of natural numbers as the product is called a simple decomposition or factorization into prime numbers. There are still many open questions about primes, the most famous of which were listed by Edmund Landau at the Fifth International Congress of Mathematicians:

1. *Goldbach's conjecture (the first Landau's problem):* Can every even number greater than two can be represented as the sum of two primes. And can every odd integers greater than 5 can be written as the sum of three primes?

2. *The second Landau's conjecture:* Are the infinitely the set of "simple twins" – are pairs of prime numbers, the difference between which is equal to 2? (in 2013 the mathematician Yitang Zhang from the University of New Hampshire showed that there was an infinite number of pairs of prime numbers, the distance between them was less than 70 million. Later, James Maynard improved his result to 600).

3. *Legendre's conjecture (the third Landau's problem):* Does there always exist at least one prime between consecutive perfect squares?

4. *The fourth Landau's problem.* Are there infinitely the set of primes of the form $n^2 + 1$, where n – integer?

I would like to introduce a few new definitions. Thus, the set D will be called a dozen set. That is equivalent to the set D is countable. For example,

$$D_0 = \{0, 1, 2, \dots, 9\}, D_{100} = \{1000, 1001, \dots, 1009\}, \text{ etc.}$$

Centre Z_n of dozen D_n will call numbers in the form $\{10n + 4, 10n + 5\}$. For example, $Z_5 = \{54, 55\}$, $Z_{30} = \{304, 305\}$.

Now we introduce several definitions for the numbers in the dozens. Right center $\vec{Z}_n = \{10n + 5\}$. For example, $\vec{Z}_5 = \{55\}$. Left center $\overleftarrow{Z}_n = \{10n + 4\}$. For example= $\{714\}$.

Right dozen space $\vec{Z}_n = [10n + 5, 10n + 9]$. Left space dozen $\overleftarrow{Z}_n = [10n, 10 + 4]$.

The number a is called right-center if it belongs to \vec{Z}_n .

The number a is called left-center if it belongs to \overleftarrow{Z}_n .

$$\text{Number } 103 \in \overleftarrow{Z}_{10}.$$

The degree of dispersion $\overset{\Delta}{a}$ of the number a is the distance to the nearest center of the numbers of a dozen, belongs to this number.

To find this degree you need to divide the number by 10 with a remainder and look at the remainder. If it is less than or equal to 9, but greater than or equal to 5, then you should subtract 5 from the result. If the remainder is greater than or equal to 0 and less than or equal to 4, then you should subtract 4 from the result.

To determine what is the dozen of number, you should divide this number by 10, and look for the particular. This will be a number of the dozen. For example: What is the dozen of 169?

Following this algorithm, we obtain: $169/10 = 16$ (rem.9). So $169 \in D_{16}$.

Now we answer the following questions. How can we determine in what space of the dozen number is located? As in the previous problem, we have to divide the number by 10 with a remainder, and look at the remainder. If it is less than or equal to 9, but greater than or equal to 5, the number belongs to the right space dozen. If the remainder is greater than or equal to 0 and less than or equal to 4, then the number belongs to the space left ten.

For example: Determine the dozen of 153. In what space of dozen 153 is located? Find $\overset{\Delta}{153}$. First, we must divide 153 by 10 with remainder $153/10 = 15$ (rem.3). Quotient 15 means the number 15 belongs to the 1 dozen. The remainder is 3, so this number belongs to the left space. As the remainder is 3, which is less than 4,

we obtain $\overset{\Delta}{153} = 4 - 3 = 1$.

Now go back directly to the prime numbers. We investigate every prime number up to all of the dozen.

1) $D_0 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$.

So $\overset{\Delta}{2} = 2$; $\overset{\Delta}{3} = 1$; $\overset{\Delta}{5} = 0$; $\overset{\Delta}{7} = 2$. The result was a set of numbers $\{2, 1, 0, 2, 4\}$.

2) $D_1 = \{10, 11, 12, 13, 14, 16, 17, 18, 19\}$.

We perform the same operation.

$\overset{\Delta}{11} = 3$, $\overset{\Delta}{13} = 1$, $\overset{\Delta}{17} = 2$, $\overset{\Delta}{19} = 4$. We have $\{3, 1, 2, 4\}$

3) $D_2 = \{20, 21, 22, 23, 24, 25, 26, 27, 28, 29\}$.

$\overset{\Delta}{23} = 1$, $\overset{\Delta}{29} = 4$. Received $\{1, 4\}$. (**)

4) $D_3 = \{30, 31, 32, 33, 34, 35, 36, 37, 38, 39\}$

$\overset{\Delta}{31} = 3$, $\overset{\Delta}{37} = 2$. Got $\{3, 2\}$. (*)

5) $D_4 = \{40, 41, 42, 43, 44, 45, 46, 47, 48, 49\}$

$\overset{\Delta}{41} = 3$, $\overset{\Delta}{43} = 1$, $\overset{\Delta}{47} = 2$. Have $\{3, 1, 2\}$

6) $D_5 = \{50, 51, 52, 53, 54, 55, 56, 57, 58, 59\}$

$\overset{\Delta}{53} = 1$, $\overset{\Delta}{59} = 4$. Received $\{1, 4\}$ (**)

7) $D_6 = \{60, 61, 62, 63, 64, 65, 66, 67, 68, 69\}$

$\overset{\Delta}{61} = 3$, $\overset{\Delta}{67} = 2$. Got $\{3, 2\}$ (*)

8) $D_7 = \{70, 71, 72, 73, 74, 75, 76, 77, 78, 79\}$

$\overset{\Delta}{71} = 3$, $\overset{\Delta}{73} = 1$, $\overset{\Delta}{79} = 4$. Have $\{3, 2, 4\}$

9) $D_8 = \{80, 81, 82, 83, 84, 85, 86, 87, 88, 89\}$

$\overset{\Delta}{83} = 1$, $\overset{\Delta}{89} = 4$. Received $\{1, 4\}$ (**)

10) $D_9 = \{90, 91, 92, 93, 94, 95, 96, 97, 98, 99\}$

$\overset{\Delta}{91}=3, \overset{\Delta}{97}=2$. We have $\{3\} 2 (*)$

To test patterns consider certain = $\{110, 111, 112, 113, 114, 115, 116, 117, 118, 119\}$. Primes of dozen are 113 and 119. Their degree of dispersion are respectively 1 and 4. To test other combinations examine = $\{120, 121, 122, 123, 124, 125, 126, 127, 128, 129\}$. Prime numbers - 127. It is the degree of dispersion is equal to 2. But in the 15 dozen prime numbers are 151, 157. And their degree of dispersion will be 3 and 2 respectively.

In this article, we learned that all such primes and some general facts about them. Also we introduced new definitions, such as a set of tens, n dozen center dozen, a dozen space, the degree of variation in the number ten. We learned an algorithm for determining a dozen, which owns the number, determined the location of the number in the top ten. We also learned how to calculate the degree of scatter. We did a study of tens from 0 to 9, and saw some patterns. For example, a prime number that is divisible by 5, there is only the number 5. We can make the assumption that the combination of (**), from the second, repeated every 3 dozen. We have seen it in the example 5, 8 and 11 dozen. And there is a set of numbers (*), which is present at the 3, 6 and 9 to 12, broken dozens of top ten, but recovered to 15.

Among the randomness of prime numbers we could find some patterns, and these patterns may form the basis for the creation of formulas for finding any prime number on a number line.

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HISTORY OF THE AUTOMOBILE

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Summary. The article deals with the history of the automobile, well-known auto-makers, car engines as well as modern innovations in the field of automotive industry. The article is of great value as it highlights the state of affairs in one of the most rapidly growing industries.

Key words: gasoline, railway, vehicle, inventor, combustion, electric, design, emission, manufacturer, engine.

Анотація. Стаття присвячена історії автомобіля. У ній розповідається про відомих автовиробників, автомобільних двигунах, а також сучасних інноваціях в області автомобільної промисловості. Стаття представляє велику цінність, оскільки вона висвітлює справжнє становище справ в одній з найбільш швидко зростаючих галузей промисловості.

Ключові слова: бензин, залізничні колії, автомобіль, винахідник, горіння, електричний, дизайн, викиди, виробник, двигун.

Аннотация. Статья посвящена истории автомобиля. В ней рассказывается об известных автопроизводителях, автомобильных двигателях, а также современных инновациях в области автомобильной промышленности. Статья представляет большую ценность, так как она освещает настоящее положение дел в одной из наиболее быстро растущих отраслей промышленности.

Ключевые слова: бензин, железнодорожные пути, автомобиль, изобретатель, горание, электрический, дизайн, выбросы, производитель, двигатель.

The early history of the automobile can be divided into a number of eras, based on the prevalent means of propulsion. Later periods were defined by trends in exterior styling, size, and utility preferences.

In 1768, the first steam powered automobile capable of human transportation was built by Nicolas-Joseph Cugnot.

In 1807, François Isaac de Rivaz designed the first car powered by an internal combustion engine fueled by hydrogen.

In 1886 the first petrol or gasoline powered automobile the Benz Patent-Motorwagen was invented by Karl Benz. This is also considered to be the first "production" vehicle as Benz made several identical copies.

At the turn of the 20th century electrically powered automobiles appeared but only occupied a niche market until the turn of the 21st century.

Early automobiles 17th and 18th centuries

Ferdinand Verbiest, a member of a Jesuit mission in China, built the first steam-powered vehicle around 1672 as a toy for the Chinese Emperor. It was of small enough scale that it could not carry a driver but it was, quite possibly the first working steam-powered vehicle ('auto-mobile').

Steam-powered self-propelled vehicles large enough to transport people and cargo were first devised in the late 18th century. Nicolas-Joseph Cugnot demonstrated his *fardier à vapeur* ("steam dray"), an experimental steam-driven artillery tractor, in 1770 and 1771. As Cugnot's design proved to be impractical, his invention was not developed in his native France. The center of innovation shifted to Great Britain. By 1784, William Murdoch had built a working model of a steam carriage in Redruth. The first automobile patent in the United States was granted to Oliver Evans in 1789, and in 1801 Richard Trevithick was running a full-sized vehicle on the roads in Camborne [1, p. 14].

19th century

Many vehicles were in vogue for a time, and over the next decades such innovations as hand brakes, multi-speed transmissions, and better steering developed. Some were commercially successful in providing mass transit, until a backlash against these large speedy vehicles resulted in the passage of the Locomotive Act (1865), which required many self-propelled vehicles on public roads in the United Kingdom to be preceded by a man on foot waving a red flag and blowing a horn. This effectively killed road auto development in the UK for most of the rest of the 19th century; inventors and engineers shifted their efforts to improvements in railway locomotives. (The law was not repealed until 1896, although the need for the red flag was removed in 1878.)

The American George B. Selden filed for a patent on May 8, 1879. His application included not only the engine but its use in a 4-wheeled car. Selden filed a series of amendments to his application which stretched out the legal process, resulting in a delay of 16 years before the US 549160 was granted on November 5, 1895 [2, p. 55].

Karl Benz, the inventor of numerous car-related technologies, received a German patent in 1886.

The four-stroke petrol (gasoline) internal combustion engine that constitutes the most prevalent form of modern automotive propulsion is a creation of Nikolaus Otto. The similar four-stroke diesel engine was invented by Rudolf Diesel. The hydrogen fuel cell, one of the technologies hailed as a replacement for gasoline as an energy source for cars, was discovered in principle by Christian Friedrich Schönbein in 1838. The battery electric car owes its beginnings to Ányos Jedlik, one of the inventors of the electric motor, and Gaston Planté, who invented the lead-acid battery in 1859.

20th century

Pre WWII

Steam-powered road vehicles, both cars and wagons, reached the peak of their development in the early 1930s with fast-steaming lightweight boilers and efficient engine designs. Internal combustion engines also developed greatly during WWI, becoming simpler to operate and more reliable. The development of the high-speed diesel engine from 1930 began to replace them for wagons, accelerated by tax changes in the UK making steam wagons uneconomic overnight. Although a few designers continued to advocate steam power, no significant developments in production steam cars took place after Doble in 1931.

Post-WWII

Whether steam cars will ever be reborn in later technological eras remains to be seen. Magazines such as *Light Steam Power* continued to describe them into the 1980s. The 1950s saw interest in steam-turbine cars powered by small nuclear reactors (this was also true of aircraft), but the dangers inherent in nuclear fission technology soon killed these ideas.

The *Flocken Elektrowagen* of 1888 by German inventor Andreas Flocken is regarded as the first real electric car of the world [3, p. 60].

Electric cars enjoyed popularity between the late 19th century and early 20th century, when electricity was among the preferred methods for automobile propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Advances in internal combustion technology, especially the electric starter, soon rendered this advantage moot; the greater range of gasoline cars, quicker refueling times, and growing petroleum infrastructure, along with the mass production of gasoline vehicles by companies such as the Ford Motor Company, which reduced prices of gasoline cars to less than half that of equivalent electric cars, led to a decline in the use of electric propulsion, effectively removing it from important markets such as the United States by the 1930s.

Internal combustion engines

Early attempts at making and using internal combustion engines were hampered by the lack of suitable fuels, particularly liquids, therefore the earliest engines used gas mixtures.

Early experimenters used gases. In 1806, Swiss engineer François Isaac de Rivaz built an engine powered by internal combustion of a hydrogen and oxygen mixture. In 1826, Englishman Samuel Brown tested his hydrogen-fuelled internal combustion engine by using it to propel a vehicle up Shooter's Hill in south-east London. Belgian-born Etienne Lenoir's Hippomobile with a hydrogen-gas-fuelled one-cylinder internal combustion engine made a test drive from Paris to Joinville-le-Pont in 1860, covering some nine kilometres in about three hours. A later version was propelled by coal gas. A Delamare-Deboutteville vehicle was patented and trialled in 1884.

About 1870, in Vienna, Austria (then the Austro-Hungarian Empire), inventor Siegfried Marcus put a liquid-fuelled internal combustion engine on a simple handcart which made him the first man to propel a vehicle by means of gasoline. Today, this car is known as "the first Marcus car". In 1883, Marcus secured a German patent for a low-voltage ignition system of the magneto type; this was his only automotive patent. This design was used for all further engines, and the four-seat "second Marcus car" of 1888/89. This ignition, in conjunction with the "rotating-brush carburetor", made the second car's design very innovative.

It is generally acknowledged that the first really practical automobiles with petrol/gasoline-powered internal combustion engines were completed almost simultaneously by several German inventors working independently: Karl Benz built his first automobile in 1885 in Mannheim. Benz was granted a patent for his automobile on 29 January 1886, and began the first production of automobiles in 1888, after Bertha Benz, his wife, had proved - with the first long-distance trip in August 1888, from Mannheim to Pforzheim and back - that the horseless coach was absolutely suitable for daily use. Since 2008 a Bertha Benz Memorial Route commemorates this event [4, p. 95].

Soon after, Gottlieb Daimler and Wilhelm Maybach in Stuttgart in 1889 designed a vehicle from scratch to be an automobile, rather than a horse-drawn carriage fitted with an engine. They also are usually credited with invention of the first motorcycle in 1886, but Italy's Enrico Bernardi of the University of Padua, in 1882, patented a 0.024 horsepower (17.9 W) 122 cc (7.4 cu in) one-cylinder petrol motor, fitting it into his son's tricycle, making it at least a candidate for the first automobile, and first motorcycle;. Bernardi enlarged the tricycle in 1892 to carry two adults.

Post-war era

Since World War II automobile design experienced the total revolution changes to ponton style (without a non-compact ledge elements), one of the first representatives of that were the Soviet GAZ-M20 Pobeda (1946), British Standard Vanguard (1947), U.S. Studebaker Champion and Kaiser (1946), as well as the low-production Czech luxury Tatra T600 Tatraplan (1946) and the Italian Cisitalia 220 sports car (1947).

Automobile design and production finally emerged from the military orientation and other shadow of war in 1949, the year that in the United States saw the introduction of high-compression V8 engines and modern bodies from General Motors' Oldsmobile and Cadillac brands. Hudson introduced the "step-down" design with the 1948 Commodore, which placed the passenger compartment down inside the perimeter of the frame and was one of the first new-design postwar cars made. The unibody/strut-suspended 1951 Ford Consul joined the 1948 Morris Minor and 1949 Rover P4 in the automobile market in the United Kingdom. In Italy, Enzo Ferrari was beginning his 250 series, just as Lancia introduced the revolutionary V6-powered Aurelia.

Modern era

The modern era is normally defined as the 25 years preceding the current year. However, there are some technical and design aspects that differentiate modern cars from antiques. The modern era has been one of increasing standardisation, platform sharing, and computer-aided design.

Some particular contemporary developments are the proliferation of front- and all-wheel drive, the adoption of the diesel engine, and the ubiquity of fuel injection. Most modern passenger cars are front-wheel-drive monocoque/unibody designs, with transversely mounted engines [5, p. 14]

Body styles have changed as well in the modern era. Three types, the hatchback, sedan, and sport utility vehicle, dominate today's market. All originally emphasised practicality, but have mutated into today's high-powered luxury crossover SUV, sports wagon, two-volume Large MPV. The rise of pickup trucks in the United States, and SUVs worldwide, has changed the face of motoring, with these "trucks" coming to command more than half of the world automobile market. There was also the introduction of MPV class (smaller non-commercial passenger minivans), among the first of which were the French Renault Espace and the Chrysler minivan versions in the U.S.

Thus, the modern era has also seen rapidly rising fuel efficiency and engine output. The automobile emissions concerns have been eased with computerised engine management systems.

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INTELLIGENT TRANSPORTATION SYSTEMS

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Summary: This article deals with intelligent transportation systems (ITS). The aim of this paper is to evaluate the impact of intelligent transportation systems on congestion, fuel consumptions and pollution emissions. ITS applications currently in existence have tremendous potential to reduce the incidence and severity of road crashes. Human factor principles must be incorporated into the design of these systems.

Key words: intelligent transportation system, road congestion, traffic flow.

Анотація: Стаття присвячена огляду інтелектуальних транспортних систем (ІТС). Ціль статті полягає в оцінці впливу ІТС на дорожні затори, витрату пального і забруднення середовища. Використання ІТС, що існують, має великий потенціал для зниження кількості дорожньо-транспортних пригод. Принципи людського фактору потрібно враховувати при дизайні таких систем.

Ключові слова: інтелектуальна транспортна система, дорожній затор, транспортний потік.

Аннотация: В статье рассматриваются интеллектуальные транспортные системы (ИТС). Цель статьи – оценить влияние ИТС на дорожные заторы, расход топлива и загрязнение среды. Применение существующих ИТС имеет большой потенциал для снижения количества дорожно-транспортных происшествий. Принципы человеческого фактора должны учитываться при проектировании таких систем.

Ключевые слова: интеллектуальная транспортная система, дорожний затор, транспортний потік.

The growth of road traffic and the increasing inconvenience and environmental damage caused by road congestion require a substantially efficient use of the infrastructure for physical transport. In contrast to many [measures taken in the past](#), advanced solutions will require a wireless [communication infrastructure](#) for vehicles communicating with roadside base stations and [with other vehicles](#). This will require extensive use of mobile radio communication, in addition to the desire to extend conventional services, such as [cellular](#) telephony and wireless electronic mail [5].

The sector of the entire transportation field is the multitude of programs listed under the label of intelligent transportation systems (ITSs, originally called intelligent highway and vehicle systems). In all instances an advantage is taken of computer data processing capabilities and the power of electronic means of communication. The basic aim is to provide good and immediate information to vehicle operators that will allow them to make more effective decisions before and during a trip and to manage traffic flows through a real-time ability to react to overall demand situations. This is the first real opportunity to proactively operate the roadway systems and constructively influence driver actions, which so far have been governed by a multitude of separate and uncoordinated individual decisions on the public rights-of-way [2].

ITS (Intelligent Transportation Systems) distinguishes six inter-related system areas: Advanced Traffic Management Systems (ATMS), Advanced Traffic Control Systems ([ATCS](#)), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), and Advanced Rural Transportation Systems (ARTS). In order to achieve an optimal utilization of the existing transportation systems, the authorities strive to alleviate the prevailing car-caused problems by means of coordinating physical flows of road traffic. In addition, they take into account preserving accessibility and environment as well as enhancing road safety. These processes take place at a given demand for road traffic, that is assumed to be fixed in time and place. We distinguish three classes of involved information systems:

- Advanced Traffic Management Systems ([ATMS](#)),
- Advanced Traffic Control Systems ([ATCS](#)),
- Advanced Traveler Information Systems ([ATIS](#)).

Advanced Traffic Management Systems seek to reduce traffic congestion in urban environments by improving the efficiency of utilization of existing infrastructures. These systems typically seek solutions to congestion problems occurring on urban freeways and surface streets through the deployment of state-of-the-art

sensing, communications and data-processing technologies. Problems considered include both congestion caused by regular traffic patterns (congestion management systems) and traffic problems caused by stalled vehicles or other unpredictable incidents. ATMS typically attempt to take advantage of information that can be provided by roadside traffic sensors. These systems typically attempt to use available traffic information to develop optimal traffic control strategies addressing traffic needs at a single intersection, along an arterial or freeway, along a given corridor, or throughout a given area. Real-time solutions capable of automatically adjusting to changes in traffic conditions are often sought. These systems also frequently rely on variable message signs or other information dissemination technologies to provide relevant traffic information and travel recommendations to travelers [1].

