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QUANTUM-CHEMICAL RESEARCH OF GLYCYRRHIZIC ACID

A clear understanding of the mechanisms of therapeutic action of drugs at the molecular level is one of the important tasks of biochemistry and medical chemistry, since understanding the processes of binding and dissociation of ligand-receptor complexes allows identifying the mechanism of action of drugs and minimizing side effects for the body. To date, the processes of self-association have not been sufficiently studied, namely, the lack of a clear understanding of the mechanism of binding of drugs to the receptor, unknown data on the transformation of the complex at the active centre, which causes its dissociation. One of the classes of such biologically active substances is adjuvant substances, namely saponins, the selectivity of which is capable of forming associates with molecules of other substances [1]. Such properties of saponins can be applied today to search for new drugs with specified characteristics based on complexes of the system "uronant polysaccharides" [2]. One of such uronant polysaccharides may be glycyrrhizic acid. Glycyrrhizic acid is found in licorice (licorice) roots. It is used as a food sweetener and as a medicine in the composition of licorice preparations (*Fig. 1*).

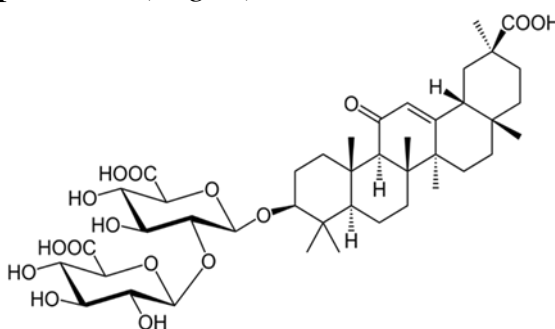


Figure 1. The structural formula of glycyrrhizic acid

The purpose of this work was to conduct quantum chemical calculations to predict the geometry and properties of glycyrrhizic acid associates. The calculations were performed using the Gaussian-09 software package and semiempirical PM3 method. The choice of this method is due to the size of the study associates. Graphic representations of molecular structures are presented in *figs. 2*, were obtained using the Chemcraft program, where the calculated data were used as the source data.

As the calculations showed, the biomolecular system ($n = 2$) forms stable structures **1-3**, which are stabilized by the hydrogen bonding system of the O-H-O bonds. The characteristics of these structures are shown in *fig. 2*, which shows the shortest bond lengths the smallest bonds between glycyrrhizic acid molecules. Complex **1** is of the head-to-head type, and complexes **2, 3** have the head-tail structure. The calculations showed that the most stable are associates **2, 3**, the complexation energy of which is 15-16 kcal / mol, which relates to the model of stabilization of dimeric associates of glycyrrhizic acid by type "head-tail". It should also be noted that the most energy-resistant biomolecular associates is structure **3** - capable of including different guest molecules.

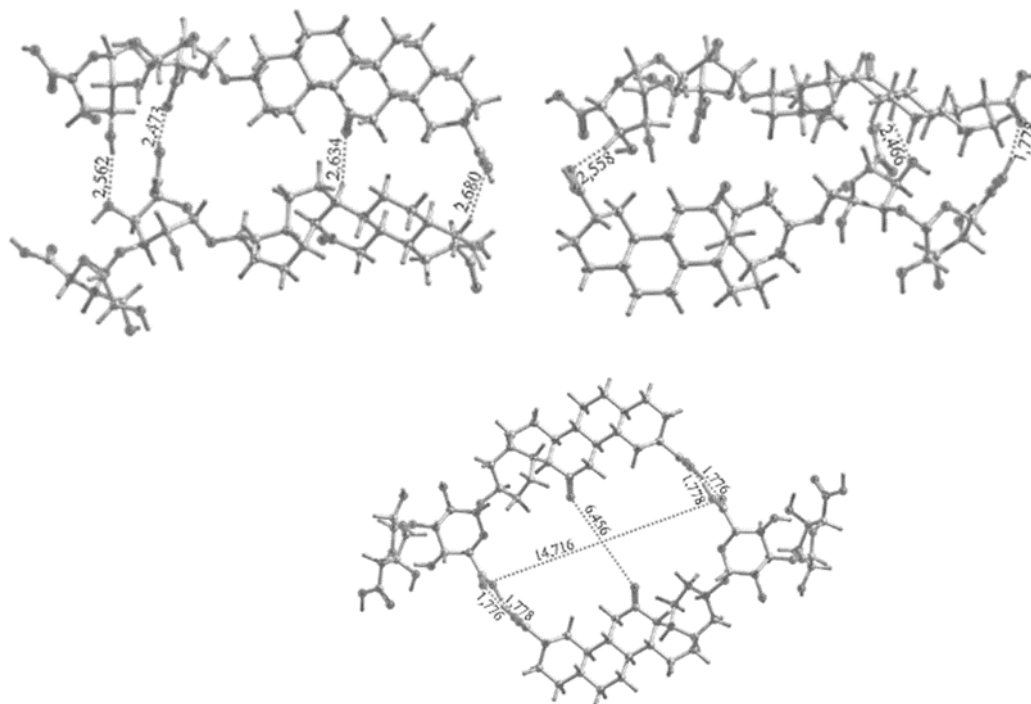


Figure 2. Geometric structure of bimolecular glycyrrhizic acid complexes according to the semiempirical PM3 calculation

There fore, quantum chemical calculations have shown that stable isomers of glycyrrhizic acid for clusters of the general type X_n can be obtained up to $n = 3$. Based on these calculations, the most stable are the clusters that have a head-tail structure that matches the model for the formation of dimeric acid associates. In this case, the self-associate of glycyrrhizic acid from two bent saponin molecules forms a cavity between them, which can be used to include guest molecules.

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CHANGE IN THE PROPERTIES OF PHYTOPATHOGENIC BACTERIA AS A RESULT OF ITS VARIABILITY

In living nature, the processes of heredity and variability always alternate. Heredity is the transfer of traits from generation to generation, and variability is the property of acquiring traits that distinguish them from their parental individuals [1].

Hereditary variations that arise in the genetic apparatus and are irreversible are very important. They are most easily observed in bacterial cells due to their greater ductility and reproduction rate. For example, enzymatic, pathogenic, antigenic properties can change, etc. They can be both positive and negative for a human and his activity. Therefore, today it's important to study the changing characteristics of the bacteria [2,3].

The aim: to study the biological properties of the phytopathogenic culture and compare them with the properties given in the Bergey identifier.

Object of study: the strain of phytopathogenic bacteria isolated from the affected sample of the fig.

To complete the study, the following tasks were set:

- isolation of the bacteria from the featus;
- identification of the bacterial strain;
- comparison of the characteristics of the obtained culture with those described in the identifier of bacteria.

Strains used in this study were isolated from a fig from the supermarket of Dnipro. The culture was isolated and plated on meat peptone agar.

To identify the strain, we studied its morphological (bacterial cell structure, cell shape), cultural (color, surface, shape, colony consistency) and physiological and biochemical properties (the motility, the ability to break down carbohydrates and alcohols - glucose, fructose, galactose, arabinose, sucrose, sorbitol, mannitol, glycerin, starch, lactose, ethanol, L-rhamnose and mannose; the release of indole and hydrogen sulfide; the utilization of citrate, mallonate and phenylalanine; the accumulation of acetoin; the growth at different temperatures and enzymatic properties - the production of gelatinase, catalase, lipase, lecithinase, amylase, oxidase, and nitrate reductase).

Based on the tests obtained, the strain was identified by the Bergey determinant [4]. It is established that this culture is *Erwinia persicinus*. Two deviations from the classical characteristics of this strain were found: the ability to hydrolyze gelatin (production of gelatinase) and lipids (lipase). The presence of these enzymes indicates the emergence of new pathogenicity factors in this type of bacterium, which proves the mutation of the strain.

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THE ADAPTATION OF MARBLE CRAYFISH PROCAMBARUS VIRGINALIS (LYCO, 2017) (DECAPODA)

Nowadays there is a particular interest to the study of the adaptation possibilities of new hydrobionts, which first appear in reservoirs with constant environmental regime [1, 2]. At the same time the process of adaptation occurring at the biochemical and cellular levels creates the prerequisites for the survival of invasive species population. In the connection with the fact that the marble crayfish *Procambarus virginalis* (Lyco, 2017) is highly invasive and able to reproduce parthenogenetically, it became necessary to investigate the possibility of its adaptation to ecological conditions of reservoirs with the aim of further forecasting of its distribution or even acclimatization [3].

The material of present work is the species of marble crayfish *P. virginalis* (Lyco, 2017) which were kept in laboratory conditions on the basis SRL of hydrobiology, hydrobiology and radiobiology SRI DNU. All experimental marble crayfish were obtained parthenogenatically from one species. The adaptive capacity of marble crayfish to the influence of heavy metals was investigated under modulated conditions ($Zn^{2+} - 0,1mg/l$ (10LPC), $Cd^{2+} - 0,01mg/l$ (2LPC), $Mn^{2+} - 0,02mg/l$ (2LPC), $Ni^{2+} - 0,04mg/l$ (4LPC), $Pb^{2+} - 0,15mg/l$ (1,5LPC)). The statistical processing of data was performed according to the generally accepted methods with the help of software package Statistica 8.0 (StatSoft Inc, USA), the credibility of the differences among the selected data was determined using the single-factor dispersion analysis ANOVA at the level of significance $p<0,05$, $p<0,01$, $p<0,001$ [1].

The concentrations of heavy metal ions were modelled to influence crayfish survival. The highest percentage of deaths was observed in cadmium (27,3%) and nickel (60%) experiments. No significant changes in lineal measures of crayfish were observed in the control and experiments under the influence of heavy metal ions. The

negative effects on crustacean weight were observed in experiments with ions Ni^2 and Cd^2 weight loss on average by 3,3% and decrease in the growth rate by 11,2%.

The heavy metals affect the physiological state of hydrobionts, which is reflected in its tissues and organs. Therefore, histological examination of tissues and organs can be used as biological markers of identification the negative effects of toxicants [1]. The cells of antennal gland of marble crayfish in the control reached the size $166,1 \pm 12,14 \text{ mkm}^2$. The granulocytes had clear edges of cells, defined structure of ducts, clear basal membrane. The major nuclei of the glandular cells in cross-section reached the size $51,3 \pm 2,34 \text{ mkm}^2$. Under the effect of zinc the green gland cells of marble crayfish had a clear organization, distinct membrane, holistic nuclei and nucleoli. The cross-section area of the granulocytes was $148,8 \pm 98,12 \text{ mkm}^2$. The nucleus of the cell occupied approximately 26,1– 29,2% and reached the size $39,2 \pm 4,21 \text{ mkm}^2$. Compared to the control of statistically reliable difference among cell sizes was not observed, however, the size of the green gland nuclei under the influence of zinc ions was by 23,4% smaller than the control. The worst histological findings for the antennal gland cells were observed in species, which were under the influence of cadmium ions. The structure of the excretory ducts of the green gland was destroyed; the ducts contained a large number of granulocyte cytoplasmic fragments, and had indistinct boundaries. The processes of nucleus pycnosis as well as the exit of the nucleolus beyond the nucleus - the emergence of micronuclei were observed in some cells. This phenomenon is explained by the toxicological effects of cadmium. In comparison with the control, the glandular cells of the antennal gland were by 14.8% smaller. The glandular cell nuclei were also credibly lower by 17.5% than the control indicators. In the experiment and control, the magnitude of nuclear-cytoplasmic ratio of glondulocytes was not statistically different and fluctuated within the range of 0.29 to 0.31 units, indicating a mutually proportional decrease in the cytoplasm of green gland cells and in their nuclei, which was caused by the influence of heavy metals. In the control the lobule area of the cross-section of the hepatopaneas was $3855,9 \pm 45,01 \text{ mkm}^2$ with the lumen $1154.4 \pm 56.83 \text{ mkm}^2$. While the structural elements of hepatopaneas were increased in 1,2 times in the zinc experiment, in the cadmium experiment the structural elements of the study material were the biggest – they increased in 1,5 times. Also it was noted a significant increase in the cross section area of the hepatopaneas lumen of marble crayfish for tissues that were affected by zinc and cadmium ions. In the manganese and lead experiments, hepatopaneas lobules were by 14.79% and 2.89% smaller, respectively. Besides it was pointed out for all crustaceans from the experiments with manganese and lead, a significant decrease in the cross-sectional area of the lumen of hepatopaneas by 38, 79% and 43, 85%, respectively. The research of hepatopaneas of marble cancers have shown the significant changes in the histological structure of

the tissue. Heavy metals have influenced on the shape of the hepatopancreas lobules and on the size of the lumen of the gland. Zinc and cadmium ions caused the deformation in the glandular section of the gland and excretory ducts. Adipocyte sizes varied over a wide range from 215 mkm² to 2178 mkm² reaching on average 872-994 mkm². It was noted for the experimental groups with nickel and manganese the significant decrease of cell area 2.1 times and 2.8 times, respectively. It was observed the increasing of adipocyte area 1,31times in experiments with lead. For other metals no significant differences between the size of a cells affected by heavy metals were identified.

Thus, the conducted researches point to the wide range of adaptive capabilities of marble crayfish to the factors of the aquatic environment that allows the species to adapt to new living conditions and to expand their range in the continental water bodies.

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COUNTERFLOW EXCHANGE. PHYSICAL INTERPRETATION AND MANIFESTATION IN ANIMAL BIOLOGY

Countercurrent exchange is the flow of liquids (gases, solid powders, etc.) along two circuits that have a common wall (in the case of a substance, a semipermeable membrane) for the exchange of matter and / or heat, the directions of particle motion in which are antiparallel, and the most hot (cold) / concentrated (diluted) centers are at opposite ends. This type of flow is notable for maintaining a constant temperature difference and / or concentration between the tubes (gradient) over the entire length, and in each individual one it slowly increases. In other words, the exchange takes place at each point and its quantity is constant in magnitude, because the most remote in value parameters in the current are naturally aligned [1].

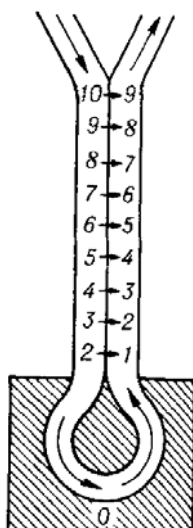


Figure 1. Scheme of countercurrent heat exchange, where the warmest fluid flows from above and the coldest flows up from the loop. The constancy of the gradient is shown by a temperature difference of 1 degree over the entire length of the tube between the contours and on each individually.

It should be noted that for maximum heat transfer, the average specific heat capacity and mass flow rate should be the same for each flow.

The phenomenon described above is not a physical abstraction or exists only under artificially created conditions, but is widely used in nature.

Birds and mammals (which is a human being), when interacting with a cold environment, transfer heat from arterial blood to venous blood, which “returns” from the limb, via countercurrent exchange (see Fig. 1). This allows the animals to be in contact with a lower ambient temperature for a long time without significant loss of body heat [3].

The same mechanism is used by mammals to lower testicular temperature, increasing their productivity. It involves *Plexus pampiniformis* – a network of many small veins found in the male spermatic cord.

Sea and desert birds have a salt gland. Its main function is to concentrate the salts from the blood in their secrets and remove them through the nostrils [4]. Without access to fresh water, seabirds, such as pelicans, petrels, albatrosses, seagulls and terns, can use seawater for their needs. Similar gland was also found in Nabi ostriches and other desert birds, where the increase in salt concentration determines dehydration and lack of drinking water.

The “wonderful net”, the so-called *rete mirabile*, is a complex of arteries and veins located very close to each other in the neck of dogs protects the brain when the animal’s body overheats during hunting [2, 5]. Venous blood is cooled by inhalation before entering this network. A similar network has been found in other mammals, such as sheep and giraffes.

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RESEARCH OF CHEMISTRY IN MODERN CONDITIONS

First of all, I want to say, that since the middle of the 20th century fundamental changes have been taking place in chemical research methods, which involve a wide arsenal of physics and mathematics. The classical problems of chemistry — the determination of the composition and structure of substances — are being increasingly successfully solved using the latest physical methods [5]. An integral feature of theoretical and experimental chemistry was the use of the latest high-speed computational technologies for quantum-chemical calculations, the identification of kinetic laws, the processing of spectroscopic data, and the calculation of the structure and properties of complex molecules.

I think that chemistry is a progressive science nowadays. Today it is developing in such directions:

- Cosmochemistry. Cosmochemistry studies are primarily informative, but it cannot be ruled out that in the future they will gain practical importance. Some important practical results were obtained. For the chemical-pharmaceutical industry, the more intensive development of bacterial cultures in zero gravity is of more practical interest than on Earth [4]. Metallurgists can obtain alloys with unique properties in zero gravity. The growth of the space of defect-free single crystals, especially metal oxides, is very promising;

- Obtaining new chemical elements;

- Plasma chemistry. Plasma chemistry allows the synthesis of metal concrete, in which steel, cast iron and aluminum are used as binders. Metal concrete is formed during the fusion of rock particles with metal and is superior in strength to ordinary concrete: compressive - 10 times and tensile - 100 times [3].

To tell the truth, a plasma-chemical method for converting coal into liquid fuel without the use of high pressures and the emission of ash and sulfur has been developed.

- Research on nanotechnology in agriculture is still ongoing. Advantages and risks of nanoscale chemistry have been analyzed. Of course, no one expects that nanotechnology will solve all the problems of agriculture, but they will undoubtedly help to increase yields, while reducing environmental damage.

- Modern chemical technology has played an important role in the creation of materials for optical devices for switching, amplifying and storing optical signals. Optical devices operate on a new time scale for processing light signals. For example, an optical switch triggers in one millionth of a millionth of a second [1, p. 188].

Actually, modern optical devices use lithium niobate and gallium aluminum arsenide. Organic stereoisomers, liquid crystals, and polyacetylenes have better optical properties than lithium niobate and are very promising materials for new optical devices.

Finally, the creation of a reliable theoretical foundation has led to a significant increase in the ability to predict the properties of substances. Modern chemistry is impossible without the widespread use of the physical and mathematical apparatus and various calculation methods. The predictive capabilities of chemistry extend not only to the properties of a substance, the main quantitative characteristics of which can often be calculated before experiment, but also to the conditions for the synthesis of this substance.

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Features of brain bioelectric activity in high-frequency range at the use of ordinary and mnemonic methods for memorizing English words

Information is the most important resource in modern world. There is much research conducted every day, so we get more new information. Consequently, ability to study something is very valuable. Mnemonics is a method that is based on creation of associations. It makes memorizing easier, faster and more qualitative. That's why

mnemonics is very useful in studying process. Mnemonics has been known as an effective way to study since ancient time, but we still do not know how it works. This method has been studied only in the psychological aspect, while physiology is unknown. It does not allow full introducing mnemonics in educational process, so such research is relevant.

For research, 11 female-students of 18-20, with visual way of thinking were chosen. Mnemonic remembering was implemented in the following way: we offered a student a visual association for a word, that she had to learn (usually connected with her native language). For analyzing brain's activity, we chose spectral power and coherence. SP shows how brain's activity differs after task changing. The changes between open eyes (control), ordinary and mnemonic remembering were analyzed.

In alpha-range, we observed a decrease in SP between thought-states and control. The last picture shows that associations provoke activation of left and prefrontal zones of both hemispheres (Fig. 1). There is a decrease in SP in central zones between two remembering and control states in beta1-range. Between two thinking states there is no difference (Fig. 2). There is a decrease in the central zones of the left hemisphere between mnemonics and opened eyes. Also it is activity in locus T6 between two ways of remembering (fig. 3).

It is well-known that alpha-activity relates to visual thinking and imagination, so alpha-rhythm is blocked, because of working with visual image [3]. According to our data, alpha-activity decreases during memorizing foreign words using the ordinary mnemonic method that displays process of mental activity.

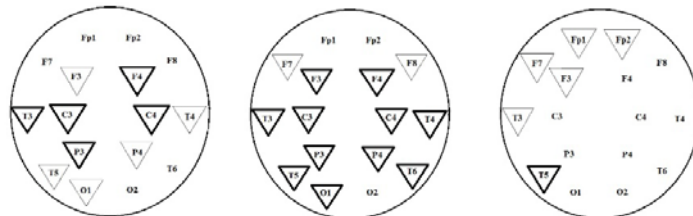


Figure 1. Areas of authentic exchanges of spectral power in alpha-diapason during ordinary memorizing of English words compared with open-eyes memorizing, mnemonics-opened eyes, mnemonics-ordinary memorizing.