Advanced Traffic Control Systems have been used in large cities in developing countries to ease traffic congestion problems. Congestion causing poor traffic performance has negative impacts on economic productivity, environmental quality and safety. ATCS have an impact on fuel consumptions and pollution emissions in a large city. Fuel consumptions and pollution emissions (carbon oxide, oxides of nitrogen, hydrocarbon) data are obtained from laboratories. The results found that the impact of ATCS on reducing fuel consumption and pollution emission is not good especially during peak periods that usually have more traffic congestion. The application of ATCS in the large city is not effective to reduce traffic congestion and enhancing environmental quality [6].

Advanced Traveler Information Systems can provide peoples' accessibility to economic and social activities through the use of technology. ATIS are intended to meet travelers' information needs, help them make more informed travel decisions, and moderate the effects of traffic congestion on travelers. There are a range of technologies that allow people to access travel information, including radio, television, wireless and landline telephone, the Internet, and geographic information systems (GIS) that are based in-vehicle dynamic navigation systems. In congested networks, dynamic information systems can support several traveler choices including the selection of destinations, modes, routes, departure times, intermediate stops and parking. Real-time information can also help with readjustments, e.g., diversions from the selected route to avoid unexpected traffic congestion. Emerging information technologies are likely to help people plan their trips, save them traveler time, reduce navigational errors, and lower anxiety and stress due to route-finding or congestion. Though in some instances traveler information systems can distract drivers and increase their crash risk [4].

For the purpose of supporting and achieving several individual users' optima, ATIS require information about complete routes from origin to destination, about delays on the regular route, about the travel time on alternative routes and about alternative ways of available transport, at the moment of passage. This implies that specific parts of different networks (urban, rural and state) that are relevant during a specific trip are of interest, with information about delays on routes at the moment they will actually be used (requiring short term predictions) instead of instantaneous information. Hence, the regular traffic information to be obtained for ATIS purposes may become available every time interval of 5 to 15 minutes (incidents should be reported more swiftly). These characteristics are in sharp contradiction to the information requirements of ATMS applications, which demand predominantly real-time information about one entire network [5]. Transportation and electronic industries and conjoint car manufacturers develop, operate and administrate the ATIS applications, whereas their indirect goal is a commercial one, that is to make profit with a product for which the consumer is willing to pay. Besides, transportation authorities pay attention to transportation telematics applications which are destined for providing road users with actual traffic information such as variable message signs and Virtual Memory System. Estimates of the current situation, historical data and prediction of near-future behavior are used in ATMS, ATCS and ATIS systems. [5].

Thus, ITS applications currently in existence have tremendous potential to reduce the incidence and severity of road crashes. To do so, human factor principles and knowledge must be incorporated into the design of these systems and they need to cater for the special needs of various road user groups. Failure to do so could seriously compromise the safety of the entire road transport system. For all these forms of intelligence, processing huge amount of data is crucial. When the computational power of computer processors goes up, their will be endless new opportunities for artificial intelligence. The smart cities of the future could embrace this new technology and we might see unprecedented smooth and autonomous transportation.

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PROBLEMS IN DETERMINING DIAMETERS AND ALBEDOS OF ASTEROIDS

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Summary: The article deals with problems in determining diameters and albedos of asteroids. Our knowledge about their physical properties helps us in understanding Solar System in general. One of the most widely distributed method of determining albedos and diameters is described. The results of the study suggest that the theoretical models have parameters whose values were not obtained for each asteroid, but diameters and albedos of these asteroids are known. The values of these parameters are considered equal for all asteroids.

Key words: albedo, asteroids, diameter, Solar System

Анотація: У статті розглядаються проблеми у визначенні діаметрів і альbedo астероїдів. Знання фізичних властивостей астероїдів дозволяє краще розуміти Сонячну систему в цілому. Описано один з найбільш широко поширених методів визначення альbedo та діаметрів. У результаті встановлено, що теоретичні моделі мають параметри, значення яких не отримані для кожного астероїда, хоча їх діаметр і альbedo обчислені. Значення цих параметрів вважаються рівними для всіх астероїдів однієї і тієї ж величині.

Ключові слова: альbedo, астероїди, діаметр, Сонячна система

Аннотация: В статье рассматриваются проблемы в определении диаметров и альbedo астероидов. Знание физических свойств астероидов позволяет лучше понимать Солнечную систему в целом. Описан один из самых широко распространенных методов определения альbedo и диаметров. В результате установлено, что теоретические модели имеют параметры, значения которых не получены для каждого астероида, хотя их диаметр и альbedo вычислены. Значения этих параметров считаются равными для всех астероидов одной и той же величины.

Ключевые слова: альbedo, астероиды, диаметр, Солнечная система

Asteroids, also known under the name minor planets, are a large population of small Solar System bodies, which do not display cometary activity. The name asteroid, which was coined by W. Herschel in 1802, is derived from the Greek word for star-like asteroids, appearing point-like in typical telescopic observations. Small Solar System bodies are the material left over from the early days of the Solar System and have undergone much less processing than the planets or the Sun throughout the past 4.6 Gyr. They, therefore, preserve crucial information on the formation and evolution of the Solar System. Asteroids, in particular, are believed to be remnant-building material of the inner planets. Impacts of asteroids and comets have significantly resurfaced the terrestrial planets and their satellites and may have been a significant source of water on Earth. Meteorites, the remnants of Earth impactors, are the major source of extra-terrestrial material available for laboratory studies. Studies of meteorites and asteroids, the parent bodies of most meteorites, benefit considerably from one another. A large impact on Earth could release sufficient energy to cause severe or even fatal damage to our civilization; the Cretaceous-Tertiary extinction event, during which the dinosaurs died out, is widely believed to have been caused by a catastrophic impact. The increasing public awareness of the impact hazard and general scientific interest has stimulated a dramatic increase in asteroid research over the past decade. This includes the dedication of an increasing number of telescope systems to asteroid discovery. Nevertheless, the steep increase in asteroid discoveries far outpaces efforts to increase our knowledge about their physical properties.

There is a growing body of information on the physical properties of asteroids, although the rapid discovery rate leaves most known objects uncharacterized. Some asteroids, however, have been scrutinized with spacecraft or have been studied by ground-based observers in great detail. The emerging picture is still rather incomplete and highly diverse.

For most asteroids, the size, arguably the most basic physical property, is only poorly known. Note that asteroids are typically far too small to be spatially resolved with current telescopes. In only a few cases asteroid sizes could be determined by means of direct imaging from near-by spacecraft, the Hubble Space Telescope, or ground-based telescopes equipped with adaptive optics. Another rather direct way of determining asteroid sizes is to observe stellar oscillations. For most asteroids, only optical photometric data are available, typically from astrometric measurements with limited photometric accuracy. The amount of reflected sunlight is proportional to the projected area and the albedo, allowing coarse conclusions on the size to be drawn. An important quantity is the absolute optical magnitude H , which is defined as the visual magnitude corrected to heliocentric and observer-centric distances of 1 AU and a solar phase angle of 0° . H is related to diameter D and geometric albedo p_v by:

$$D = 10^{-H/5} \sqrt{p_v} \text{ km}$$

Asteroid albedos range from some $p_v = 0.02$ up to around 0.6, thus diameters estimated in this way are very uncertain. A widely used method to determine asteroid sizes is derived from observations of their thermal emission, which is proportional to the projected area. This method is the source of most known asteroid diameters. Other methods of determining asteroid sizes include observations at radar wavelengths.

Alternatively, the diameter can be determined if p_v is known. Methods for determining asteroid albedos include studies of the optical brightness and also of the polarization of reflected sunlight as a function of solar phase angle. The thermal emission of asteroids contains many important clues about their physical properties. The study of asteroid thermal emission (often referred to as thermal radiometry) is the dominant source of known diameters and albedos and the only established ground-based means of determining the crucial thermal inertia. The principle of thermal radiometry is simple: asteroids are heated up by absorption of sunlight and the absorbed energy is radiated off as thermal emission. The total emitted thermal radiation at different wavelengths can be calculated by convolving the temperature distribution over the asteroid surface with the temperature-dependent thermal emission of single facets (using the Planck black-body law).

While the optical brightness of an asteroid is proportional to its albedo, its thermal emission is only a weak function of albedo. However, complications arise because other important physical properties (such as thermal inertia, surface roughness, shape, and spin state, all of which are typically unknown) significantly influence the thermal emission of asteroids. On the one hand, this imposes difficulties for the determining diameters, but on the other hand, the thermal flux contains more information about the diameter alone. Thermal observations of asteroids are disadvantaged by the fact that typical asteroid temperatures are not too different from those of most objects on Earth, leading to a huge background radiation in the mid-infrared wavelength range in which asteroid thermal emission peaks. Furthermore, the Earth's atmosphere is mostly opaque in this wavelength range, with the exception of a few "atmospheric windows".

The thermal emission of an asteroid is determined from the temperature distribution on its surface convolved with the temperature-dependent emission of the surface elements. In practice, the most relevant parameters are the easiest to model: the object diameter D , the heliocentric distance r , and the observer-centric distance Δ . Fluxes are proportional to $(D/\Delta)^2$ and temperatures are proportional to r^{-2} . The apparent color temperature is determined from the physical temperature distribution, which also affects the absolute flux level (Stefan-Boltzmann law).

Among the parameters that determine the temperature are albedo, thermal inertia, surface roughness, and shape and spin state. Observable fluxes also depend on the observation geometry, chiefly on the solar phase angle, α ; they are determined by the temperature-dependent spectral characteristics of the thermal emission as well. Observations at a single thermal wavelength contain no information on the color temperature, leading to significant diameter uncertainties in the interpretation of such measurements. Measurements at two or more thermal wavelengths combined with a suitable thermal model allow a cold and large asteroid to be distinguished from a hot and small object, reducing systematic diameter uncertainties.

Furthermore, the color temperature holds information on the physical parameters which determine the temperature, chiefly the thermal inertia. All other parameters being constant, the thermal emission is proportional to the projected area A and hence to D^2 , where D denotes the diameter. The "diameter" of a non-spherical object is not uniquely defined. For the reason above, diameters obtained from simple models based on spherical geometry are area-equivalent diameters:

$\pi 4 D^2 = A$. This definition is inconvenient to use when an asteroid shape model is available, since it depends on the observing geometry. Whenever our thermophysical model is used, diameters are defined as volume-equivalent diameters, i.e. that of a sphere with identical volume V : $\pi 6 D^3 = V$. In practice, the difference among the two definitions is negligible except for extremely elongated shapes. The amount of solar flux absorbed by an asteroid is proportional to $(1 - A)$ with the bolometric Bond albedo A . A is defined as the ratio of reflected or scattered flux over incoming flux and scattering into all directions is considered. A is therefore

restricted to remain between 0 and 1. For Solar-System objects, A_V (i.e. the Bond albedo in the V band) is a good approximation to A . The geometric albedo p_V is defined as the ratio of the visual brightness of an object observed at zero phase angle to that of a perfectly diffusing Lambertian disk of the same projected area and at the same distance as the object. For planetary bodies, p_V is more readily measurable parameter than A . The ratio $q = A_V / p_V$ is called the phase integral. In the standard HG system, $q = 0.290 + 0.684 \times G$, with the slope parameter G . G can be determined from optical photometric measurements made at different phase angles but is often not available; a default value of $G = 0.15$ is then typically assumed. Note that objects with $p_V > 1$ are by no means unphysical; highly backscattering objects such as mirrors may have $p_V > 1$, the measured geometric albedos of some Kuiper belt objects exceed unity. The amount of sunlight scattered by an asteroid, and hence its optical brightness, is proportional to its albedo and its projected area. The absorbed flux, which is later thermally reemitted, is proportional to $(1 - A)$. For typical asteroids, A is much closer to 0 than to 1. Hence thermal fluxes do not critically depend on albedo. From thermal-emission data, it is therefore possible to determine the diameter nearly independently from the albedo. Combining the diameter result with optical photometric data, it is possible to determine the albedo. Note that while this statement holds for nearly all asteroids due to their relatively low A , it would be wrong for very-high-albedo objects such as the Kuiper belt objects referred to above.

There is one widely used, yet highly idealized, thermal model: The Standard Thermal Model, which neglects the combined effect of rotation and thermal inertia. The Model was developed in the 1970s, when thermal-infrared observations of asteroids were effectively limited to a single wavelength. The color temperature is fixed by the respective model assumptions. Therefore data at a single thermal wavelength are sufficient to estimate the diameter.

In the Standard Thermal Model (STM, [2]), the asteroid is assumed to be spherical, to have a vanishing thermal inertia (hence its spin state is irrelevant), and to be observed at opposition, i.e. at a phase angle of 0° . Under these assumptions, conservation of energy determines the temperature at the subsolar point T_{SS} of a smooth asteroid:

$$\epsilon \sigma T_{SS}^4 = (1-A) S r^2,$$

where ϵ denotes the bolometric emissivity, σ - the Stefan-Boltzmann constant, A - the bolometric Bond albedo, S - the solar constant, and r is the heliocentric distance in AU. In the absence of thermal inertia, temperatures are in instantaneous equilibrium with insolation, and thus, the temperature distribution on the surface solely depends on the angular distance from the subsolar point (or, equivalently, the angle formed by the solar incidence vector and local zenith) Φ :

$$T(\Phi) = \begin{cases} T_{SS} \cos^{1/4}(\Phi) & \text{if } \Phi \leq 90^\circ \\ 0 & \text{otherwise} \end{cases}$$

Using the Planck function:

$$B(\lambda, T) = \frac{2\pi h c^2}{\lambda^5} \frac{1}{\exp[hc/\lambda kT] - 1}$$

with the Planck constant h , velocity of light c , and Boltzmann constant k , the total flux $f(\lambda)$ at wavelength λ then equals

$$f(\lambda) = \epsilon D^2 \frac{\Delta}{20\pi} \frac{2\pi}{\lambda^5} \int_0^{\pi/2} B(\lambda, T(\Phi)) \sin\Phi \cos\Phi d\Phi$$

The symmetry about the subsolar point makes the azimuthal integral trivial, leaving only a one-dimensional integral to be performed numerically. In [2] and [3] it was found that diameters estimated using this “naive” STM were systematically larger than estimates derived, using other techniques, which they attributed to thermal-infrared beaming. As a first-order correction, the so-called beaming parameter η was introduced into the energy balance

$$\epsilon \eta \sigma T_{SS}^4 = (1-A) S r^2,$$

$\eta < 1$ enhances the model temperature and thus the expected flux level (thereby reducing model diameters required to match measured fluxes) while $\eta > 1$ reduces both the temperature and flux level. By comparing occultation diameters of the few largest MBAs to radiometric diameters, they determined a best-fit “canonical” value of $\eta = 0.756$. Thus modified STM is widely used, and frequently referred to as the “refined” STM to distinguish it from the case $\eta = 1$.

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AUGMENTATION OF TRANSFER SYSTEM PERFORMANCE APPLYING NOISE-LIKE SIGNALS SUPERPOSITION

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Language supervisor: Orach Yu. V.

Summary: this article examines transfer systems which apply noise-like signals along with the properties which these systems have. The purpose was to create a new method of information transfer in those systems with an aim to increase their efficiency using signals superposition. Research has been made for the dependence of efficiency increase on the number of superposition and signal-to-noise ratio.

Key words: linear feedback shift register, noise-like signal, pseudorandom sequence, signals superposition, transfer system.

Анотація: у цій статті розглядаються системи передачі з використанням шумоподібних сигналів та властивості, якими ці системи володіють. Метою було створення нового методу передачі інформації у цих системах з наміром збільшення їх ефективності з використанням накладання сигналів. Було проведено дослідження для залежності збільшення ефективності від кількості накладень сигналів та відношення сигнал-шум.

Ключові слова: накладання сигналів, псевдовипадкова послідовність, регістр зсуву з лінійним зворотнім зв'язком, система передачі, шумоподібний сигнал.

Аннотация: в этой статье рассматриваются системы передачи, которые используют шумоподобные сигналы и свойства, которыми эти системы обладают. Целью было создание нового метода передачи информации в этих системах с намерением увеличения их эффективности использованием наложения сигналов. Было проведено исследование для зависимости увеличения эффективности от количества наложенных сигналов и отношения сигнал-шум.

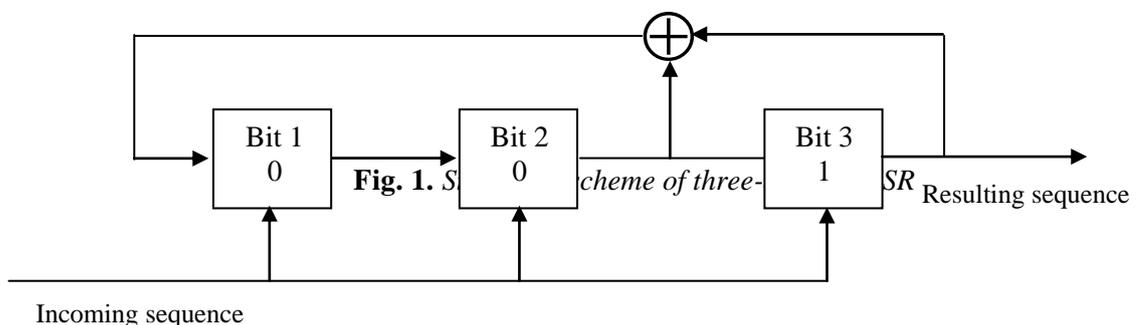
Ключевые слова: наложение сигналов, псевдослучайная последовательность, регистр сдвига с линейной обратной связью, система передачи, шумоподобный сигнал.

Wireless transfer systems are really a common way of information transfer nowadays. GPS and CDMA can be considered as the best examples of such systems. Their advantage is high protection against noise influence, which is achieved by applying noise-like signals generated with pseudorandom sequences [4].

To create noise-like signals automatically, meaning coding arbitrary character, *linear feedback shift register (LFSR)* is used. In the result the pseudorandom sequences can be produced, decoding which is way much easier at high noise magnitude than with any other sequence [3, p. 81].

The effectiveness of noise-like signals application is based on sequence length being increased thus raising the probability of correct reception and negating necessity of multiple same messages being sent for guaranteed information transfer. By doing so the sequence length increases exponentially depending on a number of bits which are form the character before passing shift register. Because of that, sequences constructed by using such method are called M-sequences, meaning maximum length sequences [1].

Because of the M-sequences being generated using LFSR, they have a length of $2^N - 1$ where N – is length of initial sequence or number of bits in shift register. If received, M-sequence is passed through the LFSR in reversed order, then during the process of determining sequence members all errors will be detected which allows the increased probability of correct reception [2, p. 168].



The new method concept lies in pseudorandom sequences superposition. The created compound will be used as information unit in information transfer. But for the receiver to distinguish sequences, the

compound was created with, different polynomials should be used for the sequences generated before superposition.

Let's take a look at the simple example: say, we have a sequence 10100, which corresponds to 'a' character and sequence 11001, which corresponds to 'b' character. When superposition is applied on these two sequences the set of coefficients 21101 will be received meaning "ab" combination. The feature of such superposition is that the magnitude of the signal does not increase, instead for the sequence member '2' default magnitude will be applied and for the sequence member '1' only the half of default magnitude.

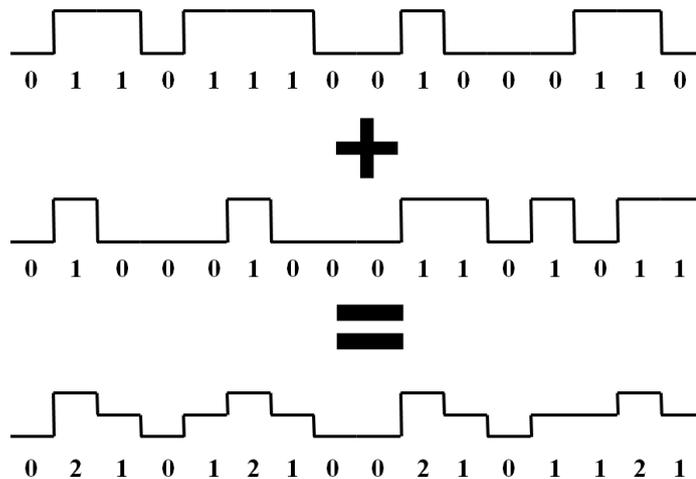


Fig. 2. Example of two sequences superposition

If these sequences were generated using same polynomial, then on the receiver variant reading can occur, meaning uncertainty of information received. For example: the "ab" combination can be defined as "ba" combination and vice versa. Because of that, different polynomials should be used for sequences generation.

When making use of the new method, the necessity of extraction of the sequence members occurs, signal magnitude of which is lower than traditional method of coding. Moreover, increasing number of superposition will decrease minimal signal magnitude, decreasing the probability of correct reception.

The principal index, which will allow to determine quality of a new method relatively to existing ones, is efficiency. Efficiency in this context is a ratio between the number of correctly received characters for the same period of time for new method and the existing one. For calculation of efficiency the following equation was used:

$$\alpha(SNR) = \frac{v_1 C_1(SNR)}{v_2 C_2(SNR)}$$

where α – efficiency index;

SNR – effective index of signal-to-noise ratio;

v_n – bit rate of information transfer;

C_n – function of probability of the correct character reception depending on SNR.

For creation of program model the Microsoft Visual Studio 2010 C++ was used. In the result the «NSS.transmit» was produced able to simulate operation of transceiver and receiver applying new method with up to three signals superposition, meaning three characters being transferred at the same time. Coding of characters is based on LFSR with three different polynomials set in the program interface. This program model was used for the research made.

Efficiency

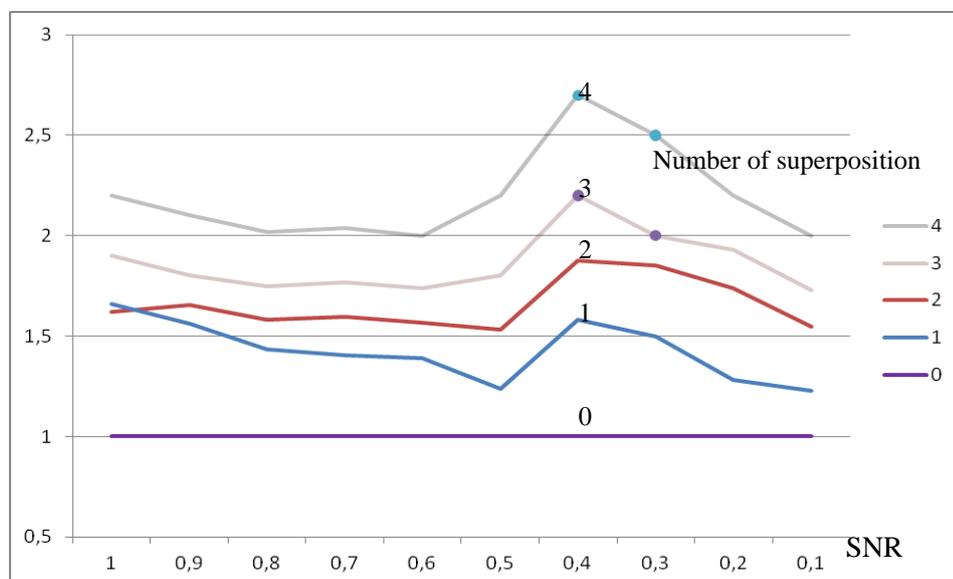


Fig. 3. Dependency of efficiency index on SNR and number of superposition

So, the new method is based on multiple pseudorandom sequences superposition, being generated using LFSR's with different polynomials. Effectiveness of such method lies in bit rate increase being higher than the probability of correct reception decrease.

Relying on performed research on dependence of probability of correct reception on different factors the result was obtained, that efficiency of transfer system operation with two signals superposition can be raised up to 1,5 times the original systems and 1,8 times using three signals superposition. Results obtained can be improved by implementation of better signal handling and recognition of sequence received. Reliability of the results obtained is verified and the certificate of the results authenticity is received proving method efficiency. Also the certificate of implementation into educational process was provided by Kharkiv National University of Radioelectronics.

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УДК 629.33=111

MODERN AUTOMOBILE TECHNOLOGIES

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Summary: The basic ideas dealing with the development of future cars are discussed in this paper. Some present-day innovations and concepts in automobile industry have been given. The modern automobile technologies are highlighted. Different types of cars are presented.

Key words: basic ideas, development, future cars, present-day, innovations, concepts, automobile industry, modern, automobile technologies, different types of cars.

Анотація: У статті розглядаються основні ідеї, які пов'язані з розвитком майбутніх автомобілів. Вказані деякі сучасні нововведення та концепції в автомобільній галузі. Висвітленні сучасні автомобільні технології. Представлені різні види автомобілів.

Ключові слова: автомобільна галузь, автомобільні технології, концепції, майбутні автомобілі, нововведення, основні ідеї, розвиток, різні види автомобілів, сучасний.

Аннотация: В статье рассматриваются основные идеи, связанные с развитием будущих автомобилей. Указаны некоторые современные нововведения и концепции в автомобильной отрасли. Освещены современные автомобильные технологии. Представлены различные виды автомобилей.

Ключевые слова: автомобильная отрасль, автомобильные технологии, будущие автомобили, концепции, нововведения, основные идеи, развитие, различные виды автомобилей, современный.

Since decades ago, people dreamed of automobile technology that can run itself without the driver. The fact is that the dream is getting closer characterized by a number of research carried out worldwide by car manufacturers and research institutes. Even the General Motors's head of Research and Development, Larry Burns boldly predicted in 2020 without driver cars are mass produced.

Technology without a driver's car has been in development since 2004, spearheaded the Defense Advanced Research Projects Agency to sponsor a robotic vehicle racing as far as 260 miles in the Mojave Desert, United States.

In 2012, the technology was growing with the release of a car without a driver's license that allowed the driver to operate on a highway Nevada, United States, provided that two people should be in the vehicle, one person sitting in front of the steering wheel and a passenger. Here are some cars without the driver being developed at this time [1; 2].

Google Self Driving Car

Google is the company best equipped to market the technology without a driver's car. Google design technology has been tested on seven different vehicles with mileage of 200,000 miles (321,000 kms).

To run a car without a driver on the highway, the system combines information gathered from Google Street View with artificial intelligence software that combines input from video cameras inside the car, a LIDAR sensor on top of the vehicle, radar sensors on the front of the vehicle and a position sensor attached to one of the rear wheels that helps locate the car's position on the map.

Simply put, the development of this technology relies on sensors and cameras mounted on the car and on the front. Useful to detect if there are pedestrians, cyclists, or other cars around the car. With the help of the equipment, the car will keep a safe distance.

Google's cars use the software to operate the vehicle, distance monitoring equipment, and tools to set goals based on GPS.

Jalandhar Lovely Professional University's Car

In India, Jalandhar's Lovely Professional University (LPU) students to develop a car without a driver on the basis of four passenger electric golf cars. When tested, the car managed to travel as far as 1,000 km.

Using a battery-driven golf cart, internet data card, mobile phone, laptop, C+ language programming and a micro-controller board, four students from Jalandhar design a remote-controlled car.

This prototype golf cart without a driver was developed by four students of electronics, communications and mechanical engineering.

They apply their knowledge in the field of wireless communications and set up the basic control of the vehicle.

Volvo SARTRE

Volvo collaborated with a British technology firm, Ricardo, for cars without a driver's test in Barcelona, Spain. A total of four vehicles, consisting of a Volvo XC60, a Volvo V60, and a Volvo S60, and one truck which are convoy to travel as far as 200 km.

Test vehicle is part of the SARTRE (Safe Road Trains for the Environment) project, which complements the car with cameras, radar sensors, and lasers.

Drove without drivers with an average speed of 85 km/h and continued to maintain a distance of 6 meters between vehicles.

Continental AG

Continental AG is developing a car that can drive itself using the Volkswagen Passat. In the car mounted radar sensors, video cameras, and computers that can drive itself in a variety of road conditions.

Through that feature, later was utilized to help the driver get stuck in traffic jams.

Continental to conduct various tests, such as the speed of the car, set goals, brakes, and keep the car still run at a constant speed of 60 km/h.

BMW Driverless Car

BMW, a German automotive company tests automatically steering technology for the programmed car to cross the street between the City of Munich and Nuremberg.

BMW uses cruise control system to monitor traffic, navigation satellites, early warning devices, and the rear-camera to run the vehicle.

BMW has successfully trialled a driverless car from Munich to Nuremberg on a high-speed autobahn without any driver's input.

BMW says this Driverless Car technology will evolve further and the navigation system will be capable to detect obstacles around the car as a public work around the road, speed limit warnings, and school zones [3].

Electric cars

E-Mobile will park independently in the future and will also be able to find the nearest charging station without a driver. Researchers are working on electric cars that can travel short distances autonomously. On the basis of cost-effective sensors, they are developing a dynamic model that perceives the environmental situation.

Electronic helpers warn of a possible collision when parking and keeping the necessary distance to the car ahead during traffic. There are lane departure, crosswind, blind spot and high beam assistants, not to mention the anti-lock system. The car is taking over step by step in the cockpit. Researchers at the Fraunhofer Institute for Manufacturing Engineering and Automation IPA are one step ahead: they are dedicated to automated driving and are working on the vehicles of tomorrow, which can drive through traffic without human assistance. In this process, Stuttgart engineers are particularly keeping an eye on electric cars.

The specialty of the researchers at the IPA is the development of robots. In the institute building, there is a prototype that independently finds its way on its four wheels through unknown territory. The challenges that are to be mastered are similar to those for automated driving. Here, as well, sensors need to recognize the environment so that the vehicle can navigate around obstacles and find its goal. That is why, one and a half years ago, an interdisciplinary team of computer scientists, mathematicians, electrical engineers and mechatronics engineers launched the project Afkar (a German abbreviation for "autonomous driving and intelligent chassis concept for an all-electric vehicle").

As the first step, the electric car is intended to learn to find a parking space and to park without a scratch. The idea behind this is that the car should be able to recharge itself with electricity without human help. This would be particularly important for car-sharing. The driver easily parks the car in a properly equipped parking garage on any randomly available parking space. The car takes care of everything else itself. It communicates via a wireless interface with the charging station and the parking garage management. In this process, it provides information about its charge level and its location. If the battery is empty and a charging station is free, it maneuvers in the corresponding parking bay and is charged inductively, without a cable. Then it makes room for the next electric car and rolls to a free parking space. In this way, the few existing charging stations can be used effectively.

The necessary technology is available. Many modern cars already have most of the sensors that are required for this. The data that these devices collect just have to be combined and interpreted accordingly so that they provide a picture of the environment. The Fraunhofer experts are currently developing the necessary technology with the help of complex simulation programs. Soon, they want to test the results in practice on a demonstration vehicle.

It becomes more difficult when a car is intended to move autonomously in traffic. This requires sensors that can look hundreds of meters ahead as well as software that can react to any unforeseen events, whether that is a building site, a thunderstorm or snow. Maidel and his team are focusing on cameras, ultrasound, radar and laser scanners that perceive the surrounding area up to a distance of 200 to 300 meters.

The Afkar group will first go with their test car to a cordoned-off test area. For public roads, a special permit is required. The advantages are obvious, particularly for car-sharing vehicles. Any customer could use his smart phone to call a car, which would then drive to the desired location. Car-sharing companies could utilize their fleets more fully than they do today [4].

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УДК 612.373

TRIBOELECTRIC GENERATION: GETTING CHARGED

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Summary: Such a phenomenon as triboelectric charging is considered in this article. Four main factors that influence on triboelectric charging (surface contact effect, work function, charge back flow, gas breakdown) are described. Some examples of triboelectric charging are given.

Keywords: charge generation, electrons, electrostatic, triboelectric.

Анотація: У статті розглянуто таке фізичне явище як трибоелектризація. Описано чотири основних фактори (ефект контакту з поверхнею, робота виходу, зворотній хід, пробій газу), які впливають на трибоелектризацію. Наведено декілька прикладів трибоелектризації.

Ключові слова: генерація заряду, електрони, електростатичний, трибоелектричний.

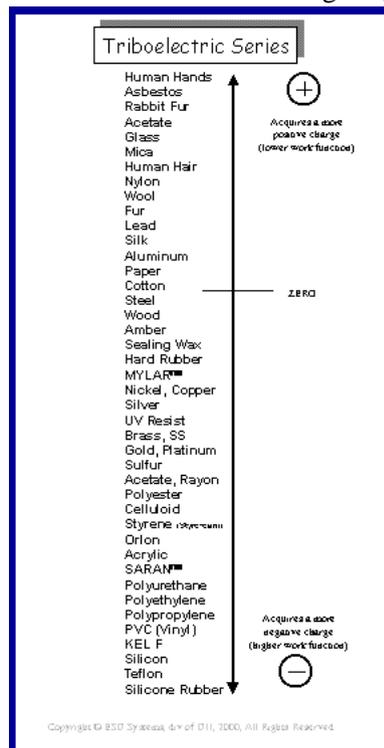
Аннотация: В статье рассмотрено такое физическое явление как трибоэлектризация. Описано четыре основных фактора (эффект контакта с поверхностью, генерация заряда, обратный ход, пробой газа), которые влияют на трибоэлектризацию. Приведено несколько примеров трибоэлектризации.

Ключевые слова: генерация заряда, трибоэлектрический, электроны, электростатический.

Almost every person has ever experienced a triboelectric charge, that is a common phenomenon which happens every time when two materials come into contact and then separate. We can feel it when our body, being an electrical conductor, comes into contact with a very good conductor (ex. a metal door). After such a contact the body's accumulated charge is quickly discharged (brought to the same potential as the door); as a result there is electric shock.

When two materials with neutrally charged surfaces come into contact ($< 4 \text{ \AA}$) and then separate, the materials undergo tribocharging and are at a non-neutral surface charge level. The level and polarity of this newly acquired surface charge are dependent on several factors.

Material such as glass, for example, that comes into contact with vinyl material will acquire more positive charge because it is near the 'more positive' position in the triboelectric series chart relative to the position of vinyl. Alternately, the vinyl will acquire more negative charge following the same logic. The fact that these two materials are far apart from each other in the series may result in a larger charge level generated if the glass comes into contact with, say aluminum.



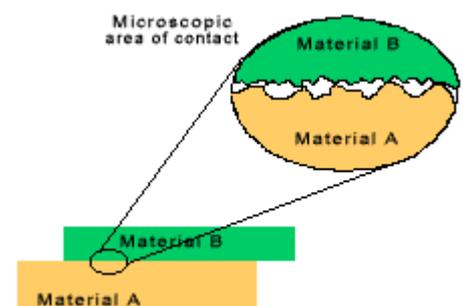
There are several mechanisms that contribute to the resulting charge that is generated by the triboelectric process. There appear to be 4 major factors that have the greatest influence on the triboelectric charging process and they are:

- surface contact effects;
- work function;
- charge back flow;
- gas breakdown.

Let us consider these factors in some detail. Surface contact effects include the roughness of surfaces, contact force, and frictional heating (caused by rubbing), all of which influence the amount of surface area that is in contact with the other material during tribocharging. The greater the surface contact is, the greater the resulting net charge may be when two surfaces are separated after contact.

Though surface contact may seem rather intuitive, there are some subtleties that should be elaborated on; one being surface friction, the other one – surface roughness [figure 2]. When the coefficient of friction between

two surfaces increases, this indicates that the surface roughness between the two surfaces may be greater, which results in decreased surface contact. For example, when two surfaces come into contact on a work surface, let's say 1.0 square inch, the actual or physical contact may only be 0.2 square inches because of surface roughness. Now, if you press down onto surface, the contact area may increase to 0.4 square inches, depending on this contact force and again the surface roughness of both surfaces. If both surfaces were polished to an extremely smooth and flat area (micro-polished), the contact area may be further increased to 0.8 square inches. The smoother each surface is, the more contact both surfaces will have with each other resulting in possible increase of the exchange of charges.



Surface charge imbalance is related to friction, and both are dependent on the adhesion between the surfaces on the molecular level. Two surfaces may stick together because chemical bonds are formed on the surface. When surfaces in contact are separated, some bonds may rupture, and any asymmetrical bonds will tend to leave imbalanced charges behind.

The other factor that influences on triboelectric charging is a work function. The greater the material work function is, the less likely for free electrons to escape during the contact (triboelectric generation). The

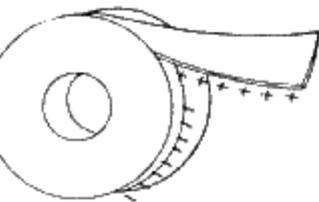
weaker the work function is, the more likely the material acquires a more positive charge. In general, materials with higher work functions tend to appropriate electrons from materials with lower work functions.

Charge backflow occurs when two materials have been charged possibly from the above mentioned mechanisms and then are separated by an intimate contact. The backflow of some of this charge imbalance may be given back to the original material reducing to some degree the net charge (charge imbalance) on the surface from tribocharging.

Gas breakdown can occur between two surfaces during separation. It is known that the microscopic surface topology of a surface has many peaks and valleys. It is one of these peaks that may have substantial charge that yields a large electric field in a very small area causing corona discharge or the breaking down of the air molecules which were acting as a dielectric (the insulator between the two separating surfaces). During this breakdown, the charge can be transferred from one surface to the other via the path of the electrified air (plasma). The amount of charge transferred depends on the distance of separation and the gas(es) pressure(s).

A standard cellulose tape is a good example of a material that has a strong surface adhesion and consequential large surface area contact typically resulting in large charge imbalance during unwind or removal. When being unwound, the contact and separation of the tape to itself is called "contact charging" or "electrification by contact" and has little to do with friction (or rubbing). Another contribution to the large imbalance of the tape during unwind is the difference in materials. The tape film is cellulose and the adhesive may be a rubber based one. The two are spaced far enough apart in the Triboelectric Series to result in defined polarities (see figure 1). The rubber adhesive will acquire more positive charge and the cellulose will acquire more negative charge due to the difference in their work functions as illustrated below. Voltages well over 20 kV are easily measured from this type of tape.

Another good illustration of tribocharging is a pair of ESD training paddles, see figure 4. One paddle is typically aluminum and the other one is acrylic, which are well separated in the Triboelectric Series. When the bottom of both paddles are brought together and rotated (frictional heating) and then separated, an electrical charge imbalance will exist between the two plates. Using a static field meter or charge plate analyzer one can measure several kilovolts on each paddle. As you can guess the resulting electric field (charge imbalance) on the aluminum paddle tends to be more positive and the acrylic tends to be more negative.



the other is to either remove or control Grounding can easily be accomplished [5]. Instead of abstaining from the use controlling them may be essential to objects is accomplished by using a target is flooded with a multitude of result in a near zero voltage level surface after just a few seconds of time depends on several factors such source, surface area, surface imbalance, etc.

To sum up, we would like to interact with each other during the design of a control program that tries to minimize charge imbalance caused by this phenomenon.

The fact that one paddle is very conductive and the other one is insulative helps to illustrate the types of materials that may become charged in your ESD safe work area. Even though the surface may be conductive, it can still become charged through triboelectric generation. Only when a conductive surface is tied to ground or other reference point, it will not be a threat by holding a charge imbalance. Controlling charge imbalance is important in ESD control. Conductors can be grounded, but insulators must be controlled by other methods.

When designing an ESD control program there are two simple rules relating to charging problems. One is to ground all conductors, all insulative charge generators. with various ESD control products of non-conductive charge generators, the program. Neutralizing of charged balanced output air ionizer. The positive and negative air ions which relative to ground on the charged exposure (decay time). The decay as surface proximity to the ionization capacitance, level of charge



tell that understanding how materials triboelectric process can help in the

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УДК 621.396.946

THE IMPACT OF SPACE WEATHER ON RADIO COMMUNICATION

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Summary: The article deals with the effect of space weather on radio communication. Much attention is paid to changes in signal propagation due to variability of the ionosphere conditions. Different space weather phenomena are considered.

Key words: distortion, electron density, ionosphere, signal scintillation, space weather.

Анотація: У статті розглядається вплив космічної погоди на радіозв'язок. Багато уваги приділяється зміні у поширенні сигналу через мінливість іоносферних умов. Розглядаються різні явища космічної погоди.

Ключові слова: іоносфера, космічна погода, мерехтіння сигналу, спотворення, щільність електронів.

Аннотация: В статье рассматривается влияние космической погоды на радиосвязь. Много внимания уделяется изменению распространения сигнала из-за изменчивости ионосферных условий. Рассматриваются различные явления космической погоды.

Ключевые слова: ионосфера, искажение, космическая погода, мерцание сигнала, плотность электронов.

Radio communication within recent decades has become a popular way of transmitting information by means of sending signals with the help of electromagnetic waves produced in the space.

There are several types of space weather that can impact HF (High Frequency) radio communication. The main usage of the HF takes place in the various specific satellites such as the broadcasting, earth-exploration, maritime mobile, meteorological, radio navigation, etc.

It is known that the ionosphere consists of free ions, electrons and neutral particles as a result of solar radiation interaction with the Earth's atmosphere. The electrons exert the major influence on HF radio signals by decreasing the refractive index, thus causing radio rays from the earth to bend and return to the Earth [7, p. 3]. The ionosphere can be conditionally divided into the distinct layers due to the variations in atmospheric dynamics and variations in chemical composition. These regions of particularly high electron density are labeled in order of increasing height as the D, E, F1 and F2 regions [10].

Being produced by X-ray and cosmic ray ionization, the D layer tends to attenuate signals passing through it, but exceptionally during the day. After sunset, the relative lack of solar radiation cause the electron level fall and the subsequent disappearance of this layer. When signals enter the D layer, they transfer energy to the electrons and set them in motion, vibrating in line with the radio signal. As the electrons vibrate in this manner, they can collide with other molecule, ions, or electrons. Each time a collision occurs, a small amount of energy is dissipated, and this is manifested as a loss in the strength of the signal [4].

The E layer reflects radio signals although they still experience some attenuation.

The higher level is the F layer, which is considered to be the most significant area for long distance HF communications. It should be noticed that during the day it splits into the F1 and F2 layers [10]. The winds in the upper atmosphere carry electrons from day-side to night-side and thus provide reflections from the night-side ionosphere even though the electron density is also reduced.