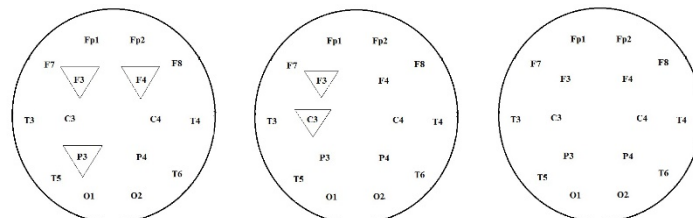


Figure 2. Areas of authentic exchanges of spectral power in beta1-diapason during ordinary memorizing English words compared with open-eyes method, mnemonics-opened eyes, mnemonics-ordinary remembering.

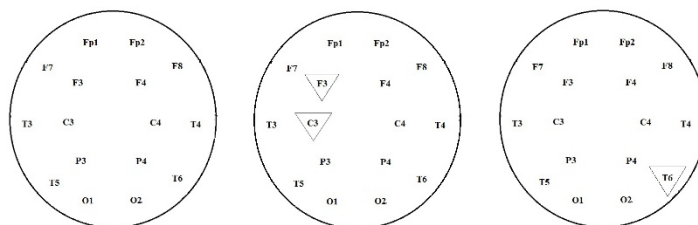


Figure 3. Areas of authentic exchanges of spectral power in beta2-diapason during ordinary memorizing English words compared with opened-eyes method, mnemonics-opened eyes, mnemonics-ordinary remembering.

The studies [1, 2] show that increasing power at low beta1-diapason in parietal and temporal zones of brain is connected with intensification of efforts that are required to keep focusing on a task. In this research we have not observed an increase in spectral power in beta1-diapason, so we can suppose that memorizing new English words with proposed methods does not require intensive attention.

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MICROALGAE — BIOFERTILIZER, GROWTH STIMULANT AND PRODUCTIVITY OF LAND

Microalgae are a large group of photosynthetic organisms that include cyanobacteria, diatoms, unicellular greens and some other species of algae. They can produce a number of useful products: fats, proteins, carbohydrates, dyes, biologically active compounds, etc. The particular interest is the use of microalgae as organisms capable of storing solar energy through photosynthesis, because the efficiency of energy conversion by microalgae is much higher than that of higher plants [2].

Microalgae are powerful producers of vitamins, micro- and macro-elements, and amino acids. What is important: all of them are in the form that is most easily absorbed by plants.

The vital activity of a plant, like any living organism, is impossible without vitamins. They are directly involved in the process of photosynthesis. Provitamin A, which is released in large quantities by algae, for example, protects against oxidation

of organic substance formed during photosynthesis. B and D vitamins help the plant to absorb nutrients stimulating the growth of vegetative mass and fruits. Vitamin C is a potent anti-stress element for plants, as well as folic acid. For today, scientists have counted more than 2000 species of soil microalgae. It is important that each region is characterized by its own specific set of microalgae.

Another important feature of soil microalgae is their ability to retain moisture. Numerous studies show that the water-holding capacity of soil inhabited by microalgae is 10-15% higher than on soil, where these microorganisms are in the minimum amount.

Soil microalgae capture molecular nitrogen, promoting the accumulation of organic substances in the soil and ensuring proper and intensive plant growth.

Soil algae actively photosynthesize, saturating the soil with oxygen, improving the respiration of plant roots and contributing to the viability of aerobic microorganisms. Application of microalgae-based fertilizers on wetlands and heavy soils is able to improve their aeration and make them fit for processing.

It is known to produce high-yielding algae cultures during prolonged intensive cultivation it is necessary to stabilize the conditions of their photosynthesis and growth (composition of nutrient media, temperature, pH, light, agitation, etc.) [3].

Microalgae are present in varying amounts in healthy soil. But their additional application as a biofertilizer allows solving a number of questions related to ensuring the proper nutrition of plants and stimulating the productivity of land. Microalgae secrete physiologically active substances into the soil, in particular auxins — phytohormones of growth. By the way, using of auxin-based preparation is becoming more popular every year, because they allow increasing the productivity of land.

One of the unique properties of microalgae-based biofertilizers is that, after application to the soil, microalgae continue to grow, increasing their biomass (and therefore efficiency) by 10-15 times.

Microalgae have higher biomass harvest per hectare, higher growth rate than cells of higher plants. So, the productivity of algae is much higher than any crop [1].

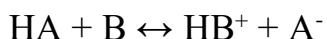
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ACID-BASIC TITRATION

The methods of acid-base titration are based on reactions associated with the transfer of hydrogen ions between substances exhibiting acid-base properties. Acids (donors of hydrogen ions) are titrated with a standard alkali solution - alkalimetry. Bases (acceptors of hydrogen ions) are titrated with a standard solution of a strong acid - acidimetry. In the titration process, acid (a1) turns into a base conjugated to it (b1), a base (b2) to a conjugated acid (a2).



As titrants of the method, 0.1 - 1 M solutions of strong acids - HCl, H₂SO₄ or strong bases - KOH, NaOH are used. They are prepared by the method of the established titer.

The acid-base titration method is based on the use of the neutralization reaction between the acid and the base with the formation of slightly dissociating water molecules. The possibility of using acid-base titration is determined by the general equilibrium constant of the acid-base reaction, which should be greater than 10⁸.

In the titrimetric analysis, direct, reverse (excess titration) and indirect titration, i.e. substitution titration, are used.

Direct titration is titration when the analyte is directly titrated with a standard solution.

Back titration (excess titration) is such titration when an exact but excessive amount of one titrant is added to the analyzed solution, and the portion of the first titrant (residue) that has not reacted is titrated with the second titrant.

Substitution titration - titration in which the analyte does not interact with the selected titrant or the reaction is not stoichiometrically. In these cases, an auxiliary reagent is added to the analyzed solution with which the analyte forms a stoichiometric (equivalent) amount of a new compound, called a substituent.

Acid-base titration in aqueous media is widely used in the quantitative analysis of inorganic, organic and biological substances with acid-base properties: strong and weak acids and bases, acidic and basic salts, as well as salts containing weak acid anions and weak base cations. It is also possible to determine substances that do not have acid-base properties, but which react with acids or bases. Acid-base titration has been used for many years for elemental analysis of organic compounds. Typically, these methods are used to determine non-metals: carbon, nitrogen, chlorine, bromine, sulfur, phosphorus, etc.

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ELECTROWEAK PHASE TRANSITION IN A SPONTANEOUSLY MAGNETIZED VACUUM

It is well known that the large scale chromomagnetic B3, B8 and ordinary magnetic H fields have to be generated in QCD after the deconfinement phase transition (DPT) at temperatures T that are larger than deconfinement temperature $T_d \propto 180 - 200 MeV$. The two above mentioned fields are created spontaneously in consequence of asymptotic freedom of gluon interactions. Whereas H is produced as a result of vacuum polarization caused by the quarks ability to possess both electric and color charges. In the process of polarization the vacuum quark loops mix the external fields. As a result, B3 and B8 become the sources that generate H.

We investigate the electroweak phase transition in the One-Higgs-Doublet [4] standard model with accounting for the spontaneous vacuum magnetization. Already such type considerations have been done as a problem in different type given external magnetic fields. Since the spontaneously generated fields are temperature dependent and strong they influence essentially the phase transition. We determine the mass interval for Higgs particle when the phase transition is strong first order and fits Sakharov's conditions for the formation of the baryon asymmetry of the Universe.

The critical temperature for the electroweak phase transition is estimated in Standard Model and beyond. The fields' strengths B3(T), B8(T) and H(T) are also estimated at relevant temperatures.

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**RADIONUCLIDES CONTENT IN TISSUES AND ORGANS OF
PUMPKINSEED *LEPOMIS GIBBOSUS* (LINNAEUS, 1758) FROM THE
ZAPORIZHZHIA (DNIPRO) RESERVOIR**

By 2018, there are 21 uranium deposits in Ukraine; most of them are located in the Dnipropetrovsk region [1]. In the Pridneprovsk region, enterprises on the extraction and primary processing of uranium ores are concentrated, as well as tailing dumps of radioactive waste, which are powerful sources of radiation impact on the water environment [2]. Radioecological situation has significantly deteriorated because of the Chernobyl accident, after which in 1986, artificial high-toxic radionuclides such as ^{137}Cs and ^{90}Sr got into the Dnipro basin [1]. Along with other anthropogenic pollutants, they have caused the occurrence of a difficult radioecological situation in the Zaporizhzhia (Dnipro) reservoir and fish can accumulate them. [2].

The object of the study were sexually mature pumpkinseed *Lepomis gibbosus* (Linnaeus, 1758) individuals, aged 4+ (five summers old). The material for work were muscles, bones, gills and scales collected during scientific research in June 2017–2018. The ichthyological sampling was carried out in the Samara Bay of the Zaporizhzhia (Dnipro) reservoir. The biological analysis of fish and the selection of tissues and organs were carried out in accordance with the classical hydrobiological and radiobiological methods [3]. The samples for measuring the content of radionuclides were prepared by separating fish tissues with subsequent homogenisation and concentration (drying) of the selected material. Samples were dried at 105°C to a constant dry mass. To determine the activity of ^{137}Cs , ^{226}Ra , ^{232}Th it was used dry tissues with weighed 100 g, and to determine the activity of ^{90}Sr and ^{40}K – 200 g. The radionuclides were determined on a scintillation gamma-ray spectrometer SEG-001 "ACP-C" and a beta-radiation spectrometer SEB-01-150 in a certified laboratory of the sanitary-epidemiological station. [3, 4, 5, 6].

The largest amount of artificial radionuclides was revealed in the fish bones: the content of cesium-137 was 8.3 ± 0.7 Bq/kg, strontium-90 was 5.1 ± 0.4 Bq/kg. It was indicated that in the bones of sexually mature pumpkinseed females, the content of radionuclides ^{137}Cs and ^{90}Sr is 24.7% and 28.6% less, respectively, than in the bones of males. This is due to the maturation of the pumpkinseed eggs, namely the radionuclides accumulation by the gonads of females during the formation of sexual products. Among the natural radionuclides, ^{40}K had the highest content; it was deposited in the muscles and reached 105.1–127.2 Bq/kg. For natural radionuclides, the following trend for radionuclide content has been observed: the highest content was in the bones, less in the muscles, even less in the scales, and the lowest one was in the gills.