The greater the density of free electrons, the greater the frequency of radio waves that can be reflected [9]. If the ionosphere were unchanged, the signal amplitude over a fixed path would be constant. In practice, however, fading arises as a consequence of variations in the propagation path brought about by movements or fluctuations in ionization [1].

Radio emission from the Sun has three distinct components, originating from the quiet sun, from the bright regions and from transient disturbances, such as flares [1]. The presence of sunspots is of particular importance to the HF communicator. Overlying and surrounding sunspots are particularly hot, bright areas called plage. Plage regions produce Extreme Ultra-Violet radiation (EUV) which is responsible for forming and maintaining the ionosphere. The number and size of sunspots varies with the solar cycle, and so the properties of the

ionosphere in turn exhibit a variation with the cycle. At the low point of the solar cycle only the lower frequency HF signals can be reflected. At the peak of the cycle, the EUV and the ionospheric density are both large and higher frequencies in the HF band can be reflected.

It has been noticed that X-rays released by solar flares bombard the Earth causing sudden and intense ionization of the D region. This leads to increased D region attenuation of HF waves and in some cases total absorption of all HF frequencies for several hours. Night-side ionospheric reflection points are unaffected, being in the Earth's shadow and shielded from solar radiation. Solar flares large enough to cause a total HF blackout occur about 300 days per 11 year cycle and are most common around solar maximum [10].

VHF can also be reflected from clouds of increased ionization in the E layer of the ionosphere. This phenomenon is known as sporadic E and this tends to limit the distance over which propagation is possible in a single hop. In some cases, multi hop transmission is possible to achieve longer distance transmission.

A coronal hole is a low density region of the Sun's corona with relatively low temperature. Coronal holes are a source of high speed solar wind streams, which can induce moderate disturbances in the Earth's magnetic field and ionosphere.

Polar cap absorption arises from the deflection by the Earth's magnetic field of the incident particle streams to the polar regions of the Earth where they cause enhanced ionization in the ionospheric D-region exerting absorption of HF waves propagated across the polar regions. So HF circuit lowest usable frequencies are increased, so the usable frequency band is reduced, or even propagation is not possible at all.

As a matter of fact, weak incoherent energy scattering occurs from random thermal fluctuations in electron density, and scattering from ionospheric irregularities gives rise to direct backscattered and forward-scattered signals. Ducting signals to great distances can take place at heights of reduced ionization between the E- and F-regions, leading in some cases to round-the-world echoes. Ducting can also occur within the regions of field-aligned irregularities above the maximum of the F-region [10].

During the electrical discharge called lightning, electromagnetic waves of all frequencies (known as harmonics) are generated in space. They do not spare any radio signal from its influence and distort the signals.

Meteor scatter or meteor burst radio communications is based on the continual penetration of the meteors in the Earth's atmosphere leaving a short lived trail of ionization behind them that can be used to reflect radio signals. At first the meteor scatter system sends out a probe signal to find out whether a path exists between the transmitter and the receiver. Once the link has been verified, high-speed data can be exchanged in either of both directions [8]. After the diffusion of the meteor trail and the ion density reduction, the link will be lost. Then the master station starts to transmit its coded probe signal searching for the next meteor trail.

Changing ionospheric inhomogeneities cause the wave-front distortion which is characterized here by a phase distortion in the received signal. The random wave-front distortion can be considered to be made up of two components, a random tilt or change in the apparent direction of signal arrival, and the variations about the tilt [7, p. 17].

Under disturbed geomagnetic conditions largely driven by increased solar wind activity, the ionosphere produces large variations in the time rate of change of the geomagnetic field at the Earth's surface. These time-varying fields in turn induce voltage potential differences that produce overruns of the compensating voltage swings that are designed into the system power supplies. Several modes of system degradation or failure can occur in power grids [6].

Radar antenna tracking the Global Navigation Satellite Systems (GNSS) at low elevation angles relative to the solar direction can suffer reduced noise floors in their received back-scattered signals, causing complete loss of any targets being sought or followed [5].

Irregularities in the plasma density cause signal scintillation, i.e. random variations in amplitude and phase caused data errors in communications, loss of coherence in radar applications and loss of signal lock in GNSS navigation. Frequency shifts and frequency spread distortion can also be imposed on the transmitted signal by the temporal variability of the ionospheric channel, and this defines the coherency time of the channel. Besides, there will be a consequential dilution of precision [3, p. 45].

Amplitude scintillation, that causes rapid changes in the carrier-to-noise ratio, can lead to the loss of carrier tracking in all receivers. Phase scintillation that sufficiently disturbs the carrier phase also impacts the reception of the important navigation data message including the satellite ephemerides.

Many features of the solar and the solar-terrestrial environment must be taken into design and operational consideration in order to ensure the survivability and reliable operations of the technologies [5].

Solar-Terrestrial Process	Impact	Technologies Affected
Magnetic Field Variations	Induction of electrical currents in the Earth	Power distribution systems Long communications cables Pipelines
	Directional variations	Spacecraft attitude control Compasses
Ionosphere Variations	Reflection, propagation attenuation	Wireless communication systems
	Interference, scintillation	Communication satellites Geophysical prospecting
Solar Radio Bursts	Excess radio noise	Wireless systems Radar systems GPS transmissions
Particle Radiation	Solar cell damage	Spacecraft power
	Semiconductor damage/failure	Spacecraft control
	Faulty operation of semiconductor devices	Spacecraft attitude control
	Charging of surface and interior materials	Spacecraft electronics
Human radiation exposure		Astronauts Airline passengers
Micrometeoroids and Artificial Space Debris	Physical damage	Solar cells
		Orbiting mirrors, surfaces, materials Entire vehicles
Atmosphere	Increased drag	Low altitude satellites
	Attenuation/scatter of wireless signals	Wireless communication systems

On the basis of the abovementioned facts, the conclusion can be drawn that the ionosphere can significantly affect the propagation of radio frequency signals which pass through it or are reflected by it. Certain measures are to be taken in order to control these effects.

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PRIME NUMBER

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Summary: The article is devoted to the history and properties of prime numbers. The study has found that many questions regarding prime numbers remain open, such as Goldbach's conjecture where every even

integer greater than 2 can be expressed as the sum of two primes, and the twin prime conjecture comprising infinitely many pairs of primes whose difference is 2.

Key words: conjecture, difference, integer, properties of prime numbers, twin prime.

Анотація: Стаття присвячена розгляду історії та властивостей простих чисел. У результаті дослідження було виявлено, що багато питань, щодо простих чисел, залишаються відкритими, такі як гіпотеза Гольдбаха, де кожне, навіть ціле число, більше, ніж 2 може бути виражене у вигляді суми двох простих чисел, і числа-близнюки, що включають нескінченно багато пар простих чисел, різниця яких 2.

Ключові слова: властивості простих чисел, гіпотеза, ціле число, числа-близнюки, різниця.

Аннотация: Статья посвящена рассмотрению истории и свойств простых чисел. В результате исследования было выявлено, что многие вопросы, касающиеся простых чисел, остаются открытыми, такие как гипотеза Гольдбаха, где каждое, даже целое число, большее, чем 2 может быть выражено в виде суммы двух простых чисел, и числа-близнецы, которые включают бесконечно много пар простых чисел, разность которых 2.

Ключевые слова: гипотеза, разность, свойства простых чисел, целое число, числа-близнецы.

A prime number (or a prime) is a natural number greater than 1 that has no positive divisors other than 1 and itself. A natural number greater than 1 that is not a prime number is called a composite number. For example, 5 is prime because 1 and 5 are its only positive integer factors, whereas 6 is composite because it has the divisors 2 and 3 in addition to 1 and 6. The fundamental theorem of arithmetic establishes the central role of primes in number theory: any integer greater than 1 can be expressed as a product of primes that is unique up to ordering. The uniqueness in this theorem requires excluding 1 as a prime because one can include arbitrarily many instances of 1 in any factorization, e.g., $3, 1 \cdot 3, 1 \cdot 1 \cdot 3$, etc. are all valid factorizations of 3.

The property of being prime (or not) is called primality. A simple but slow method of verifying the primality of a given number 'n' is known as a trial division. It consists of testing whether 'n' is a multiple of any integer between 2 and \sqrt{n} . As of November 2015, the largest known prime number has 17,425,170 decimal digits. Many questions regarding prime numbers remain open, such as Goldbach's conjecture, and the twin prime conjecture. Such questions spurred the development of various branches of number theory, focusing on analytic or algebraic aspects of numbers.

Here are hints in the surviving records of the ancient Egyptians that they had some knowledge of prime numbers: the Egyptian fraction expansions in the Rhind papyrus, for instance, have quite different forms for primes and for composites. However, the earliest surviving records of the explicit study of prime numbers come from the Ancient Greeks. Euclid's Elements (circa 300 BC) contain important theorems about primes, including the infinitude of primes and the fundamental theorem of arithmetic. Euclid also showed how to construct a perfect number from a Mersenne prime. The Sieve of Eratosthenes, attributed to Eratosthenes, is a simple method to compute primes, although the large primes found today with computers are not generated this way.

After the Greeks, little happened with the study of prime numbers until the 17th century. In 1640 Pierre de Fermat stated (without proof) Fermat's little theorem (later proved by Leibniz and Euler). Fermat also conjectured that all numbers of the form $2^{2^n} + 1$ are prime (they are called Fermat numbers) and he verified this up to $n = 4$ (or $2^{16} + 1$). However, the very next Fermat number $2^{32} + 1$ is composite (one of its prime factors is 641), as Euler discovered later, and, in fact, no further Fermat numbers are known to be prime. The French monk Marin Mersenne looked at primes of the form $2^p - 1$, with p a prime. They are called Mersenne primes in his honor.

Euler's work in number theory included many results about primes. He showed the infinite series $1/2 + 1/3 + 1/5 + 1/7 + 1/11 + \dots$ is divergent. In 1747 he showed that the even perfect numbers are precisely the integers of the form $2^p - 1(2^p - 1)$, where the second factor is a Mersenne prime.

At the start of the 19th century, Legendre and Gauss independently conjectured that as x tends to infinity, the number of primes up to x is asymptotic to $x/\ln(x)$, where $\ln(x)$ is the natural logarithm of x . Ideas of Riemann in his 1859 paper on the zeta-function sketched a program that would lead to a proof of the prime number theorem. This outline was completed by Hadamard and de la Vallée Poussin who independently proved the prime number theorem in 1896.

For a long time, prime numbers were thought to have extremely limited application outside of pure mathematics [1, p. 4]. This changed in the 1970s when the concepts of public-key cryptography were invented, in which prime numbers formed the basis of the first algorithms such as the RSA cryptosystem algorithm.

Since 1951 all the largest known primes have been found by computers. The search for ever larger primes has generated interest outside mathematical circles. The Great Internet Mersenne Prime Search and other distributed computing projects to find large primes have become popular, while mathematicians continue to struggle with the theory of primes [2, p. 4].

To illustrate the latter some examples of open questions can be considered of open questions. Take for instance zeta function and the Riemann hypothesis.

The Riemann zeta function $\zeta(s)$ is defined as an infinite sum

$\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s}$, where s is a complex number with real part bigger than 1. It is a consequence of the fundamental theorem of arithmetic that this sum agrees with the infinite product

$\prod_{p \text{ prime}} \frac{1}{1 - p^{-s}}$. The zeta function is closely related to prime numbers. For example, the aforementioned fact that there are infinitely many primes can also be seen using the zeta function: if there were only finitely many primes then $\zeta(1)$ would have a finite value. However, the harmonic series $1 + 1/2 + 1/3 + 1/4 + \dots$ diverges (i.e., exceeds any given number), so there must be infinitely many primes. Another example of the richness of the zeta function and a glimpse of modern algebraic number

$$\zeta(2) = \prod_p \frac{1}{1 - p^{-2}} = \frac{\pi^2}{6}.$$

theory is the following identity (Basel problem), due to Euler,

The reciprocal of $\zeta(2)$, $6/\pi^2$, is the probability that two numbers selected at random are relatively prime [3, p. 4].

The unproven Riemann hypothesis, dating from 1859, states that except for $s = -2, -4, \dots$, all zeroes of the ζ -function have a real part equal to $1/2$. The connection to prime numbers is that it essentially says that the primes are as regularly distributed as possible. From a physical viewpoint, it roughly states that the irregularity in the distribution of primes only comes from a random noise. From a mathematical viewpoint, it roughly states that the asymptotic distribution of primes (about $x/\log x$ of numbers less than x are primes, the prime number theorem) also holds for much shorter intervals of length about the square root of x (for intervals near x). This hypothesis is generally believed to be correct. In particular, the simplest assumption is that primes should have no significant irregularities without good reason.

In addition to the Riemann hypothesis, many more conjectures revolving about primes have been posed. Often having an elementary formulation, many of these conjectures have withstood a proof for decades: all four of Landau's problems from 1912 are still unsolved. One of them is Goldbach's conjecture which asserts that every even integer 'n' greater than 2 can be written as a sum of two primes. As of February 2011, this conjecture has been verified for all numbers up to $n = 2 \cdot 1017$ [3, p. 4]. Weaker statements than this have been proven, for example Vinogradov's theorem says that every sufficiently large odd integer can be written as a sum of three primes. Chen's theorem says that every sufficiently large even number can be expressed as the sum of a prime and a semiprime, the product of two primes. Also, any even integer can be written as the sum of six primes [2, p. 4]. The branch of number theory studying such questions is called additive number theory.

Other conjectures deal with the question whether an infinity of prime numbers subject to certain constraints exists. It is conjectured that there are infinitely many Fibonacci primes [1, p. 4] and infinitely many Mersenne primes, but not Fermat primes [4, p. 4]. It is not known whether or not there are an infinite number of Wieferich primes and of prime Euclid numbers.

A third type of conjectures concerns aspects of the distribution of primes. It is conjectured that there are infinitely many twin primes, pairs of primes with difference 2 (twin prime conjecture). Polignac's conjecture is a strengthening of that conjecture, it states that for every positive integer n , there are infinitely many pairs of consecutive primes that differ by $2n$ [41]. It is conjectured there are infinitely many primes of the form $n^2 + 1$ [42]. These conjectures are special cases of the broad Schinzel's hypothesis H. Brocard's conjecture says that there are always at least four primes between the squares of consecutive primes greater than 2. Legendre's conjecture states that there is a prime number between n^2 and $(n + 1)^2$ for every positive integer n . It is implied by the stronger Cramér's conjecture.

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Summary: The article touches upon the issue of planet Mars terraforming process. The author provides an analysis of difficulties and advantages of this process. Particular attention is given to most perspective physical and chemical methods of terraforming.

Key words: chemical methods, Mars, pollution, planet colonisation, terraforming, physical methods.

Анотація: Стаття порушує питання процесу тераформування планети Марс. Автор аналізує складнощі й переваги процесу. Особлива увага приділяється до найбільш перспективних фізичних та хімічних методів тераформування.

Ключові слова: забруднення, колонізація, Марс, тераформування, фізичні методи, хімічні методи.

Аннотация: Статья затрагивает вопрос о терраформировании планеты Марс. Автор анализирует преимущества и недостатки данного процесса. Особое внимание уделяется наиболее перспективным физическим и химическим способам терраформирования.

Ключевые слова: загрязнение, колонизация, Марс, терраформирование, физические методы, химические методы.

The Earth is gradually approximating to complete destruction. Over the centuries humanity has been consuming the resources of our planet and seems to forget about the simple truth that every home must be looked after. According to the 2014 WHO (World Health Organisation) report, air pollution in 2012 caused the deaths of around 7 million people worldwide.

Plastic trash constitutes approximately 90 percent of all trash floating on the ocean's surface with 46.000 pieces per square mile and it takes about 500 - 1000 years for plastic materials to degrade [2]. According to Greenpeace statistics about 46 - 58 thousand square miles of forest are lost each year – it is equivalent to 36 football fields every minute. The point of “no return” has been reached and if humanity suddenly stopped all polluting industry, the process of Earth's biosphere destruction would be still continuing by inertia.

Despite all these terrible facts scientists are trying to find possible solutions for this global problem. On the one hand, there is “green” revolving energy that can save our planet resources, but on the other hand there are some problems which humanity can not deal with such as huge economic investments to industry creation with low output result, weak government support, high dependency on climatic conditions *etc.* But still there are scientists who are trying to find a solution of the planet resource deficiency problem on a wide-ranging scale.

There has appeared the idea that on account of unsuccessful attempts to find local solutions for preventing our planet from complete destruction mankind should look for another place of living in our Universe. This place might be another planet. But before it becomes possible to colonise another planet people must adapt it for human living or, as scientists say, trigger the process of “terraforming”.

We are going to start giving the definition: terraforming (literally “Earth-shaping”) is the hypothetical process by which Mars's climate and surface would be deliberately changed to make large areas of the environment hospitable to people thus making future colonisation of the planet safer and more sustainable [1]. There are several proposed terraforming concepts, some of which present prohibitive economic and natural resource costs and the others may be achievable with “foreseeable technologies”. However there are advantages and disadvantages of Mar's colonization and problems related with this difficult process.

The first problem is connected with the gravity and pressure of Mars which are too low for a human being. It might be rather difficult to prevent health problems associated with weightlessness. The second problem is that a “weak” magnetic field of Mars doesn't provide such protection from solar wind and space radiation as the Earth's one. According to the scientific records magnetic field on our planet is about 31 μT (microTesla): Mars would require a similar magnetic-field intensity to neutralize the negative effects on human health. The third problem for people in the process of terraforming Mars is that the average temperatures on this planet are the same as in Antarctica. Even during Martian summer the temperature is above -23 degrees Celsius, in winter it can be about -70°C : it is unambiguously not suitable for human life.

But in spite of the above-mentioned facts Mars is still the most habitable planet in our system after the Earth due to several reasons. Firstly, there is quite enough sunlight to use solar panels for energy production on the Mar's surface which can facilitate to colonise the planet in future [3]. Secondly, the martian soil and atmosphere contain many elements crucial to human life including sulfur, nitrogen, hydrogen, oxygen, phosphorus and carbon. Thirdly, the day-night martian rhythm is very similar to the one on the Earth: a Mars day is 24 hours, 39 minutes and 35 seconds. And the main advantage of this planet for future living is the availability of real liquid water. New findings from NASA's Mars Reconnaissance Orbiter (MRO) provide the strongest evidence that liquid water flows intermittently on present-day Mars.

Generally terraforming process would entail three major interlaced changes: building up the atmosphere, keeping it warm and preventing the atmosphere from escaping into outer space. As it was mentioned above the atmosphere of Mars is relatively thin and has a very low surface pressure. Since martian atmosphere consists mainly of CO₂ (known as greenhouse gas), once Mars begins to heat CO₂ may help to maintain thermal energy near the surface. Moreover, as it heats, more CO₂ would enter the atmosphere from the frozen reserves on the poles resulting in enhancing the greenhouse effect. This means that the two processes – building the atmosphere and heating – would be involved into synergetic process.

All the methods and ideas as for terraforming are based on the principles which can be divided into physical and chemical ones. Let us analyse the most perspective physical methods at first.

Orbital Mirrors method. There are mirrors made of thin aluminised PET film that could be placed in orbit around Mars to increase the total insolation it receives. This construction would direct the sunlight onto the surface and could increase Mars's surface temperature directly. The mirror could be positioned using its effectiveness as a solar sail to orbit in a stationary position relative to Mars (near the poles) to sublimate CO₂.

Comet impact method. Another way to increase the martian temperature could be the method of directing small comets onto the surface of the planet. This could be achieved with the help of using the special lasers to alter comets' trajectories. As a result, the impact energy would be released as heat. This heat could sublimate CO₂ as in the previous method or, if there is liquid water present at this stage of the terraforming process, heating could produce steam which is also considered greenhouse gas. Comets could also be chosen for their composition such as ammonia, which would then disperse into the atmosphere adding greenhouse gas.

Albedo reduction. Reducing the albedo of the Martian surface would also make more efficient use of incoming sunlight. This could be done by spreading dark dust from Mars's moons, Phobos and Deimos, which are among the blackest bodies in the Solar System; or by introducing dark extremophile microbial life forms such as lichens, algae and bacteria. The ground would then absorb more sunlight warming the atmosphere. If algae or other green life were established, it would also contribute a small amount of oxygen to the atmosphere but it would not be enough for humans to breathe.

As for the chemical methods contributing the process of terraforming we can point out some of them.

Importing ammonia method. This method uses ammonia as a powerful greenhouse gas. It is possible that large amounts of the gas exist in a frozen form on minor planets orbiting in the outer Solar System. It may be possible to move them and send them into Mars's atmosphere. Since ammonia is mostly nitrogen by weight, it could also supply the buffer gas into the atmosphere. Sustained smaller impacts will also contribute to increasing the temperature and mass of the Mars's atmosphere.

Importing hydrocarbons method. Another way to create a Martian atmosphere is to import methane or other hydrocarbons, which are common in Titan's (the largest moon of Saturn) atmosphere and on its surface; the methane could be vented into the atmosphere where it would act to compound the greenhouse effect.

Carbon dioxide sublimation method. There is presently enough carbon dioxide (CO₂) as dry ice in the Martian south pole and its absorption by regolith would increase the atmospheric pressure to 30 kPa (0.30 atm) comparable to the altitude of the Mount Everest peak on the Earth, where the atmospheric pressure is 33.7 kPa (0.333 atm). Although this pressure would not be breathable for humans, it is above the Armstrong limit and would eliminate the need for pressure suits.

So, we can make a general but truthful conclusion: all mentioned methods have their pros and cons in a challenging process of terraforming Mars. But the perspective of another planet terraforming or colonization is closer than ever for all humanity. Our target is to support scientific progress as much as we can, because it is our Home future at stake.

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УДК 666.3.017

COOLING OF FOOD IN THE ABSENCE OF ELECTRICITY

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Summary: The article is devoted to the global problem of electricity shortage and extension of shelf life of food products. The method for providing people with fresh food in the absence of electricity is

considered. The principle of the refrigerator-effect evaporation of the liquid is described. The theoretical model and the experiment confirming the theory is discussed.

Keywords: food, refrigeration unit, cooling, evaporation.

Анотація: Стаття присвячена розгляду сутності глобальної проблеми браку електроенергії та подовженню терміну придатності продуктів харчування. Розглянуто метод для забезпечення людей свіжою їжею в умовах відсутності електрики. Описан принцип роботи холодильника на основі ефекту випаровування рідини. Побудована теоретична модель і проведено експеримент, який підтверджує теорію.

Ключові слова: продукти харчування, холодильна установка, охолодження, випаровування.

Аннотация: Статья посвящена рассмотрению сущности глобальной проблемы нехватки электроэнергии и продлению срока годности продуктов питания. Рассмотрен метод для обеспечения людей свежей пищей в условиях отсутствия электричества. Описан принцип работы холодильника на основе эффекта испарения жидкости. Построена теоретическая модель и проведен эксперимент, подтверждающий теорию.

Ключевые слова: продукты питания, холодильная установка, охлаждение, испарение.

People have been trying to extend the shelf life of food since ancient antiquity. Dark caves, deep cellars, porous jugs were used for cooling products. In ancient Egypt, the method of cooling using porous vessels was depicted on the murals. We carry out more detailed investigation of the cooling products method. The water penetrates on the outer surface of the vessel through the pores of the pot and evaporates.

Cooling by evaporating is a physical phenomenon by evaporation of a liquid into surrounding air cools an object. The fastest molecules in a liquid leave flying in the surrounding air, while slow (cold) ones remain on the walls of the pot. Thus the pot becomes cool. Let's consider a model that is in equilibrium, how much energy the pot receives from the environment and how much it gives up. In this case, it is reached the lowest possible temperature.

Water evaporates on the surface of the vessel. The mass of water that evaporates from the surface and participates in the diffusion process is described by Fick's law:

$$\Delta m = \frac{DS\Delta t(\rho(T_-)-\rho(T_+))}{l} \quad (1)$$

Where: D is a specific coefficient of air diffusion;

S is the area of the surface of the pot;

$\rho(T_-)$ is the density of the vessel equal to the temperature inside the pot;

$\rho(T_+)$ is the density of water vapor in the environment;

l is the length of the boundary layer.

To describe equilibrium states for isotropic media which links temperature gradient in a medium with a heat flux density we will use equation of heat conduction.

$$L\Delta m = \lambda \frac{T_+ - T_-}{l} S\Delta t \quad (2)$$

Where: L is the specific heat of the fluid vaporization,

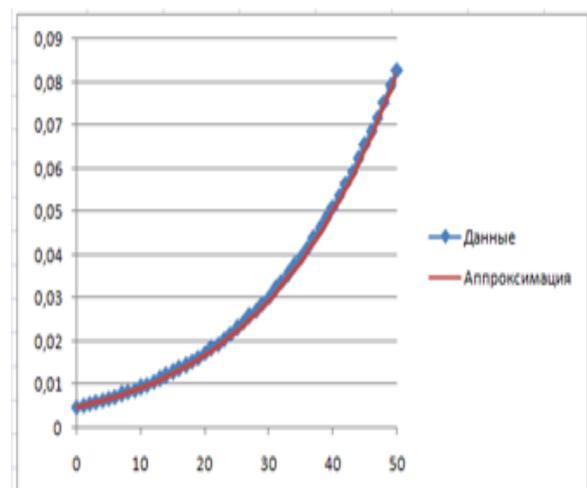
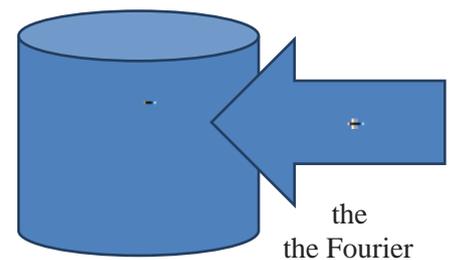
λ is the thermal conductivity of water vapor.

Using these two formulas, we find the unknown temperature of the pot T_- :

$$T_- = \frac{\lambda T_+ - LD(\rho(T_-)-\rho(T_+))}{\lambda}$$

There is an unknown variable $\rho(T_-)$ in this formula and in order to determine its value we need to know the temperature T_- that we derive through it. To solve this problem we use the formula of Taylor and expand the function $\rho(T_-)$.

$$\rho(T_-) = \rho(T_+) - \rho'(T_+)\Delta T \quad (4)$$



We need to take the derivative of the function, depending on the temperature of the vapor density. We define the approximate formula. We take tabulated experimental data density and temperature. We built schedule and approximate exponential with their help [1, p. 24-26, p. 72-75].

We obtained the theoretical formula to calculate the minimum possible temperature in our method of cooling. It is a modified variant of the pot. We use it to put inside of the cup. The room temperature is 16.2°C. and out The water temperature inside is equal to 11.5°C less than an hour. However, that is not all. Looking at the current humidity and temperature and clicking on the

$$\Delta T = \frac{\rho(T_{\infty})(1-\phi)}{K + \rho(T_{\infty})} \frac{3000}{(T_{\infty} + 273)^2}$$

needed column of psychrometric table, we can see the same temperature difference: 4.5 degrees. We can have the same number if we substitute the parameters of the pot in a theoretical formula. Therefore, if we know the ambient temperature and some characteristics of the environment, we can find out what temperature can be achieved. Psychrometer and the pot are very similar. The ambient temperature plays the role of the dry thermometer in our model, the wet one is our vessel, and water is evaporated from the surface of the "thermometer" like from the one of a psychrometer.

Thus we solve the static problem and we know the final temperature and compare it with the testimony of a psychrometer. Now we define the temperature dependence of the vessel on time.

We have two heat flows; one of them is directed from one medium to the outer surface of the clay. The second flow is directed from the water inside and it has a higher temperature than the outer surface of the clay when the process of evaporation starts where l is the length of the boundary layer that has a temperature gradient and diffusion occurs. T_1 is the temperature at the surface of the outer layer of clay directly. [2]

$$q_1 = K_r \frac{T - T_1}{l}$$

, where l_r is the width of the layer of clay.

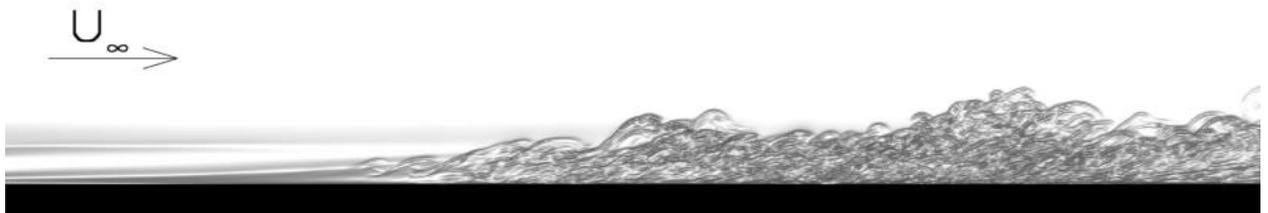
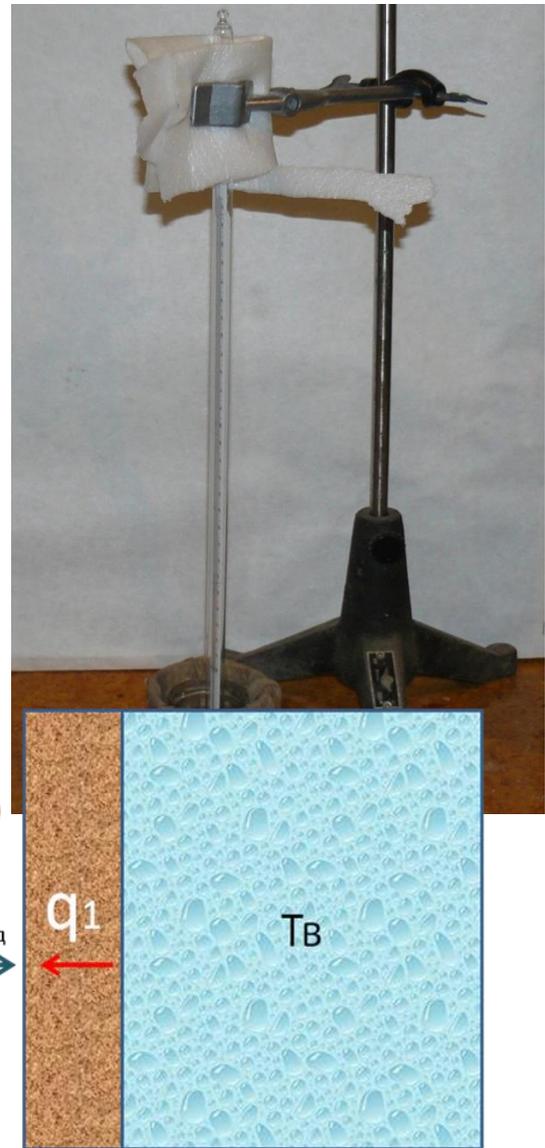
q_1 can also be expressed in terms of change in heat of water per unit time.

$$q_1 = - \frac{mc}{S} \frac{dT_B}{dt}$$

$$l = 6 \sqrt{\frac{\eta R}{\nu \rho}}$$

is the length of the boundary layer, μ is dynamic viscosity, R is the one of the characteristic lengths of the body (e.g., the length of the plate, when flow is viewed over a flat plate), ρ is density of gas or liquid, U is free-stream velocity. The amount of heat which is required per unit time per unit area for evaporation: $j = \Delta \square L / S$,

where $\Delta \square$ is calculated by the formula (1) As all the heat that comes in the system is spent on evaporation so we can write the equality of heat flows: $q_1 + q_{\text{возд}} = j$. We find the following solution of the differential equation:

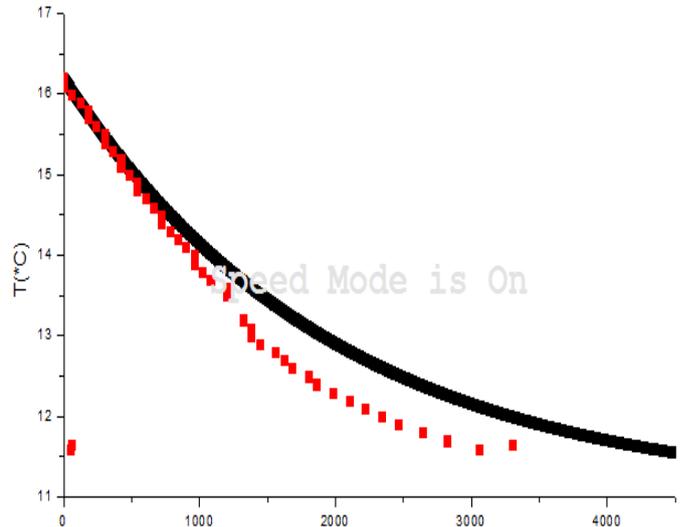


$$T_B = \frac{e^{\frac{mc}{S} \left(1 + \frac{lz}{Kz} - (K_B + DL\rho(T_0)) \frac{5000}{(T_0 + 273)^2}\right)}}{\left(\frac{K}{DL} + \rho(T_0) \frac{5000}{(T_0 + 273)^2}\right)} + T_0 - \frac{\rho(T_0)(1 - u)}{\frac{K}{DL} + \rho(T_0) \frac{5000}{(T_0 + 273)^2}}$$

Thus we have a complex exponential dependence of the temperature inside the pot from time. We test it in practice.

Theoretical graph lies well on the chart obtained by the experimental points which is a good argument in favor of our theoretical model.

To draw conclusions on the basis of the obtained dependence and experimentation we have found out that the faster the air flow that blows our vessel then faster the cooling of water and this cooling method applies well in hot, dry climates. For example, the climate in Africa is one and people who live there cannot provide themselves with electric appliances. The experiment has success because the vessel was cooled to approximately 15 degrees. The vessel must necessarily be porous and the pores themselves should not be too small but in case the dishes are burned or lacquered, they do not miss the water out.



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УДК 930.24:51.3 = 111

HISTORY OF COMPUTING HARDWARE BEFORE VON NEUMANN MACHINE

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Аннотация: В этой статье представлена история развития первой вычислительной техники. Также описаны первые электронные устройства.

Ключевые слова: вычислительная техника, история развития вычислительной техники, электроника, компьютер.

Анотація: У цій статті представлена історія розвитку першої обчислювальної техніки. Також описані перші електронні пристрої.

Ключові слова: обчислювальна техніка, історія розвитку обчислювальної техніки, електроніка, комп'ютер.

Summary: The history of the earliest computing hardware is presented in this article. The first electronic devices are also described.

Key words: computing hardware, history of computing hardware, computer, electronics.

Computing hardware has been an important component of the process of calculation and data storage since it became useful for numerical values to be processed and shared. The earliest computing hardware was probably some form of tally stick; later record keeping aids include Phoenician clay shapes which represented counts of items, probably livestock or grains, in containers. Something similar is found in early Minoan excavations. These seem to have been used by the merchants, accountants, and government officials of the time.

Devices to aid computation have changed from simple recording and counting devices to the abacus, the slide rule, analog computers, and more recent electronic computers.

Humanity has used devices to aid in computation for millennia.

One example is a device for establishing equality by weight: the classic scales. Another is simple enumeration: the checkered cloths of the counting houses served as simple data structures for enumerating stacks of coins, by weight. A more arithmetic-oriented machine is the abacus. One of the earliest machines of this type was the Chinese abacus.

In 1623 Wilhelm Schickard built the first mechanical calculator and thus became the father of the computing era. Since his machine used techniques such as cogs and gears first developed for clocks, it was also called a 'calculating clock'.

Machines by Blaise Pascal (the Pascaline, 1642) and Gottfried Wilhelm von Leibniz (1671) followed. Around 1820, Charles Xavier Thomas created the first successful, mass-produced mechanical calculator, the Thomas Arithmometer that could add, subtract, multiply, and divide. It was mainly based on Leibniz's work.

Mechanical calculators, like the base-ten addiator, the comptometer, the Monroe, the Curta and the Addo-X remained in use until the 1970s.

Leibniz also described the binary numeral system, a central ingredient of all modern computers. However, up to the 1940s, many subsequent designs (including Charles Babbage's machines of the 1800s and even ENIAC of 1945) were based on the harder-to-implement decimal system.

In 1801, Joseph-Marie Jacquard developed a loom in which the pattern being woven was controlled by punched cards. The series of cards could be changed without changing the mechanical design of the loom. This was a landmark point in programmability.

In 1833, Charles Babbage moved on from developing his difference engine to developing a more complete design, the analytical engine, which would draw directly on Jacquard's punch cards for its programming.

In 1890, the United States Census Bureau used punch cards and sorting machines designed by Herman Hollerith, to handle the flood of data from the decennial census mandated by the Constitution. Hollerith's company eventually became the core of IBM. IBM developed punch card technology into a powerful tool for business data-processing and produced an extensive line of specialized unit record equipment. In many computer installations, punched cards were used until (and after) the end of the 1970s.

The defining feature of a "universal computer" is programmability, which allows the computer to emulate any other calculating machine by changing a stored sequence of instructions. In 1835 Charles Babbage described his analytical engine. It was the plan of a general-purpose programmable computer, employing punch cards for input and a steam engine for power. One crucial invention was to use gears for the function served by the beads of an abacus. In a real sense, computers all contain automatic abacuses (technically called the ALU or floating-point unit). His initial idea was to use punch-cards to control a machine that could calculate and print logarithmic tables with huge precision (a specific purpose machine). Babbage's idea soon developed into a general-purpose programmable computer, his analytical engine.

While his design was sound and the plans were probably correct, or at least debug gable, the project was slowed by various problems. Babbage was a difficult man to work with and argued with anyone who didn't respect his ideas. All the parts for his machine had to be made by hand. Small errors in each item can sometimes sum up to large discrepancies in a machine with thousands of parts, which required these parts to be much better than the usual tolerances needed at the time. The project dissolved in disputes with the artisan who built parts and was ended with the depletion of government funding.

Ada Lovelace, Lord Byron's daughter, translated and added notes to the "Sketch of the Analytical Engine" by Federico Luigi, Conte Menabrea. She has become closely associated with Babbage. Some claim she is the world's first computer programmer, however this claim and the value of her other contributions are disputed by many.

A reconstruction of the Difference Engine II, an earlier, more limited design, has been operational since 1991 at the London Science Museum. With a few trivial changes, it works as Babbage designed it and shows that Babbage was right in theory. The museum used computer-operated machine tools to construct the necessary parts, following tolerances which a machinist of the period would have been able to achieve.

By the 1900s earlier mechanical calculators, cash registers, accounting machines, and so on were redesigned to use electric motors, with gear position as the representation for the state of a variable. Companies like Friden, Marchant and Monroe made desktop mechanical calculators from the 1930s that could add, subtract, multiply and divide. The word "computer" was a job title assigned to people who used these calculators to perform mathematical calculations. During the Manhattan project, future Nobel laureate Richard Feynman was the supervisor of the roomful of human computers, many of them women mathematicians, who understood the differential equations which were being solved for the war effort. Even the renowned Stanislaw

Ulam was pressed into service to translate the mathematics into computable approximations for the hydrogen bomb, after the war.

In 1948, the Curta was introduced. This was a small, portable, mechanical calculator that was about the size of a pepper grinder. Over time, during the 1950s and 1960s a variety of different brands of mechanical calculator appeared on the market.

The first all-electronic desktop calculator was the British ANITA Mk.VII, which used a Nixie tube display and 177 subminiature thyratron tubes. In June 1963, Friden introduced the four-function EC-130. It had an all-transistor design, 13-digit capacity on a 5-inch CRT, and introduced reverse Polish notation (RPN) to the calculator market at a price of \$2200. The model EC-132 added square root and reciprocal functions. In 1965, Wang Laboratories produced the LOCI-2, a 10-digit transistorized desktop calculator that used a Nixie tube display and could compute logarithms.

Before World War II, mechanical and electrical analog computers were considered the 'state of the art', and many thought they were the future of computing. Analog computers use continuously varying amounts of physical quantities, such as voltages or currents, or the rotational speed of shafts, to represent the quantities being processed.

The era of modern computing began with a flurry of development before and during World War II, as electronic circuits, relays, capacitors and vacuum tubes replaced mechanical equivalents and digital calculations replaced analog calculations. The computers designed and constructed then have sometimes been called 'first generation' computers. First generation computers such as the Atanasoff-Berry Computer, the Z3, the Colossus and ENIAC, were built by hand using circuits containing relays or valves (vacuum tubes), and often used punched cards or punched paper tape for input and as the main (non-volatile) storage medium.

Alan Turing's 1936 paper has proved enormously influential in computing and computer science in two ways. Its main purpose was an elegant proof that there were problems (namely the halting problem) that could not be solved by a mechanical process (a computer). In doing so, however, Turing provided a definition of what a universal computer is: a construct called the Turing machine, a purely theoretical device invented to formalize the notion of algorithm execution, replacing Kurt Gödel's more cumbersome universal language based on arithmetic's. Modern computers are Turing-complete (i.e., equivalent algorithm execution capability to a universal Turing machine), except for their finite memory. This limited type of Turing completeness is sometimes viewed as a threshold capability separating general-purpose computers from their special-purpose predecessors.

Working in isolation in Germany, Konrad Zuse started construction in 1936 of his first Z-series calculators featuring memory and (initially limited) programmability. Zuse's purely mechanical, but already binary Z1, finished in 1938, never worked reliably due to problems with the precision of parts.

Zuse's subsequent machine, the Z3, was finished in 1941. It was based on telephone relays and did work satisfactorily. The Z3 thus became the first functional program-controlled computer. In many ways it was quite similar to modern machines, pioneering numerous advances, such as floating point numbers. Replacement of the hard-to-implement decimal system (used in Charles Babbage's earlier design) by the simpler binary system meant that Zuse's machines were easier to build and potentially more reliable, given the technologies available at that time. This is sometimes viewed as the main reason why Zuse succeeded where Babbage failed.

During World War II, the British at Bletchley Park achieved a number of successes at breaking encrypted German military communications. The German encryption machine, Enigma, was attacked with the help of electro-mechanical machines called *bombes*. The bombe, designed by Alan Turing and Gordon Welchman, after the Polish cryptographic *bomba* (1938), ruled out possible Enigma settings by performing chains of logical deductions implemented electrically. Most possibilities led to a contradiction, and the few remaining could be tested by hand.