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FIRST π -COMPLEXES OF COPPER WITH DIBORYNE LIGANDS

π -Complexes of transition metals with alkynes as ligands are key compounds in organic synthesis and catalysis. Such π -complexes are formed during catalytic processes and exist only as transition intermediates. There are also a large number of stable at room temperature and fully characterized alkyne π -complexes. Some of these display intense luminescence and are thus of great interest for opto-electronic applications [1]. Due to the inherent rarity of non-carbon alkyne analogues, far fewer π -complexes between transition metals (TM) and molecules containing triple bonds ($\text{E}\equiv\text{E}$) are known.

In 2012, the first π -complex coordinated (LRB=BRL)-fragment was obtained with Ag^+ , (II, fig. 1) [2], and with Cu^+ (I, fig. 1) as a complexing agent presented in 2015 [3].

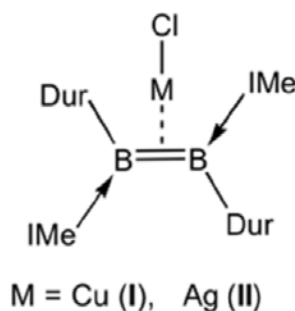


Fig. 1. First π -complex with (LRB=BRL)-fragment has obtained

An unexpected property of these compounds with exceptionally high quantum yields, hinting at their potential application for use as emissive materials, in stark contrast to TM-alkene complexes, which are not generally known to be emissive.

The diboryne B_2IDip_2 ($IDip = 1,3\text{-bis}(2,6\text{-diisopropylphenyl})\text{imidazol-2-ylidene}$), the first reported example of a stable compound with a boron-boron triple bond [4]. This discovery served as a great impetus in the creation of the first π -complexes of copper with a $(B\equiv B)$ -fragment (B_2IDip_2) (fig. 2) [5].

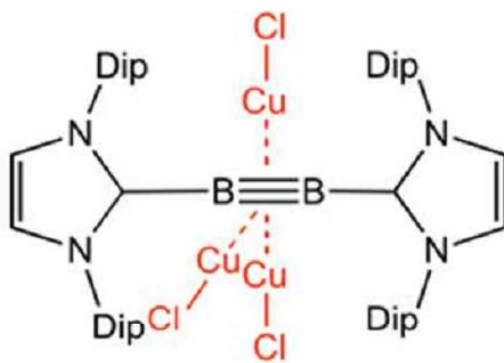


Fig. 2. First π -complex with $(LB\equiv BL)$ -fragment has obtained

The $(B\equiv B)$ -bond of tris(copper) complex (1.526 \AA) is longer than that of the ligand in the absence of copper (1.449 \AA). Furthermore, using NMR spectroscopy, it was found that near the $(B\equiv B)$ -fragments are located on three $CuCl$ fragments that rotate around it without any significant energy barrier. This explains its strong luminescence. DFT calculations (B3LYP/TZP) were carried out, which confirmed the observed experimental results.

It has been established that there are several interactions between the diboryne moieties and $CuCl$ units, namely: orbital, electrostatic interaction, and Pauli repulsion.

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**POPULATION MODELLING OF AMPHIBIANS FOR ENVIRONMENTAL
RISK ASSESSMENT UNDER PESTICIDE INFLUENCE**

Amphibian skin is extremely penetrative to most substances. That is why amphibians usually accumulate much amount of toxic compounds from the aquatic environment. Many of them stay in water bodies most part of their life span; it makes amphibians more vulnerable to pesticides than reptiles, birds and mammals.

The population modelling can be used to support the for many amphibian species under pesticides influence throughout the world. Topping and co-workers [9] proposed the ALMaSS system to assess a population of the great crested newt *Triturus cristatus* (Laurenti, 1768) on the bases of the individual-based pattern. Inputs of data rely on Griffiths et al. [2] and consist of elements of Griffiths and Williams [3], Hels and Buchwald [6] research. Model's extension and testing were proposed to carry out using pattern-oriented modelling approaches [4, 5], which is becoming the most widely used approach to complex individual-based simulations in ecological research. Analogous approaches have been used for the moor frog *Rana arvalis* Nilsson, 1842 by Dick and Ayllon [1] and for the Houston toad *Anaxyrus houstonensis* (Sanders, 1953) (formerly *Bufo houstonensis*) by Swanack et al. [8], the latter also using a pattern-oriented approach to development of model.

There are three main ways in which population modelling are able to support amphibian environmental risk assessment:

- 1) setting specific protection objectives;
- 2) translation of toxicity data to population-modelling endpoints;
- 3) as a higher storey assessment – refinement for population-level endpoints.

The model has been operated using a rather bounded and blended selection of data inputs to illustrate these three points. This is thoughtful and the consequences of the scenarios, which are introduced – are not indicative of the results of running a properly defined and agreed great crested newt scenario. For example, all proposed scenarios were developed and assessed assuming global optimal pond parameters, namely amphibians would inhabit all ponds, which is not the real situation in many suitable water bodies in the world [7].

The great crested newt, as a tailed amphibian model species, can be characterised as a species that is highly exposed to toxic substances including pesticides, since it is typically breeding in or around agriculturalist areas. That newt species is also characterised by low mobility with mandatory seasonal migration to and from breeding ponds. As so, the great crested newt is usually sensitive to weather conditions

(primarily amount of water and temperature regime) and has density-dependent populational processes foremost acting at the larval stage [7].

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PROBLEMS OF CONTROLLED THERMONUCLEAR FUSION

For energy production, it is proposed to use nuclear fusion reactions of light nuclei. Among many reactions of this type, the fusion of deuterium and tritium nuclei is most easily carried out.



In this reaction, the energy released to a particle with a neutron mass is approximately 3.5 MeV. This is about 3-4 times more energy per particle released during the fission of uranium ($1\text{MeV}=10^6\text{eV}$). The main problem is that tritium is not found in nature. Due to the small half-life of 12 years, it disappeared from earth. The tritium that is mined is too long mined in nuclear reactors and is too expensive. Both

particles, nuclei of deuterium and tritium participating in the reaction (1) have a positive charge and therefore are repelled by the Coulomb force. To overcome this force, particles must have high energy. The dependence of reaction rate (1) on the temperature of the tritium-deuterium mixture is quite large. With increasing temperature, the probability of reaction (1) increases rapidly. An acceptable reaction rate for the reactor is achieved at a temperature $T > 10 \text{ keV}$. If we take into account that $1 \text{ eV} = 10^4$ degrees, then the temperature in the reactor should exceed 100 million degrees. All atoms of a substance at this temperature should be ionized, and the substance itself in this state is usually called plasma.

There are other fusion reactions that are suitable, in principle, for the production of thermonuclear energy. Here we note only two reactions widely discussed in the literature:



Reaction (2) is good in that there is any amount of fuel (deuterium) on earth for it. The technology for the release of deuterium from sea water has been developed and is relatively inexpensive. Unfortunately, the rate of this reaction is noticeably lower than the rate of reaction (1), therefore to implement reaction (2) a temperature of about 500 million degrees is required. Reaction (3) is currently causing great excitement among people involved in space flights. It is known that there is a lot of ${}^3\text{He}$ isotope on the Moon, therefore the possibility of its transportation to Earth is discussed as one of the priority tasks of astronautics. Unfortunately, the rate of this reaction is also noticeably lower than the rate of reaction (1) and the required temperatures for this reaction are also at the level of 500 million degrees. To maintain plasma with a temperature of the order of 100-500 million degrees, it was proposed to use a magnetic field. The most promising installations today are those in which the plasma has the appearance of a torus. To suppress unstable plasma motions, in addition to the toroidal (longitudinal) magnetic field, a transverse (poloidal) field is also required. There are two types of installations in which a similar magnetic configuration is implemented. In installations of the tokamak type, the poloidal field is created by a longitudinal current flowing in the plasma in the direction of the field. In installations like a stellarator, the poloidal field is created by external helical windings with current. Each of these plants has its advantages and disadvantages. However, there are several conditions on the tokamak reactor because of which, for the implementation of reaction (1), it is necessary to increase the temperature and magnetic field, because of which the longitudinal field coils must be made of a material capable of operating in a magnetic field of the order of 13-14 Tesla. For the ITER international tokamak reactor, it was decided to use the niobium-tin (Nb_3Sn) superconductor. For reactions (2) and (3), the magnetic field on the superconductor reaches 30 Tesla. Such a superconductor does

not exist, but its development is underway. In a tokamak reactor, the plasma chamber should be surrounded by a thick layer of materials protecting the windings of toroidal field from the destruction of superconductivity by neutrons (blanket). Here, heat must be removed, emitted by neutrons during braking. Moreover, part of the neutrons can be used to produce tritium inside. The most suitable nuclear reaction for such a process is the following reaction, which proceeds with release of energy. ${}^6\text{Li} + \text{n} = {}^4\text{He} \text{ (2 MeV)} + \text{T} \text{ (2,7 MeV)}$ (4)

Since the neutron is a neutral particle, the Coulomb barrier is absent and reaction (4) can occur at a neutron energy noticeably less than 1 MeV. However, for practical implementation requires detailed experiments and calculations. By virtue of (8), the primary “fuel” for the reactor is the lithium isotope ${}^6\text{Li}$. There are two isotopes in natural lithium $\text{Li} = {}^6\text{Li}(7,5\%) + {}^7\text{Li}(92,5\%)$ (5)

Lithium reserves in the Earth at the current level of energy consumption will last for several thousand years, and in the ocean for tens of millions of years. Thus, for one reactor with the discussed capacity, 15 tons of natural lithium per year will be required. Although significant energy will be required to separate isotopes in natural lithium, the additional energy released in reaction (4) can compensate for these costs. There is also a method of “cold” thermonuclear reaction, which was recorded in laboratory conditions. Sound waves were intensively transmitted through a beaker with liquid acetone the size of two or three glasses, producing the effect of acoustic cavitation, the result of which is sonoluminescence. During cavitation, small bubbles appeared in the liquid, which increased to two millimeters in diameter and exploded. The explosions were accompanied by flashes of light and the release of energy, i.e. the temperature inside the bubbles at the time of the explosion reached 10 million degrees Kelvin, and the released energy, according to the experimenters if enough to carry out thermonuclear fusion. The essence of the reaction is that as a result of the combination of two atoms of deuterium, tritium is formed, and a neutron, characterized by a tremendous amount of energy.

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TAUTOMERIC BEHAVIOR OF 1,2,4-TRIAZOLE DERIVATES: A DFT STUDY

Considerable interest in the chemistry of 1,2,4-triazoles has grown from their broad synthetic potential and the prospect of obtaining biologically active compounds. On this basis, the series of new compounds can be synthesized that will be useful in the field of optoelectronics as they provide fluorescence properties. One of the most relevant properties of triazoles is their antitumor activity.

However, in order to successfully solve the problems of obtaining new functional derivatives, it is necessary to study a block of theoretical problems. In particular, these are tautomeric transformations.

To understand the tautomeric behavior of the newly synthesized 1,2,4 triazole derivatives, a study was conducted using the method of the SMD/M06-2X/6-311++G(d,p) approach.[1]

During the study, we considered possible conformations caused by the spatial rotation of heteroaryl groups.

We designed the possible conformers and isomers of triazoles and calculated their angles of rotation, Gibbs energy, and population.

These calculations make it possible to determine the most stable compounds and to predict their chemical ability.[2]

The next step in our work is to calculate the UV spectrum of the triazole derivatives in methanol and gas, comparing the values with the experimental results. We are going to model of chemical properties of compounds of 1,2,4 triazoles derivatives, their stability and reactivity. These calculations will facilitate a difficult and long-lasting experiment.

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INFLUENCE OF TRANSPLANTATION OF MESENCHYMAL STEM CELLS ON ACTIVITY OF SUCCINATE DEHYDROGENASE OF MITOCHONDRIONS OF A LIVER IN ANIMAL RECIPIENTS

Studying such a narrow-profile issue should help treat some types of cancer, because of a better understanding of the cause of the cancer from a biochemical perspective.

Succinate dehydrogenase, or SDH or complex II, is a complex globular protein that consists of four subunits - A, B, C, D. SDG is located in the mitochondrial membrane and is an integral part of the respiratory chain, playing the role of electron transport, and is involved in the oxidation of succinate to fumarate of the tricarboxylic acid cycle. For the transport of electrons, SDH contains special complexes consisting of ferric ions and sulfate ions, which allows it to be considered as a metalloprotein. Thus, the functions of SDH can be divided into transport (electron transfer) and synthetic (catalysis of oxidation of succinate to fumarate) [1].

There are several theories that link the occurrence of cancer with impaired integrity or normal mitochondrial function. To date, there are several studies that clearly, with active carcinogenesis, observed a decrease in the activity of SDH. It should be noted that not only the disruption of this enzyme can lead to cancer. In other studies, cancer patients had normal rates of SDH activity. Researchers explain that impaired functioning of this protein, most often associated with certain genetic mutations, so it becomes useful to study the genome of a patient for the presence of this mutation [2].

Stem cell transplantation is a promising area in medicine. Stem cells can be conditionally divided into hematopoietic (HSC) and mesenchymal cells (MSC). The former originate in blood cells and have the potential for the treatment of leukemia, the second - in tissue cells that originate from mesenchyme and are promising in the treatment of diseases of the respective tissues [3].

According to one study, in the transplantation of mesenchymal stem cells from adipose tissue and bone marrow, an increase in the amount of recovered potassium cyanide was observed in experimental animals, the amount of which is an indicator of SDH activity. Moreover, in animals that were transplanted with MSC from adipose tissue, the activity of SDH was higher than in animals that were transplanted with MSC from bone marrow. Based on the results of these studies, it became apparent that MSC transplantation leads to a significant increase in SDH activity [4].

Therefore, the use of stem cells is a very promising and necessary direction in medicine. Based on the results of many studies, it can be concluded that in the presence of reduced activity of SDH and further establishment that the cause of carcinogenesis

was this enzyme, transplantation of mesenchymal stem cells, with their ability to increase activity of SDH, can be a significant help in the treatment of this type cancer.

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CHANGES IN LEUKOCYTE FORMULA IN HUMAN ONTOGENY

Introduction. In recent years, worldwide attention of researchers and practitioners - neonatologists, obstetricians, pediatricians, therapists - has been paying attention to the problems associated with the study of the ontogeny of the immune system in normal and its functioning in pathological conditions at various stages of human development.

Normal immune response is a necessary condition for disease resistance. Changes in the work of the immune system begin long before any manifestations of aging. [1].

Human's chemical composition of the blood is relatively constant. The greatest fluctuations in the blood composition are observed in the period of newborn and elderly.

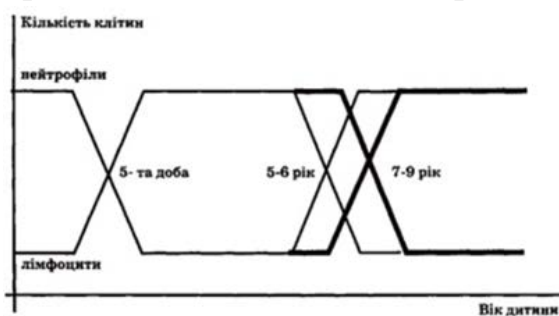
Normally, a healthy baby has a special, different from the adult, immune system, which is appropriate: from sterile conditions of pre-natal development the baby enters the world, where it is destroyed by a huge number of antigens of different nature. [1]

In newborns, the correlation between neutrophils and lymphocytes is about the same as in adults. During the first days after birth, the number of neutrophils begins to

decrease, and the number of lymphocytes grows, and on the 4-5th day of life, their percentage is equal (45% each).

This is the so-called "first physiological cross" of leukocytes. Physiological role: increase in the number of leukocytes (3-4 times higher than the adult rate), which provides reliable protection of the skin and mucous membranes. From 10 months to 2.5 years, children have a maximum lymphocyte level (65%) because the child has a specific antigenic effect. Quantitative increase of lymphoid tissue is observed.

At the 4-5th year of life there is a rebalancing between the levels of lymphocytes and neutrophils - "the second physiological cross in the blood formula". Subsequently, there is a gradual involution of lymphoid tissue with the simultaneous improvement of its function. The percentage of lymphocytes begins to decrease and the level of neutrophils rises to the adult level (pic. 1). [2].



Immunological changes in aging.

According to immunological theory, old age is genetically programmed for each person, resulting in changes in immunocompetent cells and autoimmune reactions - autoantibodies that react against normal structures. [1]

Age-related involution of the thymus is considered to be a major factor in the development of autoimmune pathologies and diseases of old age. There is a decrease in the number and activity of T-lymphocytes, because the presentation of hormones that contribute to the formation of T-lymphocytes is reduced. The activity of phagocytes is reduced; time and level of immune response are reduced; decreases variation and narrows the spectrum of antibodies and T-cell receptors; there is a marked tendency for increased susceptibility to infectious diseases (65% of deaths) with the absence of fever.

As follows, aging is manifested in the form of two main interrelated processes - immune deficiency and autoimmune processes. [1]

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HEPATOTOXICITY OF MEDICINAL PRODUCTS

Taking medication is one of the most important causes of liver damage. Medication-induced lesions are the most common cause for withdrawal from the circulation of approved medicinal products. The pathophysiological mechanisms of drug hepatotoxicity have not yet been studied. Known forms of liver damage include hepatocytes and transport proteins destruction, cytolytic activation of T cells, apoptosis of hepatocytes, mitochondrial decay, bile duct lesions.

The purpose of this work is to analyze already known data on hepatotoxicity of certain categories of drugs. Identify which drugs have the most harmful effect on hepatocytes.

According to the literature, the most commonly observed liver damage happens:

- when using drugs such as 6-mercaptopurine, methotrexate, urethane. This leads to changes in biochemical parameters - increased activity of aminotransferases and alkaline serum phosphatase, increased level of bilirubin in serum. The morphological changes in the liver include necrosis and obesity of hepatocytes. [3]

- with isoniazid therapy. Rifampicin is usually prescribed with isoniazid. After its usage deaths have been reported in patients with jaundice on a background of liver pathology and in individuals taking rifampicin with other hepatotoxic drugs. [5]

- when using the anti-arrhythmic agent Amiodarone. Hepatotoxicity usually develops within a year of starting therapy, but may occur within a month. Usually, it is predictable, dose dependent, has a direct hepatotoxic effect. [6]

- when using high doses (or dose escalation) of paracetamol, sulfonamides, tetracyclines, NSAIDs (diclofenac), etc. [1]

- use of anticonvulsants: Felbamate (felbatol), Carbamazepine, Phenytoin, Depakin (active substance valproic acid), valproax sodium.

The main medication used to reduce the manifestations of hepatotoxicity are: N-acetylcysteine in the early stages of acetaminophen toxicity, L-carnitine in valproam toxicity, corticosteroids, cholestyramine is prescribed to reduce itching. Ursodeoxycholic acid may also be prescribed.

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АКТУАЛЬНІ ПРОБЛЕМИ СОЦІАЛЬНО-ГУМАНІТАРНИХ НАУК

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KONSTRUKTION DES NOMINATIVFELDES DES KONZEPTS

Heutzutage basieren Sprachstudien auf der Analyse der Weltanschauung, um die Rolle der Interaktion von Mentalität, Ethnizität und Sprache zu bestimmen, die im Bereich der Linguistik relevant ist.

Konzeptuelle Einheiten repräsentieren unser Wissen über die Welt in einer weitgehend abstrakter Form und ermöglichen eine effektive Verarbeitung von Umweltinformationen und -reizen durch Kategorisierung [1; 179].

Es wird angegeben, dass das Weltbild durch nominative, funktionale, imaginative und phonosemantische Mittel der Sprache geschaffen werden kann. Die Felder wurden von Trier J. als die zwischen den einzelnen Wörtern und dem Wortschatz als Ganzes bestehenden sprachlichen Wirklichkeiten definiert. Damit wird die Gesamtheit aller zum gleichen Sinnbezirk gehörenden Einzelwörter gemeint, die einander ihre Bedeutung bestimmen [2; 52]. Als mentale Einheit kann das Konzept mit sprachlichen Mitteln beschrieben werden, die es objektivieren. Das Nominativfeld des Konzepts wird als die Menge der sprachlichen Mittel identifiziert, die das Konzept in einer bestimmten Periode der Entwicklung der Gesellschaft verbalisieren und repräsentieren.