Colossus was the first totally *electronic* computing device. The Colossus used a large number of valves (vacuum tubes). It had paper-tape input and was capable of being configured to perform a variety of Boolean logical operations on its data, but it was not Turing-complete.

The US-built ENIAC (Electronic Numerical Integrator and Computer), often called the first electronic general-purpose computer, publicly validated the use of electronics for large-scale computing. This was crucial for the development of modern computing, initially because of the enormous speed advantage, but ultimately because of the potential for miniaturization. Built under the direction of John Mauchly and J. Presper Eckert, it was 1,000 times faster than its contemporaries. ENIAC's development and construction lasted from 1943 to full operation at the end of 1945. When its design was proposed, many researchers believed that the thousands of delicate valves (i.e. vacuum tubes) would burn out often enough that the ENIAC would be so frequently down for repairs as to be useless. It was, however, capable of up to thousands of operations per second for hours at a time between valve failures.

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Strait of Messina Bridge Project Tsarova M. O. (Kharkiv) Language supervisor: Makovyey R. G.

Summary: The article deals with the problems associated with the Strait of Messina Bridge. The study found that the problem with the bridge over the Messina Strait is important for transport routes in Italy. There are concerns about the environmental impacts of the bridge and whether it can withstand earthquakes, which are not uncommon in the region.

Key words: bridge, project, engineer.

Анотація: У статті розглядаються проблеми, пов'язані з мостом через Мессинську протоку. Дослідження показало, що проблема з мостом через Мессинську протоку має важливе значення для транспортних маршрутів в Італії. Є побоювання з приводу впливу на навколишнє середовище моста і чи може він витримати землетруси, які не рідкість в регіоні.

Ключові слова: міст, проект, інженер.

Аннотация: В статье рассматриваются проблемы, связанные с мостом через Мессинский пролив. Исследование показало, что проблема с мостом через Мессинский пролив имеет важное значение для транспортных маршрутов в Италии. Есть опасения по поводу воздействия на окружающую среду моста и может ли он выдержать землетрясения, которые не редкость в регионе.

Ключевые слова: мост, проект, инженер.

Bridge is a structure that provides passage over obstacles such as valleys, rough terrain or bodies of water by spanning those obstacles with natural or manmade materials. They first begun be used in ancient times when first modern civilizations started rising in the Mesopotamia. From that point on, knowledge, engineering, and manufacture of new bridge building materials spread beyond their borders, enabling slow but steady adoption of bridges all across the world.

In the beginning bridges were very simple structures that were built from easily accessible natural resources – wooden logs, stone and dirt. Because of that, they had ability only to span very close distances, and their structural integrity was not high because mortar was not yet invented and rain slowly but constantly dissolved dirt fillings of the bridge. Revolution in the bridge construction came in Ancient Rome whose engineers found that grinded out volcanic rocks can serve as an excellent material for making mortar. This invention enabled them to build much more sturdier, powerful and larger structures than any civilization before them. Seeing the power of roads and connections to distant lands, Roman architects soon spread across the Europe, Africa and Asia, building bridges and roads of very high quality.

One of the defining successes of Roman bridge architecture was their discovery of arches. By using this type of building, load forces of the bridge were conveyed to move along the curve of the arch, meeting with the ground where they were canceled by supports on the end of the arch. Because of that, Romans were able to create bridges that were much lighter than before and were able to hold load that was twice as heavy as the bridge itself. In construction of their numerous aqueducts, Roman architects even managed to create water carrying bridges with multiple arched tiers that reached incredible heights!

By using this new building technique, Romans had the ability to quickly produce cheap, light and very powerful bridges from materials that could be found in the vicinity of the project. The only material that had to be imported from Italy was mortar dust, which was combined with water and inserted into bridge structure.

After the fall of roman empire, bridge building techniques in Europe and Asia stagnated until the 18th century (if we ignore introduction of Rope suspension bridges that were brought back to Europe from Central and South America) when new age of science and engineering swept across the world. Architects of that time started using new construction material – cast iron! Iron enabled creation of new bridge designs such as truss systems. Sadly, wrought iron did not have tensile strength to support heavy structures, which was fixed with the advent of steel and the ideas of famous French architect and engineer Gustave Eiffel.

Modern bridges are usually made with the combination of concrete, irons and cables, and can be built from very small sizes to incredible lengths that span entire mountains, rough landscapes, lakes and seas. Bridges are fascinating marvels of engineering that have managed to infuse themselves in our history like no other architectural objects. If you ever wanted to know more about bridges, their types, largest bridge structures or tragic failures, here is the perfect place to do so. Over the last 3000 years, engineers and architects have devised many ways of building bridges. Here you can see for yourself bridge types that are in use today, from what materials they are made, and for what uses are they built.

One of the seven modern wonders of the world – Channel tunnel between Britain and France has a much longer history than we could assume at first sight. It existed in the minds of dreamers for two centuries. Sicily is one of the most beautiful places in Italy, but its island status does not make a most positive impact on the economy and, in particular, on the development of tourism.

The idea to link Sicily to the mainland by a bridge has existed more than one thousand years. Some historians believe that the Romans even implemented a similar view, constructing a pontoon bridge. However, the pontoon bridge was a distinct lack: the bridge interfered with navigation. Charlemagne, Robert Guiscard, Ferdinand II of Bourbon speculated on the given problem. The task was difficult. At the narrowest point, the width of the strait is a little over 3 km. It is not too much for ducts, but too much for a bridge to be built. The depth of the sea floor is uneven, and in the deepest points, the ground floor descends more than 100 meters. In addition, such large-scale and technically complex project required considerable expenditures. The interest in the project concerning the connection of the mainland and Sicily erupted with renewed vigor after the unification of Italy. They even offered options of an underground tunnel.

Isolation of the great continent of Sicily is one of Italy's main transport problems, so the project of building a bridge across the strait has long been hovering in different circles. But the implementation of this project is likely to take place only in the distant future, it is going to be a mega-bridge that will break the record in terms of distance among the majority of most existing bridges.

The bridge will span over the Straits of Messina and connect two Italian regions – Sicily and Calabria. The first reason, because of which its opponents have criticized the project lies in the fact that the Strait of Messina is the busiest sea route. The construction of such large-scale structures may create some security problems for ships and trains, which will start up on the bridge. Also in this area are very strong wind and there are a number of engineering considerations that may make the project much more expensive.

The second problem, which they say the opponents of construction – the Mafia. The government plans to finance the construction of the bridge 1.3 billion. euros of taxpayers' money. The total cost is estimated at 6.1 billion euros.

Critics fear that a significant portion of these funds will be in the pockets of various mafia clans, which, in fact, control the public works and the distribution of budget funds in southern Italy.

The opposition claims that construction of the bridge should become a priority in the current economic climate. The design of the stiffness beam of the central three-kilometer span is of particular difficulty, and the existence of such a bridge in a highly seismic zone of construction.

The current project is quite different from the first one. It will be a road-rail bridge: in the center of the bridge there will be located a double-track railway, to the right and left of it – there will be three traffic lanes.

It is planned to improve the local ports. It is expected that after all the tremendous amount of work is accomplished, the bridge will attract many tourists.

For the first time the project was seriously considered only when the Prime Minister of Italy was Silvio Berlusconi (from 2001 to 2006), but his successor from the left-wing coalition Romano Prodi blocked the decision because, in his opinion, this bridge would bring benefits only to construction companies controlled by mafia. The new prime minister called the project "the most useless and dangerous plan during the last 100 years". The total cost of the bridge is estimated at 6.1 billion euros. If the bridge is built, it will be the longest suspension bridge in the world. According to the design, the length of the bridge will be 3,300 meters.

According to the plan of the bridge, it can withstand the load of 5,000 vehicles per hour.

Some engineers have warned that the huge pylons would be vulnerable to strong winds. Minister of Public Works of Italy said that the cost would come to about six billion euros, but the project has already started and there is no turning back. The tender for the construction of the bridge has been won by the Italian company «Impregilo», which will work together with the Spanish partner «Sacyr Vallehermoso».

According to technical specifications, the bridge is expected to outdo the bridge under construction in Primorye to the Russian island in the Russian Federation. Builders say that the bridge will be one of the largest cable-stayed bridges in the world, whose central span length of 1104 meters will be recorded in the world practice of bridge building.

The total length of the bridge – 1885.53 m; the total length with approaches – 3100 m; the length of the central channel flight – 1104 m; the width of the carriageway – 23,8 m; the height of the pylons – 320 m.

In developing the project there were involved more than 100 professors and engineers with a worldwide reputation, 12 research institutes, 39 associations and companies (Italian and foreign). The main contractor (since 2005) is the association of enterprises "Evrolink." Indeed, to participate in such a project is a great honor for any bridge-builder!

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TRANSPORTATION MODES DEVELOPMENT

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Summary: The historical process of transportation development is described in the article. The results of this problem investigation are shown. The passenger transportation is devoted much attention to.

Key words: development of transportation, passengers, motor transport, air transportation, public transport.

Анотація: У статті описаний історичний процес розвитку транспорту та пасажирських перевезень. Представлені результати цього дослідження. Особлива увага приділяється розвитку пасажирських перевезень.

Ключові слова: розвиток транспорту, пасажирів, автотранспорт, повітряний транспорт, громадський транспорт.

Аннотация: В статье описан исторический процесс развития транспорта и пассажирских перевозок. Представлены результаты исследования даны. Особое внимание уделяется развитию пассажирских перевозок.

Ключевые слова: развитие транспорта, пассажиры, автотранспорт, воздушный транспорт, общественный транспорт.

We go to and from work by overcrowded buses and other modes of transport every day. Perhaps at that moment we want the public transportation not to be invented at all and people continue to go on foot or on horses to reach their points of destination.

Everything started more than 5,000 years ago when the wheel was invented.

Despite the age that the wheel has, it was necessary several thousand years for it to be improved enough to play the important role it has today.

Meanwhile people were improving the marine transport, which seemed to have been among the first forms of transportation.

Historically, people have always settled near water. Waterways are critically important for the transportation of people and goods throughout the world. The complex network of connections between coastal ports, inland ports, rails, air, and truck routes forms a foundation of material economic wealth worldwide.

Within the United States, waterways have been developed and integrated into a world-class transportation system that was instrumental in the country's economic development. Today, there are more than 17,700 kilometers of commercially important navigation channels in 48 states.

The historical development of water-based transportation is connected with the importance of domestic and international trade. Early exploration of North America identified large amounts of natural resources such as fisheries, timber, and furs. Trade centers were established along the east coast of North America where goods could be gathered together and ocean vessels could transport them to consumers in Europe and other foreign areas.

Waterways in the developing countries are crucial avenues for local and regional commerce. Fruit and vegetable vendors flock to floating markets on rivers and canals, such as in Bangkok. Large colonial settlements that in turn resulted in additional increase of population, economic activity and trade.

From the sixteenth to the eighteenth centuries, small subsistent farms were prevailing among the American colonies. Eventually larger farms emerged and produced crops such as wheat, tobacco, rice, indigo, and cotton that were commercially marketable in Europe. Ocean vessels transported bulky, low-value goods

from the colonies to Europe and returned with high-value, low-density goods such as ink, linen, and finished products that had a much higher return on the invested per vessel trips.

In 1640 public transportation was divided into social classes: the richest people traveling in the crowded carriage (up to 8 in number), middle class people must fit the rear basket attached to the vehicle while poorer people stood on the roof of carriages, above luggage, facing directly the risk of fall.

A bus is a transportation vehicle used for carrying passengers from one place to another. The word "bus" comes from the Latin word omnibus meaning 'for all'. The origin of the first public transport system can be traced back to Nantes, France. In 1826, a retired army officer named Stanislas Baudry built a public bus and he used the omnibus to carry people from the center of the town to his public baths. When he realized that they had been more interested in getting off in between, he changed the focus and instead of carrying passengers to his public baths only, the omnibus traveled on a predetermined route from one inn to another inn and carried passengers and mail like a hackney carriage.

An entrepreneur Abraham Brower started this bus service. The route ran along the Broadway to Bowling Green. This service also started in other American cities, such as Philadelphia, Boston, and Baltimore the next few years. The travelers came to know many strangers while travelling in an omnibus. Omnibus also went to far off cities facilitating travelling. The distance one had to travel on foot was too much even for young people and omnibus made travelling comfortable.

So, the first bus started operating in 1662, at the initiative of Blaise Pascal. Then, the bus had a travel schedule, a fixed route, a charge carrier and of course, horses to put it in motion.

The first motorized bus appeared in 1895 in Germany. It was a modified Benz truck and the modification was done by Netphener Omnibusgesellschaft, a company from Netphen, Germany. Early buses were actually made by fitting the body of a bus on chassis of a truck. Modern day buses are manufactured using advanced technologies and have latest features like GPS location, passenger information systems and electronic controls.

Buses have come a long way from wooden seats to luxurious and comfy seats.

The present day buses are also used as recreational vehicles. These recreational vehicles have everything one might need, such as a bed, a sofa, electricity, a television, a microwave, etc. People also buy used recreational buses for personal use as they are better for travelling comfortably and luxuriously. A new bus is comparatively expensive so many people prefer buying a second hand used bus for sale and modifying it.

In 1775, James Watt perfected the steam engine. From now on trains, buses, boats, all will use the steam engine to "improve" life of the masses.

In 1807 there was invented the first steam vessel that carried passengers. In 1825 it was built the world's first public railway between the cities of Stockton and Darlington.

And the first subway in the world appeared in 1863 in London. The story began with Charles Pearson, the first in a succession of underground visionaries. It was he who in long the first to propose the notion of 'trains in drains' in 1845, when the railway was a relatively new invention (the first steam passenger service opened in 1830). Pearson, instrumental in the removal of the anti-Catholic inscription on the foot of the Monument, was a progressive and his persistence helped persuade the House of Commons to approve the bill in 1853 to build a subterranean railway between Paddington and Farringdon.

The reason of such a hare-brained, experimental scheme receiving approval was one of necessity. London's roads were suffering from terrible overcrowding and the mainline railways all stopped on the fringes of the West End and City thanks to a Royal Commission of 1846 that declared central London a no-go area for railway companies. A method of linking the mainline stations of Paddington, Euston and King's Cross was needed, and Pearson's plan fitted the bill. He helped raise the finance from private investors and the City of London, and excavation began in 1860, with a shallow trench dug beneath Euston Road and then covered over. Thousands of poor residents were displaced in the process.

The Metropolitan Line was opened for business on January 10 1863, clocking 30,000 passengers on the first day. A celebratory banquet had been held the previous day in Farringdon. Pearson was not among the guests, having passed away the previous year. Another absentee was the Prime Minister Lord Palmerston, who was approaching his 80th birthday, and said he wanted to spend as much time above ground as possible.

Mr. Hallidie patented the inventions that made cable traction possible and the world's first cable tram system commenced operation in San Francisco in 1873.

Air Transportation started in 1910 with the first line of airships to undertake a carriage of passengers, built by Ferdinand von Zeppelin.

The modern age in the history of air transportation began with the hot air balloon designed by the Montgolfier brothers in 1783, it was the first un-tethered human lighter-than-air flight. But the flights were limited as the balloon could only travel downwind. In 1784, a steerable balloon of Jean-Pierre Blanchard was

the first human-powered dirigible. He crossed the English Channel in one in 1785. However, the concept of the modern airplane, as a fixed-wing flying machine with separate systems for lift, propulsion, and control was only set forth in 1799 by Sir George Cayley, as per the history of air transport. The first assisted take-off flight was in December 17, 1903 by the Wright Brothers, who are known to be the first to fly in a powered and controlled aircraft.

Following the new standards in the air transport history, there were extensive adoption of ailerons versus wing warping made aircraft which were much easier to control. At the start of World War I, only a decade later, heavier-than-air powered aircraft were used for investigation, artillery spotting, and even attacking against ground positions.

The history of air transportation reflects how following this, as designs grew larger and more reliable; the aircraft began to carry people and cargo. There were giant rigid airships transporting passengers and cargo over large distances. The German Zeppelin company became the best known manufacturers of these type of aircrafts in the air transport history. The most triumphant Zeppelin was the Graf Zeppelin, which flew over one million miles.

However with the advancement in the airplane design, the dominance of the Zeppelins in this period of history of air transport was soon to end. During the 1920s and 1930s there was marked huge progress in the field of aviation. The first airliner that was a commercial one, carrying passengers exclusively was the Douglas DC-3. And here begins the modern era of passenger airline service. With the World War II, one also saw many towns and cities building airports. There were numerous qualified pilots available too. The first jet aircraft and the first liquid-fueled rockets brought many improvements to air transport.

After World War II, a boom was seen in general air transport, both private and commercial. Many inexpensive war-surplus transport and training aircraft became available and thousands of pilots were released from military service. Manufacturers like Cessna, Piper, and Beechcraft swelled their production to supply light aircraft for the new middle-class market. As the history of air transportation reveals, the first widely-used passenger jet was the Boeing 707 which was also the most economical.

Ever since the 1960s, the composite airframes have become lighter and quieter and engines more competent. But the most significant lasting improvements have taken place in instrumentation and control, as we study the air transport history. The influx of solid-state electronics, the Global Positioning System, satellite communications have radically changed the cockpits of airliners. Small and powerful computers and LED displays help the pilots in navigating and viewing the terrain much more accurately, even at night or in low visibility.

In 2004, SpaceShipOne became the first privately funded aircraft to make a spaceflight. This has opened the likelihood of an aviation market competent of leaving the Earth's atmosphere.

The 20th century has improved pretty much everything to have been invented but unfortunately it wasn't enough. We expect the 21st century to create some teleportation devices for traffic, neighbours sweat in the bus and highway fees.

The motor transport is the most widespread type of transport now. The motor transport is younger than the railway and water transport. The first cars appeared at the end of the XIX century. After World War II the motor transport started competing with the railroad transport. There are many advantages of the motor transport – maneuverability, flexibility, speed. Trucks transport practically all types of freights nowadays; successfully compete with the railroad transport in transit of perishable goods. Certainly, road transport is one of the most developed in the world. But if you suddenly found yourself in an unfamiliar city, what kind of transport do you choose? The first you need to know about public transport.

Public transport (also public transportation, public transit, or mass transit) is a shared passenger transportation service to be available for general public. Most modes of public transport run according to a scheduled timetable.

Urban public transport may be provided by one or more private transport operators or by a transit authority.

The best way to travel along a city is to walk. When you go on foot, you do not depend on any kind of transport. You can observe the beauty of the buildings and landscapes wandering along the streets, you can go anywhere you like. These are the advantages. But, of course, the disadvantages of foot walks are the time you spent while walking.

If you are short of time and you are in a hurry, it is better to take advantage of any means of public transport. If you live not far from the underground, it is better to use this mode of transport. First of all it's the fastest one. Underground trains run every 3 or 5 minutes. It is the most reliable type of transport and it will never let down.

With trams, trolley-buses and buses, there are lots of things that may interfere with their normal operations. As for the fare, it's a little more expensive than trams and trolley-buses but cheaper than most buses and shuttle minibuses (route taxis). The only problem with the underground that it does not cover the whole city. But every metro station has good trolley-bus, bus and shuttle minibus connections.

You can also travel along the city by car if you have one. But the traffic in most cities is very heavy, especially during the rush hours. There are a lot of traffic jams on the roads, so it is more convenient to go by underground.

If you want to reach the place of destination without any problems and in a short period of time you can order a taxi by telephone. But bear in mind that it can be rather expensive.

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RED DWARF STARS AND THEIR EXOPLANETS

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Summary: The paper deals with studying such types of the stars on the main sequence as red dwarfs and their characteristics. Theoretical model of exoplanets i.e. planets with surface conditions similar to those of Earth has been presented. As a result of the study, it has been concluded that planetary systems of red dwarfs are possibly the best place for creation of the planets which can develop and sustain life.

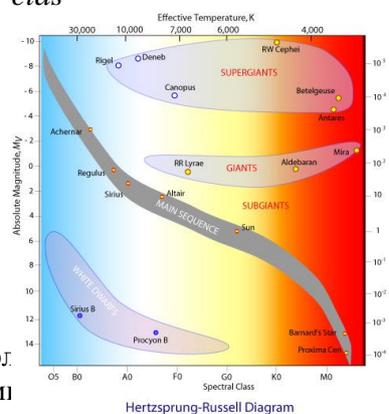
Key words: convectivity, exoplanet, flares, red dwarf, tidal locking, super-earth.

Анотація: Стаття присвячена розгляду таких типів зірок головної послідовності, як червоні карлики та їх властивостей. Надане теоретичне зображення екзопланет – планет з умовами на поверхні, схожими на земні. У результаті дослідження було зроблене допущення, що планетні системи червоних карликів є найбільш вірогідним місцем для утворення планет з придатними для життя умовами.

Ключові слова: екзопланета, конвективність, надземля, приливний захват, спалахи, червоні карлики.