Abhängig von den Nominativmitteln gibt es drei verschiedene Arten von Nominierungen: lexikalische Nominierung, Nominierung von Sätzen und diskursive Nominierung. Die lexikalische Art der Nominierung zielt darauf ab, ein bestimmtes Element der Realität zu schaffen: Prozess, Beziehung, Qualität, Sache, jedes reale oder mögliche Objekt. Eine Phrase vermittelt eine individuelle Bedeutung, wobei eine bestimmte Art der Verbindung zwischen ihren Komponenten erhalten bleibt. Das bedeutet, dass Wörter in einer Phrase durch syntaktische Kompatibilität gekennzeichnet sind. Die Satznominierung enthält Mikrosituationen, die eine Reihe von Elementen zusammenführen. Die diskursive Nominierung ist eine Textnominierung [4].

Der Hauptunterschied zwischen dem Nominativfeld und den traditionell unterschiedenen strukturellen Gruppen der Lexik (lexikalische und semantische Gruppe, lexikalisches und semantisches Feld, lexikalisches und phrasenbezogenes Feld, Synonymie und assoziatives Feld) ist zu beachten. Das Nominativfeld hat einen komplexen Charakter: Es vereint alle oben genannten Gruppen [5; 47].

Es wurde festgestellt, dass die Konstruktion des Nominativfeldes eines verbalisierten Konzepts aus den folgenden Schritten besteht: erstens müssen Nominativeinheiten aus lexikografischen Quellen extrahiert werden, die semantisch mit der lexikalischen Schlüsseleinheit (normalerweise Substantiv) verwandt sind – dem Namen vom Konzept; zweitens ist es notwendig, eine Analyse der Wörterbuchdefinitionen der Nominativeinheiten durchzuführen, um die Schlüsselsemen zu identifizieren; drittens sollten die Schlüsselsemen nach ihrem semantischen Potential angeordnet werden; viertens sollte das Feld in den Kern, die mediale Zone und die Peripherie strukturiert werden, und fünftens sollte die etymologische Erforschung von Schlüsselsemen durchgeführt werden [3].

Also, die Definition des Konzepts des "Nominativfeldes" wird bereitgestellt, die Arten von Nominierungen werden angegeben, die Stufen der Konstruktion des Nominativfeldes des Konzepts werden bestimmt.

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ÄHNLICHKEITEN UND UNTERSCHIEDE VON WORTBILDUNGSMODELLEN IM ENGLISCHEN UND DEUTSCHEN

In unserer Studie wurde versucht, die Ähnlichkeiten und Unterschiede von Wortbildungsmodellen in Englisch und Deutsch zu analysieren.

Die Wortbildung als Ganzes ist eine ziemlich eigenartige Sphäre der Sprache und kann nach Ansicht einiger Linguisten kaum typologisch beschrieben werden. Der Grund dafür ist, dass die Liste der Wortbildungsmethoden, wie A. L. Zelenetsky feststellte, relativ klein ist und alle in fast allen Sprachen vertreten sind, so dass sich die Unterschiede zwischen den Sprachen hauptsächlich auf Details beschränken [1, s. 25].

Die Besonderheiten der Wortbildung in jeder der von uns gewählten Sprachen liegen in der Verbreitung einer und der relativen Unterentwicklung einer anderen Art der Wortbildung, was das Problem der Korrelation und Interaktion dieser Methoden aufwirft.

Die Produktivität eines bestimmten Wortbildungsmodells hängt von den typologischen Merkmalen der gesamten Sprache ab [3, s. 11].

Insbesondere ist die Struktur eines Wortes eng mit der Wortbildung verbunden. Wenn Wörter in einer Sprache in ihrer ursprünglichen Form einfach morphemisch sind, ist in solchen Sprachen die Art der Wortbildung ohne Zusatz produktiv - und dies wird durch ein Beispiel veranschaulicht (Englische Sprache). Wenn die Struktur eines Wortes zweimorphemisch ist, dann herrschen in solchen Sprachen affixale Wortbildungsmethoden (Deutsch) vor [3, s. 8-9].

Es gibt eine gewisse Ähnlichkeit der Wortbildungssysteme in Englisch und Deutsch. In diesen Sprachen gibt es drei Hauptmethoden der Wortbildung:

1. Umwandlung;
2. Befestigung;
3. Zusammensetzung.

Die Prävalenz in den analysierten Sprachen ist jedoch nicht dieselbe, was unsere Analyse dieser Methoden bestätigt.

1. Die Bildung oder Konvertierung von Wörtern ohne Anhänge ist eine relativ häufige Methode, um neue Wörter in englischer Sprache zu erstellen.

2. Konversionsformationen, abhängig von den an diesem Prozess beteiligten Wortarten.

Die Wortbildung ohne Zusatz auf Deutsch ist jedoch nicht so weit verbreitet. Eines der anschaulichen Beispiele für die Umwandlung ist die Bildung von Verben aus Substantiven (Antwort – antworten; hammer – to hammer). Dies liegt daran, dass die deutsche Sprache eine gut entwickelte syntaktische Beugung aufweist, bei der ein bestimmtes Wort in einem beliebigen Teil der Sprache enthalten ist, wodurch die isolierte Wahrnehmung in der grammatikalischen Ebene und damit der Übergang ihrer verschiedenen Verteilungen in den Bereich des Wortschatzes verhindert wird [2, s.70].

3. Die Bildung von Affix-Wörtern ist auf Englisch stärker entwickelt als auf Deutsch. Sowohl in Englisch als auch in Deutsch können jedoch die folgenden Arten von Token unterschieden werden:

- Suffix-Typ mit R + s-Struktur (seid-en (Deutsch); bakery (Englisch));
- Präfixtyp mit p + R-Struktur (Verkauf (Deutsch); subgroup (Englisch));
- Der Typ ist Präfix-Suffix mit der Struktur p + R + s (Gefrage (Deutsch); prerevolutionary (Englisch))

3. Die deutsche Produktivität wächst stetig.

Im Rahmen des Kollokationsmodells werden verschiedene und unbestimmte Additionen vorgenommen. Die erste ist eine Kombination aus zwei Komponenten; Sie können eine andere Ableitungsstruktur haben, die Aufteilung eines komplexen Wortes ist jedoch immer binär, zum Beispiel: Freiheits-Liebe (beide Komponenten sind Suffixe), Arbeiter-Erholungsheim (die erste Komponente ist ein Suffix, die zweite ist eine komplexe Basis). In der Regel definiert die erste Komponente die zweite und die zweite eine allgemeine morphologische und semantisch-kategoriale Charakterisierung der Verbindung [2, s. 71-72].

Der zweite Typ der Addition umfasst „imperative Namen“ wie Vergissmeinnicht, Tischleindeckdich usw., kompositorische Ergänzungen und einige andere Arten von Konjunktionen, zum Beispiel: Ohnebart (Konjunktion eines Substantivs mit einer Präposition).

Zusammengesetzte Wörter können einen unterschiedlichen Grad an Umdenken aufweisen, bis die Motivation vollständig gelöscht ist.

Am häufigsten und produktivsten ist die definitive Phrase. Sie spielt eine große Rolle beim Entwurf von lexikalischen Einheiten, ist aber auch eng mit der Syntax verbunden: Komplexe Wörter können semantisch mit Phrasen zusammenfallen, zum Beispiel: Abteilstenfenster – Fenster des Abteils, Briefmarkenverkauf – Verkauf von Briefmarken.

Als Ergebnis unserer Analyse können wir schließen, dass Englisch und Deutsch ähnliche Methoden und Modelle der Wortbildung haben. Im Englischen ist das Anbringen jedoch häufiger, und im Deutschen ist das Phrasieren häufiger.

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ELECTRONIC INFORMATION SECURITY AUDIT IN SPORTS EDUCATION INSTITUTIONS

Sports education facilities have constant threats of restricted information leakage. To ensure the performance of audits, it is necessary to perform periodic inspections.

Periodic audits are required to ensure the effectiveness of the audits. Periodic audits performing can be used to:

- 1) minimize the risks, associated with unauthorized access to information;
- 2) provide evidence in the course of investigation of incidents in the field of security and breach of privacy of an athlete;
- 3) identify the new threats and intrusion attempts.

This practice identifies and defines the components, necessary for successful security audit strategy and process. To create this a multidisciplinary team is involved, which is significant for the development and implementation of effective strategies of security audit. The team should take proper measures when determining the strategy and the process of security audit [1]:

- 1) to create circuit flows within the organization, to identify programs and systems which are intended to audit;
- 2) to make audit viewing, to determine the feasibility of access to the electronic database of athletes on the basis of labor resources and tasks;
- 3) to determine the process and the frequency of audit.

To ensure the audit quality it is necessary to use the specialized tools, such as specialized software, hardware sensors and other types of tools [2].

The use of specialized audit tools is aimed at:

- 1) ensuring the safety of officials or employees with the adherence to warning reports of possible incidents;
- 2) collecting audit logs from other applications for correlation, centralized storage and analysis.

It is expensive to install third-party tools. Upfront costs may include auditing software, the server and the operating system to run it, as well as labor costs for installation, training, and modification.

An organization's audit strategy should also include the following measures to protect and maintain audit logs:

- 1) the audit log and records on the server should be placed separately from the system that generates the control trace;
- 2) limiting access to audit logs to prevent tampering or alteration of audit data;
- 3) keeping the audit on a timely basis that should be determined together with operational and technical risk management, as well as the legal staff.

The organization's audit strategy should also include the following measures to protect and maintain audit logs [3]:

- 1) ensure that all staff and partners understand the rights of athletes, including accounting, disclosure, safety policies and procedures;

- 2) ensure that all staff and partners are aware of the use of security audit practices. Staff should be aware that their activities are audited and monitored. They can be held accountable for their actions;
- 3) ensure that hiring new recruits involves targeted training for access to the athletes' online database, as well as policies and procedures for the use of audit and monitoring;
- 4) to familiarize the staff with the safety policy and the rules of use of the audit log in sports training establishments.

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THE VARIATIONS OF MODERN PRONUNCIATION IN THE GERMAN LANGUAGE AND THEIR TERRITORIAL DELIMITATION

The article focuses on the variations of German language in regards to geographical location. It has been established that these dialects vary in terms of phonetics and phonology, often resulting in misinterpretation between the speakers from different regions. Studying the similarities and distinctions of these variants is essential to students of the German language as well as the native speakers.

One of the origins of the language variation phenomenon is referred to as language development. Since the language is heavily influenced by societal dynamics, it becomes ever-evolving. Therefore, the regions in which German language is spoken have progressed and developed differently.

Upon conducting a thorough analysis of the phonetic system, three main language variants have been introduced as The Standard German, Austrian German, and Swiss German. To an extent, the dialects vary in both written and spoken forms.

In addition, while some grammatical rules are inherent across all variants, others may have been gradually modified due to the cultural and historic dynamics of a given geographical region. When it comes to phonetic differences, each dialect is identified by stress emphases, the length and variations of sounds, and so on.

Summary: The variability of regional variants or dialects of German language poses a challenge in translation and explication. In order to avoid misunderstanding

between German speakers and provide the most accurate interpretation, the knowledge of German language variations is incremental.

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AUSSENPOLITISCHE BEZIEHUNGEN ZWISCHEN DER VR China UND LATEINAMERIKA

Die umfangreiche und aussagekräftige Charakterisierung vom Pekings derzeitigen Ansatz in Bezug auf die Karibik und Lateinamerika im Allgemeinen ist in der Formel "1 + 3 + 6" enthalten, die Xi Jinping im Juli 2014 als neues Format für die Beziehungen zwischen China und der lateinischen Karibik vorgeschlagen hat.

In dieser Formel steht "1" für einen einzigen koordinierten Plan für die Entwicklung der Zusammenarbeit zwischen China und den Ländern der lateinamerikanischen Karibik für den Zeitraum 2015-2019. "3" bedeutet drei Kooperationsmechanismen für Handel, Investitionen und Finanzen. "6" bedeutet sechs Richtungen für Entwicklung der Zusammenarbeit: Energieressourcen, Infrastruktur, Landwirtschaft, Industrie, wissenschaftliche und technische Innovationen und Informationstechnologien. So hat Peking die wirtschaftlichen Interessen in den Vordergrund der LAC-Beziehungen gestellt [3, S. 44].

Gleichzeitig ist die Zusammenarbeit im Handels- und Wirtschaftsbereich nicht die einzige Richtung der Beziehungen zwischen Peking und den lateinamerikanischen Ländern. Diplomatische Kontakte entwickeln sich auch aktiv [3, S. 44].

Eine der Möglichkeiten, Chinas Position und Kontakte in der Region zu stärken, bestand darin, strategische Partnerschaftsabkommen zwischen China und verschiedenen lateinamerikanischen Ländern zu schließen. Das erste dieser Abkommen wurde zu Beginn der Intensivierung der Beziehungen zur Region unterzeichnet - 1993 zu Brasilien. Seit dem Jahr 2000 wurden fünf weitere strategische Partnerschaftsabkommen mit lateinamerikanischen Ländern unterzeichnet: Venezuela (2001), Mexiko (2003), Argentinien (2004), Peru (2008) und Chile (2012) [2, S. 18-19]. Es ist erwähnenswert, dass die strategische Partnerschaft mit Brasilien im

Allgemeinen die erste Allianz solcher Art in China geworden ist. Trotz der Tatsache, dass die chinesische Regierung das Konzept der "strategischen Partnerschaft" nicht offiziell definiert und keine Statistiken führt, die auf Informationen über die Unterzeichnung von Dokumenten zur strategischen Zusammenarbeit beruhen, stellen die Forscher fest, dass bislang 47 ähnliche Abkommen mit verschiedenen Ländern und internationalen Organisationen unterzeichnet wurden. auch mit Russland [2].

Das Bestehen solcher Abkommen mit den Ländern der Region ermöglicht es, engere Kontakte zwischen den Staatsoberhäuptern und Vertretern der sektoralen Agenturen herzustellen. Darüber hinaus ermöglicht dieses Format der Dialogentwicklung den Parteien, dauerhafte Mechanismen der Zusammenarbeit in einer Vielzahl von Bereichen zu schaffen, darunter Investitionen, Wissenschaft und Bildung, humanitäre Zusammenarbeit usw.

Der Austausch und die Zusammenarbeit in den Bereichen Kultur, Bildung, Sport, Gesundheitswesen und Tourismus haben sich intensiviert. China und die Karibik, die weit voneinander entfernt sind und nicht viel Erfahrung in der interkulturellen Kommunikation miteinander haben, haben allmählich begonnen, ihr gegenseitiges Wissen zu erweitern [1, S. 5].

Somit hat Lateinamerika für die VR China eine größere strategische Bedeutung, indem sie politische Bündnisse zur Unterstützung ihres Aufstiegs als neue Supermacht und als Gegengewicht zu den Versuchen der USA, sie einzudämmen, schließt.

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PRÄFIXDERIVATION VON FACHBEGRIFFEN IM BEREICH DER PÄDAGOGIK

Heutzutage ermöglicht umfassende und schnelle Entwicklung der deutschen Pädagogik die aktive Erweiterung **des Lexikons**, wo eine der wichtigsten Sprachebenen Fachbegriffe sind. Wie bekannt, ist die Wortbildung „eine Form der Wortschatz-Funktion“ [1, s. 40] und eine der Quellen der erfolgreichen Schaffung von Termini in der Fachsprache der Pädagogik.

Pädagogische Fachbegriffe in der deutschen Sprache entstehen häufig durch Affix Derivation mithilfe der Präfixe, Infixe und Suffixe. Das Ziel der vorliegenden Arbeit war es, die Besonderheiten der Präfixderivation in der deutschen pädagogischen Terminologie zu erforschen, weil die Präfixderivation Wörtern „bestimmte kategoriale Eigenschaften“ beschenken [2, s. 15]. Die Klassifikation der Präfixderivation beinhaltet untrennbare Präfixe wie „be-, ge-, ver-, er-, ent-, emp-, zer-, emp-, miss“ und trennbare deutsche Präfixe wie „ab-, an-, auf-, aus- bei-, ein-, mit-, nach-, vor-, neben, zu-, durch-, hinter-, über-, um-, unter-, wider-“, [3, s. 153].

Die Analyse der pädagogischen Fachtexte gestattete uns, folgende Arten der Präfixderivation der Fachbegriffe festzustellen.

1. Das Präfix **über-** bezeichnet, dass eine Grenze überschritten wurde: „überarbeiten“, „überschätzen“, „Überlastung“.
2. Das Präfix **miss-** verneint die Bedeutung des Fachbegriffs im Sinne „etwas falsch“: „Missverständnis“, „Misserfolg“.
3. Es gibt Präfixe, die Fachbegriffe gegenteilige Bedeutung schenken. Dazu gehören **un-** und **nicht-**: „genügend - ungenügend“; „Fachleute - Nichtfachleute“.
4. Das Präfix **vor-** bezeichnet „Zeitanordnung“, wenn etwas vor dem anderen Geschehen passierte: „Vorkenntnisse“, „Vorstufe“.
5. Die Tätigkeit, die nach dem anderen Geschehen passiert, wird durch die Präfixe **fort-** und **weiter-** abgebildet: „Fortbildung“, „Weiterführung“.
6. Das andere Präfix der zeitlichen Anordnung ist **nach-** mit der Bedeutung „Wiederholung des Geschehens“: „nachprüfen“, „nachlesen“.
7. Das Präfix **unter-** stellt die Fachbegriffe dar, dass sie im Sinne „geringe oder wenige Masse“ sind: „Untergruppe“, „Unterstufe“.
8. Durch das Präfix **ober-** wird „zu viel Masse“ in den pädagogischen Fachbegriffen dargestellt: „Oberstufe“, „Oberschule“.
9. Das Präfix **ein-** verursacht die Bewegung „nach innen“: „Einschulung“, „Einstufungstest“, „Eintritt“.
10. Das Präfix **außer-** bezeichnet die Bewegung „nach außen“: „außerschulische Aktivitäten“.
11. Die semantische Funktion des Präfixes **mit-** ist „Beteiligung“, wenn mehrere Menschen an einer Tätigkeit teilnehmen: „mitarbeiten“, „mitentscheiden“.

Die erhaltenen Resultate zeugen von **der Zweckmäßigkeit einer Präfixklassifizierung der pädagogischen Fachbegriffe**. Im Verlauf der Untersuchung **wurden** die Aspekte der Präfixderivation wie „Masse“, „Zeit“, „Opposition“ und „Bewegung“ **festgestellt**. Diese Präfixderivation-Klassifizierung ermöglicht eine Wortschatzerweiterung und wenn sie das tut, hilft sie uns die deutsche Sprache als eine fremde Sprache zu beherrschen. Darum scheint sie uns für die weitere Erforschung der deutschen Fachbegriffe im Bereich der Pädagogik von Nutzen zu sein.

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SOCIO-HISTORICAL CONDITIONS OF DYSTOPIA GENRE FORMATION

Abstract

The article analyzes socio-historical conditions of dystopia genre formation, reasons which had influence on this specific genre, its main features and the messages of dystopian works. The article is based upon the scientific research of the native and foreign literary critics.

Keywords: utopia, dystopia, warning, future.

Dystopia has existed as a phenomenon of philosophical and artistic thought from antiquity, that is, from the time when utopia arose. However, dystopia appeared when the state and society revealed that their negative traits became dangerous to humans and did not contribute to progress. Dystopia has always been a protest against violence, an absurd social system and the marginal person. Authors of dystopias, referring to the analysis of real social processes, with the help of fantasy, tried to predict the dangerous consequences of the existing order or utopian illusions.

Formally, dystopia originates from the satirical tradition of J. Swift, F. Voltaire, I. Irwin, and S. Butler.

The anti-utopian elements are in

- in the comedies of Aristophanes (as a satire on the utopian state of Plato);
- in the writings of many writers of the XVII-XVIII centuries as a kind of amendment to the reality of the utopia of T. More, F. Bacon, T. Campanella, where in most cases they acted only as a satirical secondary for theological and practical commentary on utopian constructions;
- in the fantastic works of the XIX century writers (M. Shelley "Frankenstein", S. Butler "Edin", "Return to Edin", G. Wells "Machine of Time", "Modern Utopia" and others).

The anti-utopia of the first half of the XX century was traditionally attributed to the novels "We" by E. Zamyatin, "The Solar Machine" by V. Vynnychenko, "Kotlovan" by A. Platonov, "This Brave New World" by A. Huxley, "The Senseless Pursuit" by F. Urren, "1984" G. Orwell [1].