Анотація: Стаття посвящена изучению таких типов звёзд главной последовательности, как красные карлики, их свойств. Представлено теоретическое изображение экзопланет – планет с условиями на поверхности, схожими на земные. По результатам исследования был сделан вывод, что лучшим местом для образования планет с

Fig.1. Stars clas



планетные системы красных карл. пригодными для жизни условиями

Ключевые слова: вспышки, конвективность, красные карлики, приливной захват, суперземля, экзопланета.

Red dwarfs, spectral class from M0 to M9 (Fig.1), are the most frequent and most inconspicuous stars in the universe. Red dwarfs have between eight percent and the half of the mass of the Sun. The low masses of the stars cause the nuclear fusion reactions at their cores to proceed exceedingly slowly, giving them luminosities ranging from a maximum of roughly 3 percent of that of the Sun to a minimum of just 0.01 percent [1, p. 94].

Red dwarfs have lifespan which greatly exceeds that of the universe. The fact above makes it clear why they are so numerous. In groups of new born stars they haven't got such distribution. These types of stars aren't quiet on their surface. There are often eruptions, the so called flares. Flaring is provided by the convective nature of M-class star. Plasma convection allows creating powerful magnetic fields which can recombine with each other in the convective zone of the star. This physical phenomenon releases enormous quantities of energy,

which is represented by intensive UV-radiation and dense star wind. A lot of young red dwarfs are flare stars with frequent and heavy eruptions, increasing their brightness enormously, it only takes a few minutes for a flare to reach peak brightness, it emits up to 10000 times more ultraviolet compared to the Sun. More than one flare can occur at a time. Intensity of flares can diminish in limits from one hour to a few days.

After a few billion years, the rotation of the star slows down so much that the conditions in the convective zone become more stable. In direct ratio it depends on star mass, the heavier star, the less period of flare activity will occur. Besides, this period can be reduced by presence of a satellite star. Tidal forces created by a companion star will reduce the rotation speed.

Due to all these factors, a theoretical exoplanet is able to save its atmosphere and get favourable surface conditions for carbon forms of life. Usually the zone near the red dwarf star, where the water can be supported in liquid state, is approximately 40 million kilometers or 0.3 astronomical units. At such close distances, the planet could become tidally locked. A year on such a planet will equal about twenty days on the Earth.

This problem can be solved if the planet is an exomoon, orbiting the larger planet, or if it has a satellite with similar mass. These cases are uncommon in our galaxy and this planetary system has many other issues, which are not favourable for exoplanet. Therefore, we can assume that the tidal synchronization is the main characteristic of red dwarfs exoplanets.

Tidal locking to the host star is appropriate, causing the planet to rotate around its axis once for every revolution around the star; as a result, one side of the planet would eternally face the star and the other side would perpetually face away, creating great extremes of temperature. For many years, it was believed that life on such planets would be limited to a ring-like region known as the terminator i.e. zone where day meets night, where the star would always stay on the horizon. Due to differential heating, it was argued, a tidally locked planet would experience fierce winds blowing continually towards the night side with permanent torrential rain at the point directly facing the local star [2, p. 415].

Planets formed from a gas cloud with the star will have different sizes, ranging from massive gas giants, like Jupiter, to the smallest like Pluto. Size, mass and composition of a planet are the most important characteristics that determine a planetary body, as a potential exoplanet. Gas giants can have the acceptable conditions, but absence of the solid surface and high gravity makes this planet difficult for colonization. Planets covered with water, so-called “oceanides”, also have problems, they are the following: absence of the solid surface, strong planetary storms, lack of natural resources, etc.

Small solid planets (M_{\oplus} (Earth mass) < 0.9) have a weak magnetic field. It becomes distorted under the solar wind of a parent star and it is not able to protect the planet from stellar plasma flows. Exposed to the ruthless radiation, the atmosphere starts to lose gases. The photolysis of water vapor and hydrogen escaped to space could lead to the loss of water on the planet, leaving a thick abiotic O₂ atmosphere [3, p. 119]. The conditions on such a planet would be unfavorable.

Heavier planets, up to M_{\oplus} (Earth mass) = 3, have more chances to be exoplanets due to a range of factors. Such a big planet is easy to detect with a transit method, which makes it accessible to analyze its properties. According to physical modeling, these massive bodies have higher geological activity. This activity is reasoned by planet largeness and high core temperature. The planetary interior will cool off considerably longer compared to an Earth-sized planet. Due to this fact, the powerful magnetic field will surround a planet longer, which allows the planet to save water resources from hostile environment of space and support comfort conditions on its surface.

To see how habitable tidally-locked planets really are, simulation has been calculated, using a computer model that comprehensively accounted for both atmospheric circulation and oceanic circulation and how they might influence each other on a planet orbiting a red dwarf about 5,660 degrees F (3,125 degrees C). The model used the same planetary parameters as those of an exoplanet called Gliese 581g located about 20 light years away, which may be the first known potentially habitable alien world – this world is a “super-Earth,” a rocky planet 1.5 times wider than Earth. The researchers assumed the planet would have a global ocean about 13,125 feet (4,000 meters) deep, the average depth of Earth’s oceans.

Because of the way ocean heat flows, the amount of open water on the day sides of these planets might be substantially larger than it was thought before. It also efficiently warms their night sides, preventing atmospheric collapse. If the starlight is bright enough or if there are sufficiently high levels of heat-trapping greenhouse gases such as carbon dioxide, ocean heat flow could actually lead to a complete lack of ice on the planet’s surface, even on the night side [4, p. 629].

As a result of the research, the conclusion is made that though red dwarfs differ from the Sun, planets with properties similar to those of Earth can orbit them. Their multitude and lifespan which greatly exceeds that of the Sun allows assuming that those planets can be habitable. This fact encourages researchers to develop new

methods of detecting stars and planets, which in the future will allow the mankind to explore the space and to settle in the worlds similar to ours, in the worlds situated at a distance of many light years away from Earth.

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REVIEW OF METAMATERIALS EXTRAORDINARY PROPERTIES AND NEW CHALLENGES

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Summary: Metamaterials are one of the promising areas of modern science. Due to their unusual properties, metamaterials allow to discover and to investigate new phenomena, never observed in nature. The main purpose of this work is to present the nature of certain phenomena, effects and their further applications using metamaterials. Active development of metamaterials leads to many new questions and challenges, further described in this work.

Key words: metamaterials, plasmonics, negative refraction, invisibility, cloaking, superlens, nanoantennas, photonic crystals.

Анотація: Метаматеріали є одним з найперспективнішим напрямків розвитку сучасної науки. Завдяки своїм незвичайним властивостям вони дозволяють відкривати та вивчати нові явища, які раніше не спостерігались у природі. Основною метою цієї роботи є опис сутності деяких явищ, їх ефектів та їх застосування за допомогою метаматеріалів. Активний розвиток метаматеріалів веде до значної кількості нових питань та випробувань, які викладені у цій роботі.

Ключові слова: метаматеріали, плазмоніка, негативне заломлення, невидимість, маскування, суперлінза, наноантени, фотонні кристали.

Аннотация: Метаматериалы – одно из перспективных направлений развития современной науки. Благодаря своим необычным свойствам они позволяют открывать и исследовать новые явления, ранее не обнаруженные в природе. Основной целью этой работы является описать характер некоторых явлений, их эффектов и их применение при помощи метаматериалов. Активное развитие метаматериалов приводит к большому количеству новых вопросов и вызовов, которые описаны в данной работе.

Ключевые слова: метаматериалы, плазмоника, отрицательное преломление, невидимость, маскировка, суперлинза, наноантенны, фотонные кристаллы.

Introduction

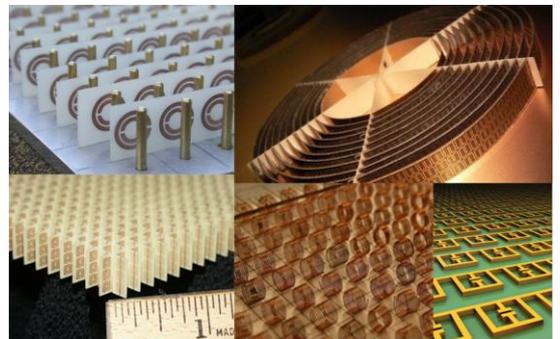
According to International Association «METAMORPHOSE VI AISBL» metamaterial is an array of artificial structural elements, designed to achieve advantageous and unusual properties, not found in nature. An important property of metamaterials is the ratio between the characteristic size (lattice constant) of structure a

and the wavelength of the incident radiation $\lambda : \frac{a}{\lambda} \ll 1$.

Fig. 1. Examples of typical metamaterials.

Negative refraction

All optical properties of materials are fully specified by the parameters permittivity ϵ and permeability μ , which can be generalized by introducing refractive index $n = \sqrt{\epsilon\mu}$. Standard materials have $n > 0$, but the concept



of metamaterials implies negative values of the refractive index $n < 0$. It leads to the phenomenon of negative refraction of light (Fig. 2). It is an important basis for other unusual properties of metamaterials and further discussion.

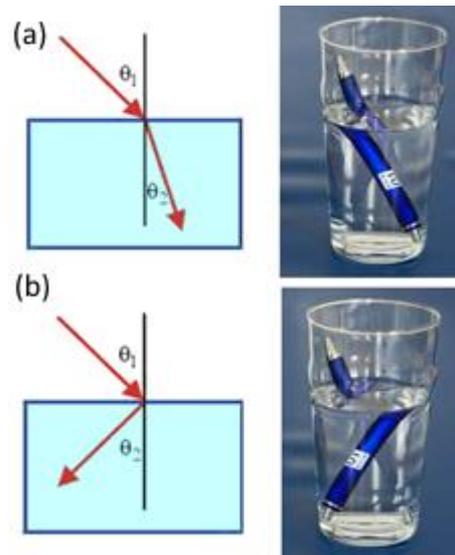


Fig. 2. Positive (a) and negative (b) refraction of light.

Historical overview

Negative refractive index materials were first theoretically described by Victor Veselago in 1967 [10]. But only in 1999 John Pendry identified a practical way to produce a metamaterial [4]. One year later David Smith with his team implemented it experimentally [9]. Furthermore, it provides the appearance of many new areas in science.



Fig. 3. Starting from left side Victor Veselago, John Pendry and David Smith.

Invisibility and cloaking

First suggested in 2006 [5] this topic remains the most popular and discussed in the media. Indeed, it is amazing! Metamaterials allow to cloak the object, i.e. to make it invisible. There is a wide range of possibilities to cloak the object [8], but the most promising are cloaking based on transformation optics and the method of cancellation of radiation using plasmonic coatings. First method allows bending the wave front of the incident electromagnetic radiation, in order to force rays to bend around the object and to take the initial direction on the output (Fig. 4). Besides, the optical path length of each ray in the shell should be the same as if it extended rectilinearly in the free space. It can be achieved by choosing the needed material parameters ϵ and μ .

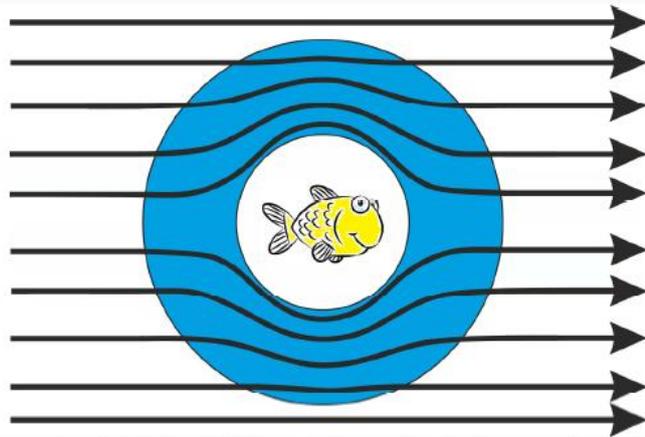


Fig. 4. Wave front bend is a principle of cloaking based on transformation optics.

Superlenses

All optical devices have the limits. The most fundamental limit is diffraction limit, which means the resolution of any optical imaging system is limited. However, we can expand the boundaries of this limit using metamaterials properties. Superlens can be represented as a slab of negative refractive index material (Fig. 5) [6] or wire medium [1]. It results to the transmission the information and amplification the image.

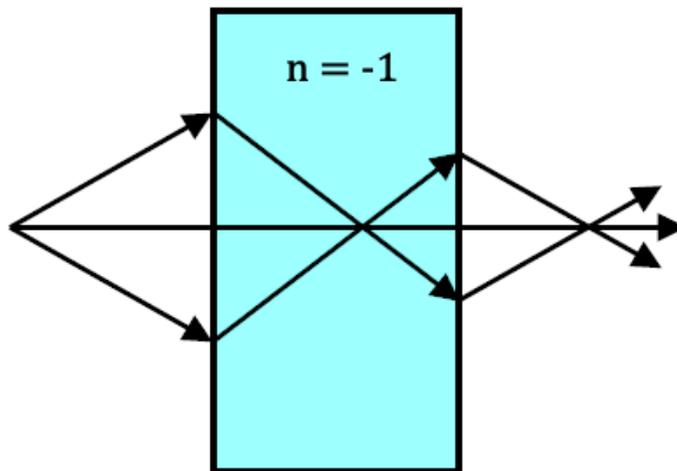


Fig. 5. Superlens based on negative refraction.

Waveguide

Photonic crystals are the materials that can be characterized by a periodic change of the refractive index in the spatial directions (Fig. 6a). Photonic crystals can be perfect waveguides on the bandgap's frequencies, if you create any defect in the photonic periodic structure. It is possible, because photons cannot propagate through the photonic crystal medium, but can propagate through defect. Moreover, you can guide the light using photonic waveguides. For example, you can rotate the light beam by 90° (Fig. 6b) [2]. Similar structure can be achieved using metamaterials.

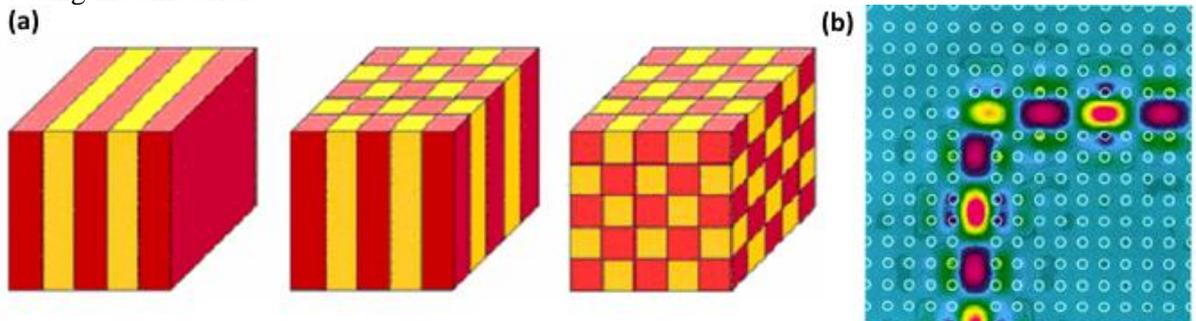


Fig. 6. (a) 1-D, 2-D and 3-D photonic crystals. (b) Photonic waveguide.

New challenges

Multiplicity of listed properties provides a lot of new questions and challenging problems. Moreover, it leads to new directions in other fields. For instance, dielectric nanoantennas improve solar radiation and, in this way, increase the efficiency of solar cells [3]. Recently, hyperbolic metamaterials were investigated. They exhibit distinctive properties, such as strong enhancement of spontaneous emission and enhanced superlensing effects [7]. These new directions already bring interesting and unique results. Nevertheless, experimental verification, commercialization and implementation in specific applications as well as in everyday life are serious challenges in the development of metamaterials. Although the experimental realization of current investigations is far from ideal, certain theoretical predictions were confirmed and implemented in the real applications.

Conclusions

Last years have showed the power of metamaterials. They provide unprecedented control over light. Due to the development of metamaterials new scientific directions have been revealed. However, many questions and challenges remain unresolved.

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УДК 656.025.4=111

MULTIMODAL TRANSPORTATION PROBLEM

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Summary: This paper studies a transportation problem in a multimodal network with shipment consolidation options. A freight forwarder can use a mix of flexible-time and scheduled transportation services. Time windows are a prominent aspect of the problem. For instance, they are used to model pickup and delivery time slots. Various features of the problem can be described as elements of a digraph and their integration leads to a holistic graph representation.

Keywords: multicommodity flow problem, multimodal transportation, time windows, transportation timetable.

Анотація: В статті розглядається транспортна проблема в мультимодальній мережі з варіантами консолідації вантажу. Експедитор може використовувати поєднання гнучкого часу і запланованих транспортних послуг. Час вікна є важливим аспектом проблеми. Наприклад, вони використовуються для моделювання пікап і часу доставки слота. Різні ознаки проблеми можуть описуватись як елементи орієнтованого графа, а їх інтеграція призводить до цілісного графічного відображення.

Ключові слова: мультимодальні перевезення, проблема багатотоварного потоку, розклад перевезень, часові вікна.

Аннотация. В статье рассматривается транспортная проблема в мультимодальной сети с вариантами консолидации груза. Экспедитор может использовать соединение гибкого времени и запланированных транспортных услуг. Время окна является важным аспектом проблемы. Например, они используются для моделирования пикап и времени доставки слота. Разные признаки проблемы могут

быть описаны как элементы ориентировочного графа и их интеграция приводит к целостному графическому представлению.

Ключевые слова: временные окна, мультимодальные перевозки, проблема многотоварного потока, расписание перевозок.

The problem considered in this paper is a multimodal transportation problem with flexible-time and scheduled services arising in the operations of a logistics company in Italy.

The practical problem is that of a freight forwarder serving a large customer that requires shipments from factories located in Central-North Italy to regional distribution platforms in Central-South Italy. The freight forwarder is a third part logistics provider that organizes the transportation of freight from origin to destination by acquiring capacity from carriers and assigning shipments to these carriers. Transport requests are continuously filled, and the operational plan consists in a two-week rolling horizon. A transport request is characterized by several attributes: origin, destination, volume, weight, type of goods, pickup and delivery time windows.

There are five train stations where loading can take place and four arrival stations where these full trains end. Once arrived at one of these four stations the shipment can be sent to its final destination by truck. Two of the four arrival stations offer the opportunity to re-route the shipment by rail to seven other train stations. This additional set of railway links has a cost structure similar to a dedicated service, i.e. there are no quantity discounts and the cost is per railcar.

The number of pallets of a transport order determines the number of requested railcars. A full train is characterized by a maximum length, hence the number of pallets has an impact on this constraint. However, a full train is needed to consider also the constraint on the maximum weight. There are full trains of 400 meters, and full trains up to 550 meters. The full train weight constraint ranges from 800 to 1200 metric tons.

There are then two types of rail services: full trains, eventually shared by more than one shipment, and railcars associated to a given order. These two options as consolidated (full train) and dedicated (railcars) rail services are denoted. Here the term “consolidated” refers to the possibility of sharing the transportation cost among more than one shipment, and “dedicated” indicates that this opportunity is not present or not exploited.

While the full train travel times are implicitly set by the timetables, the truck travel times are computed by taking into account an average travel speed and the rest hours of the drivers. The travel times of individual railcars are computed according to a formula that depends on the distance between the origin and destination train stations.

The problem faced by the forwarder is to satisfy customer demand through a minimum cost combination of rail and truck services, either consolidated or dedicated, and with different types of departure. The distribution network consists of origin (factory) and destination (distribution platform) nodes connected by roads and terminals (train stations) which are linked together by railways. Transportation alternatives resulting from combining modes and consolidation options:

1. dedicated origin-destination service by truck;
2. consolidated origin-destination service by truck;
3. consolidated service by truck to a loading train station; consolidation by full train to arrival station; final link to distribution platform;
4. as option three, but with an additional step before the last link: a dedicated rail service (by railcars) between two compatible train stations;
5. as option three, but with dedicated truck service between factory and loading train station;
6. dedicated truck service between factory and loading train station; consolidation by full train to intermediate station; dedicated rail service to arrival station; final link to distribution platform.

Crainic and Laporte extensively review the optimization models for freight transportation. A main distinction feature can be established between strategic-tactical and operational models that respectively consider a national or an international multimodal network, such as in the Service Network Design Problem [1] and the unimodal distribution management models that are variants of the Vehicle Routing Problem [2].

Macharis and Bontekoning propose a classification based on two criteria: the type of operator and the length of the problem’s time horizon. Four types of operators are distinguished: drayage operators, terminal managers, network planners, and intermodal operators. The time horizon criterion results in the classical differentiation of strategic, tactical, and operational levels. In this classification matrix of twelve categories, transport problems would correspond to operational problems faced by an intermodal operator, since the problem can be stated as the selection of routes and of services in a multimodal network [3].

Container based transportation is the key enabler of intermodalism because of various advantages like higher productivity during the transfers, less product damage, etc. Consequently, Crainic and Kim focus on the

container related aspects of the transportation industry. In particular, empty container repositioning and container terminal management problems are thoroughly discussed [4].

Barnhart and Ratliff introduce two models to determine a minimum cost route combining truck and rail services. The first model holds when the rail service has a per trailer cost, while in the second model the rail cost is per flatcar with a maximum of two trailers per flatcar. Time related constraints are added for trailer availability and maximum allowed delivery time. Under these hypotheses the minimum cost route for the first model is easily found by means of a shortest path algorithm, while for the second model a non-bipartite weighted matching procedure is applied [5].

Min studies an international intermodal supply chain. He presents a chance-constrained goal programming model to select the intermodal mix that minimizes costs and risks while satisfying on-time service requirements [6].

Ziliaskopoulos and Wardell present an algorithm for computing an optimal path in a multimodal network when travel and transfer times are dynamic. They also consider timetabled services. Their approach is aimed at realistic simulation of large networks both in freight and in passenger transportation [7].

Conclusions

A multimodal transportation problem combining several parameters such as timetables, flexible-time transportation, and consolidation options is described and formulated.

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ACM ICPC PROBLEMS AND SOLUTIONS

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Summary: This article deals with problems typical for ACM ICPC format. It can be concluded that this kind of problems requires deep math knowledge, understanding of various algorithms and ability to assess their difficulty and programming experience. The process of solving problems always requires creative and original approach.

Key words: algorithms, programming, problems, tutorials with solutions.

Анотація: Ця стаття розглядає завдань, типових для формату олімпіади ACM ICPC. Дослідження показали, що для успішного розв'язання задач необхідні глибокі математичні знання, розуміння різноманітних алгоритмів та спроможність оцінювання їх складності, а також досвід програмування. Процес вирішення задачі завжди потребує креативного та нестандартного підходу.

Ключові слова: алгоритми, задачі, програмування, розбирання розв'язку задач.

Аннотация: Эта статья рассматривает задачи, типичные для формата олимпиад ACM ICPC. Исследования показали, что для успешного решения задач такого типа необходимы глубокие математические знания, понимание различных алгоритмов и способность оценки их сложности, а также опыт программирования. Процесс решения задач требует креативного и нестандартного подхода.

Ключевые слова: алгоритмы, задачи, программирование, разбор решений.

The Association for Computing Machinery International Collegiate Programming Contest (abbreviated as ACM ICPC) is an annual programming contest for university teams from all over the world. This competition is conducted and sponsored mainly by computing giant IBM. It was first held at Texas University in 1970. In 1997 the finals were held during the ACM Computer Science Conference and the competition evolved into its present form as an annual programming contest. This is an activity of the ACM that provides college students with an opportunity to demonstrate their problem-solving and computing skills.

More than 2000 universities located in 80 countries worldwide participate in this technical event every year. The main aim of the contest is to provide students with a platform to sharpen their technical skills working as a team.

According to the rules, the teams are made up of three students who are enrolled for a degree program of any higher educational establishment. The contest lasts for 5 hours and within this period the teams have to solve 8-12 problems (depending on the level of the competition). The team, which solves most of the problems, wins.

Some of the typical ACM ICPC problems and their solutions are reviewed in the article.

Problem 1 There are n disjoint intervals on the coordinate line: interval i has coordinates $[l_i, r_i]$, $r_i < l_{i+1}$, for $1 \leq i \leq n-1$. There are also m «connectors» with lengths a_1, a_2, \dots, a_m . A connector can be placed between intervals number i and $(i+1)$, if there are coordinates x and y , which comply with the following requirements: $l_i \leq x \leq r_i$, $l_{i+1} \leq y \leq r_{i+1}$ and $y-x = a_j$. It is necessary to decide, whether all intervals can be connected.

Solution: A connector can be placed between intervals i and $i+1$, if its length is equal or less than interval $[l_{i+1} - r_i, r_{i+1} - l_i]$. We will define two values for every 2 neighboring intervals: min_gap – length of the smallest possible connector ($l_{i+1} - r_i$), and max_gap – length of the biggest possible connector ($r_{i+1} - l_i$) – and store them in a table, that is going to have $(n-1)$ lines, sorted by values of min_gap in non-increasing order. Values of connectors' lengths are also going to be stored in another table in non-increasing order. For every gap between intervals i and $i+1$, we have to extract the largest connector's value that fits into range $[min_gap_i, max_gap_i]$. If such connector can be found for every gap, the solution exists, otherwise doesn't.

$$\sum_{i=1}^k c_i = n$$

Problem 2 There is a bag with n balls of k different colors (c_i balls of color i). All colors are enumerated from 1 to k . Balls of the same color are indistinguishable. Balls are taken out of bag until it is empty. Let us figure out how many ways there are to take out the last ball of color i earlier than a ball of color $(i+1)$.

Solution: Let us derive a recurrence formula to evaluate the amount of possible solutions. Let R_k be the amount of ways to solve this problem for k colors.

If $k=1$ (there is a single color and thus all balls are indistinguishable), then $R_1=1$. To evaluate R_{k+1} we need to put the last ball of color $(k+1)$ at the very end and all the other $c_{k+1}-1$ balls can be anywhere in the sequence.

The number of possible ways to place $c_{k+1}-1$ balls is $\binom{c_1 + c_2 + \dots + c_k - 1}{c_{k+1} - 1}$, we take away 1 ball from the total amount; since the last ball of color $(k+1)$ is always at the end of the sequence. With the help of this formula, we can evaluate the amount of possible solutions for n balls.

Problem 3 Imagine there was a sequence of n non-negative numbers (h_1, h_2, \dots, h_n) . For $1 \leq i \leq n-1$ the numbers satisfied the following condition: $|h_{i+1} - h_i| \leq 1$. Accidentally, some of them were eliminated from the sequence and only m remained unchanged (d_i – number of the position that was not changed, $1 \leq i \leq m$). The task is to figure out the greatest possible number that could be in the lost sequence if records were not misrepresented completely and stopped complying with the required condition.

Solution: Our task is to make the maximum possible value. If we rearrange the numbers of the sequence between positions d_i and d_{i+1} (according to the rule), it will not change other parts of the sequence, hence we can consider all parts separately.

Let us consider that $d_i=0$, $d_{i+1}=t$ (they can be increased or decreased simultaneously without affecting the answer), $h_{d_i}=a$ and $h_{d_{i+1}}=b$. In accordance with the given condition: $|a - b| \leq t$. If at least one pair of the given positions fails to hold this condition, we can conclude that records were misrepresented and it is impossible to solve this problem.

Otherwise, we can restore our sequence by the following rule: we are going to move between positions d_i and d_{i+1} starting from d_i , whose value is equal to a . On every step we are going to assign the current position (d_i+j , $1 \leq j \leq t$) to the incremented (if $a < b$) or decremented (if $a > b$) value of the previous position. If at some point the value is going to become equal to b , all the other cells are going to be assigned to b .

This solution will not be optimal, but restored numbers will be compatible with the required inequality. Now let us try to construct the optimal sequence. For any i between 0 and t such inequalities are true: $h_i \leq a+i$ and $h_i \leq b+(t-i)$. To find the maximum value of the greatest possible number, we have to see where lines $(a+i)$ and $(b+(t-i))$ intersect and we will arrive to the formula $(t+a+b)/2$.

Problem 4 N bars of different weight are stored in a stack. Bar i has weight w_i , $1 \leq i \leq N$. To take bar x from the stack, you have to follow the steps described below:

- 1) You lift all the bars above bar x
- 2) You take bar x out of stack
- 3) You put down the lifted bars without changing their order
- 4) You put bar x on the top of the stack

The order of the bars is going to be changed, according to the described rules, m times $((b_1, b_2, \dots, b_m)$ - sequence of bar numbers, that have to be moved; one bar can be moved several times). On the step j ($1 \leq j \leq m$), bar b_j with weight w_{b_j} is to be moved to the top of the pile. It is necessary to rearrange bars in such a way, so that the weight lifted during transposition is minimal.

Solution: In order to minimize the weight to be lifted, we need to place bars, which are going to be transported later, closer to the top of the pile. Again this is a little confusing. Let us find the positions of the bars step by step.

In order to not lift any weight at the first step, we will place bar b_1 at the top of the pile. To minimize weight, that is going to be lifted at step 2 (for simplicity we consider that $b_2 \neq b_1$), we'll place bar b_2 immediately under the first one. We will use the same approach for the rest of the bars in the sequence.

Following this strategy, we can optimally set the order of the initial stack. If some bar has to be moved several times, we put it in the position where we first encountered it.

It is noteworthy that not all the bars are necessarily going to be transposed, and that is why their numbers are not going to be in the given sequence. Therefore, we will put them in the bottom of the stack.

Problem 5 N people are standing in a queue and each of them has a unique number ($k_i > 0$, $1 \leq i \leq N$). The people became bored waiting, and to entertain themselves each person writes down the number of a person who is placed immediately after him (A_i) and a person who is placed immediately before him (B_i) (A_i, B_i are stored in a table $N \times 2$). If none happens to be after or before a person, 0 is to be written down. The queue broke up then. Your task is to restore the initial order of people in the queue with the help of the numbers of their neighbors.

Solution: At first, we are going to assign the number to the person, who was standing in the beginning of the queue – k_1 . It is going to be a person with a number that we will be able to find among column B but will not be able to find among column A because no one was standing after him.

Now we can find a person, who was the second in the queue – number k_2 . Since we know that A_i of the first person is equal to 0, we find the corresponding line in the table and B_i from this line is k_2 .

After these two steps it is easy to find numbers of all other people, beginning from the third with help of the penultimate found number.

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FINITE-TIME SCOPE DECISION MAKING PROBLEMS IN LOGISTICS WITH MULTIPLE RANGE OF FACTORS

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Summary: The newsvendor's problem is applied to many problems in logistics in which the principal decision is the level of inventory which should be ordered to meet stochastic demand during a finite-time scope. This type of decision makes demand the central variable to be examined and since the time horizon is finite, there is a variable risk throughout the period. While the NVP formulation is applicable to many areas (e.g. retail business, service booking, investment in health-insurance, humanitarian aid), modeling and research into the factors affecting the demand and its uncertainty has been conducted mainly where the goal is to increase demand (e.g. price, rebate, substitutability). The main goal of this paper is to model demand and its uncertainty using other causally related, case-specific factors by applying Bayesian inference. An intuitive demand modeling tool within the newsvendor's problem framework where modeling uncertainty is of great importance and past demand data are scarce might be recommended to decision makers.

Key words: Bayesian, decision making, decision supply systems, logistics problems, newsvendor's problem.

Анотація: «Задача продавця газет» може бути застосована до багатьох задач логістики, в яких принциповим розв'язком є визначення рівня закупівлі, який має бути замовлений для задоволення

стохастичного попиту у масштабі обмеженого часу. Цей різновид рішення робить попит центральною змінною, яка має бути оцінена, і, оскільки зріз часу є обмеженим, існує мінливий ризик за відповідний період часу. Зважаючи на те, що «задача продавця газет» застосовується до різних галузей (наприклад, роздрібна торгівля, бронювання послуг, інвестування страхових внесків щодо охорони здоров'я, гуманітарної допомоги), було проведено моделювання та вивчення факторів, що впливають на попит і його невизначеність, головним чином, де метою є його збільшення (наприклад, вартості, знижок, взаємозамінності). Основна мета статті – моделювання попиту та його невизначеності з використанням інших у причинному відношенні, ситуативно специфічних факторів як гіпотез Байєса. У прийнятті рішення можна рекомендувати інтуїтивний інструмент моделювання попиту в рамках «задачі продавця газет», у якій невизначеність, що змодельована, є дуже важливою, а попередні дані щодо попиту є дефіцитними.

Ключові слова: гіпотези Байєса, «задача продавця газет», логістичні проблеми, системи підтримки прийняття рішень.

Анотація: «Задача продавця газет» может быть применена ко многим задачам логистики, в которых принципиальным решением является определение уровня закупок, которые требуется заказать для удовлетворения стохастического спроса в масштабе ограниченного времени. Эта разновидность решения делает спрос центральной переменной, подлежащей оценке, и, поскольку срез времени ограничен, существует изменчивый риск за соответствующий период времени. Несмотря на то, что «задачу продавця газет» можно применять к различным отраслям (например, розничная торговля, бронирование услуг, инвестирования страховых взносов по здравоохранению, гуманитарной помощи), было проведено моделирование и изучение факторов, влияющих на спрос и его неопределенность, главным образом, где целью является его увеличение (например, стоимости, скидок, взаимозаменяемости). Основная цель статьи - моделирование спроса и его неопределенности с использованием других в причинном отношении, ситуативно специфических факторов как гипотез Байеса. В принятии решения можно рекомендовать интуитивный инструмент моделирования спроса в рамках «задачи продавця газет», в которой смоделированная неопределенность обладает крайней важностью, а предварительные данные по спросу являются дефицитными.

Ключевые слова: гипотезы Байеса, «задача продавця газет», задачи принятия решений, логистические проблемы, системы поддержки принятия решений.

The newsvendor problem (also commonly known as the newsboy or single period problem) is one of the classical problems in operations management. The main question that it seeks to answer is how much of one or more types of commodity a "newsvendor" should order, as an effort to deal with some unknown/uncertain and, in some cases, even risky future demand, given that the time horizon that he/she expects demand for is finite. If the newsvendor orders too much, the left-over items are usually assumed to have low or even zero residual value, while if the newsvendor orders too little, there is an opportunity cost associated with lost sales. Even though its name seems to limit its applicability to the case of a professional newspaper salesman under the dilemma of how many papers to order for the following day, its area of application is much wider and the lost sales component may be replaced, for example, with a more general shortage penalty. A list of existing and possible future areas of application includes the following:

1. Seasonal/fashion goods;
2. Advanced booking in services such as hotels, airplanes etc;
3. Amount of insurance money to invest for health etc;
4. Selecting spare parts for a product at the end of its production life, i.e. before it becomes obsolete;
5. Deciding on the water reservoir level on an island that is isolated and waits for replenishment for the summer period;
6. Large military operations "Last Order", i.e. how much to order when a decision to withdraw from an operation has been taken;
7. Humanitarian aid in multiple places that have suffered disasters;
8. The load of a shipment within a supply chain;
9. The "hedge contracts" that energy providers use in order to insure against the risk of unknown demand.

Demand is the main problem for the newsvendor. He/she has to predict or even affect its value in order to be able to optimize his/her set objectives. In the classical infinite-horizon inventory systems in which demand needs to be modeled like the continuous review, or the periodic review ones, the length of the risk period is more or less controllable by the manager. This risk period is considered as the period during which the decision maker wants the amount on hand and the amount ordered to be enough so that the commodity does not run-

out until the arrival of that next order. It is a period of risk because during that, any demand fluctuations cannot be faced immediately by a new arrival but by only just hoping that what is on hand and what is expected to arrive soon will be able to cope with these fluctuations. Functions have been used to model and investigate the dependency of demand on other variables, mainly the price, but also:

1. Prices set either by the newsvendor or his/her supplier;
2. Rebate;
3. Lead-time that affects the customer's level of satisfaction;
4. Space presented to the customer, thus affecting his perception of product availability;
5. Quality;
6. Advertising.

An important point regarding demand distributions has been raised by Sherbrooke (2004) in which he observes that the mean demand is "drifting" with time. The factors in each case that cause/impose this drift can be analyzed through engineering breakdown approaches using Subject Matter Experts' (SME) opinions. Consequently, there is an inherent gap in the approaches that use just probability distributions since they define them by the use of past data only. The same issue seems to exist in the use of uncertainty theory and fuzzy logic. Vairaktarakis (2000) in his use of scenarios asks the SMEs to consider the factors that define the values which demand can take but fails to account for the relative strengths of their effects and also prompts them to exclude very rare values of demand unless they want to hedge for them. On the other hand, Bayesian inference models consider this drift effect but need fresh data on demand itself to do that, something that is rarely available in many of the newsvendor-type problems. Of all the previously discussed modeling approaches, only the functional ones take into consideration the main factors that define the context within which demand is considered. However, they also fail to adequately model the uncertainty and its effect on decision making which is of vital importance to newsvendor-type decisions. Furthermore, in order to work they need sufficient data which is available mainly in market related applications but not in other areas within the newsvendor spectrum of problems. What is suggested is to combine the consideration of demand uncertainty and the demand-defining context formed by causal factors, which are likely to take uncertain values as well. A natural way of doing this is to form a joint probability distribution of all the relevant variables. The modern probabilistic framework of Bayesian Networks (BNs) provides an efficient way of representing, building and manipulating such a distribution in order to perform inference of various types. Furthermore, one can believe that its application to newsvendor type problems is novel.

A BN is a directed acyclic graph (DAG) in which the nodes correspond to variables of interest in the modeled domain and arcs correspond to direct probabilistic dependencies. Absence of an arc between two nodes does not necessarily imply that they are completely independent but that dependence might be mediated by another variable, for example. It does imply that they are at least conditionally independent under some conditions.

Considering the case referred to in the introduction as military operations' "Last Order", suppose that the demand for a certain support item is expected to be directly affected by the following variables:

- "Equipment usage";
- "Operating hours";
- "Equipment losses".

In addition other variables will have an indirect effect and be included in the BN to make the model more complete and the probability distributions easier to specify and obtain from either data or SMEs.

It is obvious that the different values of these variables form different contexts within which demand can again take different distributions of values. Combining the likely demand distributions conditioned on the influencing variables with the prior distributions of the influencing variables themselves provides a coherent approach to modeling the demand. It also allows for the inclusion of related forecast variables in a straightforward fashion, e.g. relevant environmental forecasts such as temperature. The distinction between the forecast temperature which is known and the actual realized temperature which will be unknown when the order is placed is important in this type of model. As well as allowing the demand distribution to be updated when a new forecast is made, questions about the value of buying improved forecast information can also be addressed. Based on the above example, a BN model could have the form shown in Fig.1.

A more practical and intuitive approach for managers is suggested and has been successfully applied by Sherbrooke and Cohen. Through this approach future demand is initially estimated using a candidate demand model. The predictions are used in the inventory system to calculate the suggested level of spares. Then the actual demand which is known from past data (kept for the validation of the models) is used to calculate the attained availability through simulation. The best demand model is the one which gives the optimum measure of system performance when real data are used, thus, the measure of goodness of fit relates to the manager's

objective itself. Furthermore, Sherbrooke also used as a complementary measure the estimated availability that the spares calculation model gave and then compared it to the “true”/attained availability to see if it was an optimistic estimate or not. Therefore, following this suggestion the following two measures of goodness of fit are suggested for research on practical cases:

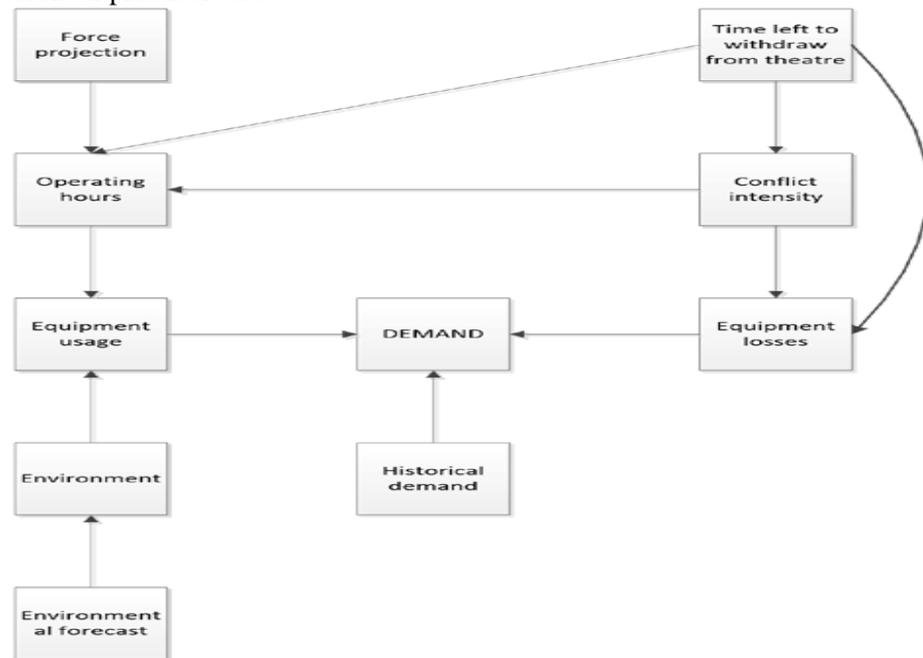


Fig.1. Example of the Bayesian Network used to estimate demand and thus facilitate decision making in military operations “Last Order” as a newsvendor-type problem.

1. The actual result that would be attained using the suggested method of modeling the demand within the context of each specific application of the model;
2. The predicted optimum estimate.

The newsvendor framework is applicable to a very wide problem spectrum. One of the major difficulties that its application poses is that compared to other infinite-time horizon management policies, consideration of demand uncertainty is of supreme importance to decision making. The traditional ways of modeling this demand have been outlined and some of the issues surrounding it discussed. In this paper, the use of Bayesian networks to model demand in newsvendor type problems has been proposed. This framework naturally permits consideration of a wider set of context-defining variables or factors which influence the demand. The usefulness of the BN approach is also enhanced in cases where little past demand data exists and decisions need to be taken by considering the relationship of demand with these context-defining variables. Furthermore, in order to develop a BN, close cooperation of the analyst with the manager/SME is of fundamental importance in the procedure and therefore the validation approach has to be in accord with the decision maker’s intuition. That is why the BN applications will be validated using practical approaches and measures of merit such as the ones suggested by Shrebrooke and Cohen et al that relate to the real effectiveness concerns of the decision makers.

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