The reasons for this turn of utopian literature are, first of all, due to the complexity of the historical process of human development in the XX century, saturated with shocks in a relatively short time that equals the life of a generation that has absorbed itself: economic crises, revolutions, totalitarian regime, peace and colonial wars, the emergence of fascism, the contradictory consequences of the technical revolution, which became a solid engine of mathematical progress and which revealed a catastrophic lag of social and spiritual progress in the bourgeois world.

A logical consequence of such sentiment was the reorientation of socio-utopian literature on dystopia. It depicts fundamentally different messages in the image of the future, though it gives a similar features with utopia a more detailed panorama of the public future.

Writers - dystopians in their works describe totalitarian societies in which ideology, which comes from the state apparatus and is limited to them, penetrates all levels of public and private life. Here the problem of a personality arises by influencing it (the personality) of external forces, in most cases - the state, embedded in the soul and mind of man [1, 678 p.].

J. Orwell is a well-known English journalist, newspaper columnist, brilliant writer. He saw threats to human freedom, to democracy, to higher human values. The most famous works of the writer - the novel - dystopia "1984" and satirical work "Farm Yard", as well as many essays, memoirs.

The work "1984" depicted the future world society, called Oceania. Here totalitarianism is built on the complete physical and spiritual enslavement of man. Here we see a meticulous look at every little thing, because, from the state eye of Big Brother, nothing should elude. The overriding purpose of the regime is to prevent any deviation from the established canons, especially in private life. A person must belong to the regime completely throughout his life [2, 233-239 p.].

The fear of the upper classes which embodied the main ideas of the utopians, found expression in dystopia, but already clearly reactionary. Among them are works that are imbued with a sense of worldwide pessimism and disbelief in man, depicting the terrible effects of mechanization, which have criticized traditional utopian and socialist ideas about the future of society and expressed openly anti-communist views of the authors.

The dystopia in the very sense is a critical image of the state system, which contradicted the principles of true humanism. The anti-utopia protests against violence, the absurdity of the existing system, the marginal situation of the individual [2].

Summarizing this question, we can confidently say that the formation of the genre of dystopia was influenced by a number of socio-historical conditions such as: economic crises, revolutions, totalitarian regime, world and colonial wars, the emergence of fascism, contradictory consequences of the technical revolution, which were reflected in such works like: A. Huxley, "This New Brave World," G. Orwell, «1984», and others.

Dystopia emerges and develops on the basis of utopian ideas. When trying to realize at least one utopian idea it becomes clear that for humanity it will not do any good. After all, such a society can exist only on paper, not in the real world. This created the genre of dystopia, which is spreading at an unprecedented rate due to the turbulent socio-political events.

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UNESKO WORLD HERITAGE AS A LEVEL OF TOURISM DEVELOPMENT IN AUSTRALIA

The UNESCO World Heritage Site has received considerable attention from both locals and tourists alike. The list of such objects in the Australian Union has 19 names, which is 1.7% of their global number (as of 2019), of which 2 objects are listed by cultural criteria, 12 - by natural, 5 - mixed.

Consider the most visited UNESCO World Heritage Sites [3].

The first place to attend is the Sydney Opera House, which opened in 1973. Wonderful urban sculpture located on the water landscape at the edge of the peninsula, speaking to Sydney Harbor, the building has had a lasting impact on architecture. The Sydney Opera House consists of three groups the interconnected vaults of "turtles", which overlap the two main concert halls and the restaurant.

These seashells are located on a large platform and surrounded by terraces which function as pedestrian halls. The Sydney Opera House has outstanding universal value for its achievements in the field of design and construction technologies. It was included in the national heritage list in 2005 in accordance with the Environmental

Protection Act and the New South Wales State Register of Heritage in 2003 according to the Legacy Act 1977 [1].

Second place is the Great Barrier Reef, which is called the most beautiful coral reef in the world. It is an entire ecosystem of 3000 continuous reefs, stretching 300 kilometers along the Queensland coast. It is one of the seven natural wonders of the world, a huge living organism with rich flora and fauna. You can see the reef as a small plane excursion, and go there by boat and even scuba dive.

Third place was Carlton's Royal Exhibition House and Gardens, which are a preserved manifestation of the international exhibition movement of the late 19th and early 20th centuries. The Exhibition House was built as a Great Hall, a permanent building, which was intended to host the Melbourne International Exhibition of 1880 and the subsequent Melbourne International Exhibition of 1888. At the Carleton Gardens Exhibition Reserve in the north and south the Great Hall is located. This building is cruciform in plan and includes a typical architectural pattern earlier exhibition buildings: the dome itself, large entrances to the portal, observation platforms, towers and portholes [2].

In fourth place by attendance – Phillip Island – is one of Australia's most beautiful islands with the best beaches. On the territory of 100 hectares you can see many amazing things – many mangroves, shrubs and other vegetation, wetlands with diverse flora. Among the representatives of the local fauna – population of penguins, who travel daily from their homes to the sea and back, marine seals, koalas and many rare birds. The island is part of one of Australia's National Parks.

Fifth place ranks farthest from Australia – Christmas Island, which has a culturally diverse population, which includes Malaysian Chinese and Indians, as well as Australians. The island is known for its biodiversity. Many plants and animals are endemic. Its most famous species is the red crab. Thousands of tourists come to see the annual red crab migration to the sea, which is considered one of the greatest wonders of nature and occurs annually in November [4].

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How Social Media Influences on People's Mind during COVID-19

Anxiety, tension, fear, panic — are the manifestations of widespread concern, both personal and public, that has arisen from such an unexpected phenomenon as COVID-19 epidemic, that changed the lives of Italians and Europeans in a short span of time [2]. It seems that the danger that used to be so far away is quite close now. This all also causes irrational behavior, such as emptying supermarkets or pharmacies, even in areas where there is no infection [1].

As people have never faced the problems of such a scale during the last 200 years, it is essential to examine the impact of information on the society and learn to manage this information.

It's important to realize that media and social networks play the key role during the pandemic. According to the survey 48% of the population have admitted that they are watching TV more often now, 40% checking the web sites constantly, 39% — watching streaming frequently. For the most part, humankind responds very painfully to any news of new terrible diseases, which seems to be spreading at high speed through the world [2]. Using their influence on the public and the human subconscious, the media, including informal insiders, can spread deceptive and potentially dangerous content, thereby raising social anxiety. Our subconscious is very responsive to any signals from the outside, forming a certain picture of what is happening. Therefore, without even being aware of all the responsibility for the information being spread, journalists, bloggers, pranksters can potentially influence the level of anxiety and emotional instability of a person [3]. 74 % of the population believe that there are too many fakes connected to the COVID-19. Against the background of public panic, misinformation can be extremely dangerous for particularly vulnerable sections of the population, including the older generation, who has not learned yet how to filter information from online resources quickly.

However, it doesn't matter how persistent and picky you are, when you choose the information to believe in, it is difficult to completely protect yourself from information aggression. As a result, your behavior will become irrational [4] and then you will do reckless things.

Thus, relying on the research one can highlight a few tips how to protect oneself from misleading and negative information:

- Trust only proven sources of information and comments from international healthcare professionals or scientists. According to the data 48% of people believe official sources of information (scientists - 83%, doctors - 82%).

- Remember: your mental and emotional state directly affects the physical one. Avoid information overload.

— Always be calm and optimistic [3].

COVID-19 and social isolation will lead to the desire of communicating with the help of the Internet, and social networks will become the platform of interaction and the source of information. Therefore, the misleading information will be spread, that will affect on the social state badly. That's why we advise you to follow this algorithm: checking of the source, decreasing of emotional perception, calmness and equilibrium.

In conclusion, it can be said, that perception of information is different during the epidemic, that's why this topic requires further learning.

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LEHRSTUHL FÜR GEISTWISSENSCHAFTEN BEI McDONALDISIERUNG DER HOCHSCHULAUFBILDUNG

Moderne Ukraine kann auf ihrem Weg zur Europäischen Gemeinschaft nicht umhin, Teilnehmer an den globalen Prozessen, die alle Bereiche des gesellschaftlichen Lebens betreffen, zu sein. Die Hochschulausbildung ist darunter keine Ausnahme. Eines der Globalisierungsmerkmale ist der Prozess der McDonaldisierung geworden. Er wurde vom US-amerikanischen Soziologen George Ritzer in seinem Buch „The McDonaldization of Society“ beschrieben [3].

Die Hauptaspekte der McDonaldisierung sind:

– Effizienz (optimaler Übergang von einem Zustand bis zum anderem, bester Weg vom Hunger bis zum Sättigungsgefühl);

- Kalkulierbarkeit (unter Berücksichtigung ist der Anzahl der verkaufenden Waren und Services, die Anzahl ist die Äquivalent der Qualität);
- Voraussagbarkeit (alle Waren und Services sind gleich jederzeit und an jedem Ort);
- Kontrolle (alle Mitarbeiter sind gleich an jedem Ort und machen gleiche Operationen; die Arbeit aller Fast-Foods wurde darauf gezählt, um schnell zu essen und wegzugehen) [3].

Wie bekannt entsprechen die Lehrgänge an den Universitäten den Anforderungen folgender Aspekte – „die meisten Lehrgänge dauern eine Standardanzahl von Wochen, jede davon teilt sich in eine Standardanzahl von Stunden“. Der Ausbildungsqualität wird mit solcher Stundenzahl fast keine Aufmerksamkeit gewidmet [3]. Sicherlich steht es außer Frage, dass man Autonomie bei Lehrinhaltsauswahl nicht realisieren kann. Es gibt an den Universitäten eine Tendenz, Fachkräfte so auszubilden, dass sie nur engspezialisierte Probleme lösen können (diese Tendenz entstand im Ausbildungssystem im Westen und sie erfordert das Studium der Geisteswissenschaften nicht [2]). Dieser Sachverhalt wird von der Situation in moderner Ukraine damit ergänzt, dass in Folge „einer ökonomischen Unsicherheit, einer unwirksamer Staatsregierung und, als Ergebnis, eines chaotischen Gesellschaftslebens, das Interesse an der Ausbildung sinkt und wenn auch Jugendliche sich weiterhin fürs Studium bewerben, leisten sie keinen Einsatz für echtes Studium [1].

Es sei betont, dass es ziemlich schwierig ist, den weltweiten McDonaldisierungsprozessen zu widerstehen. Der Lehrstuhl für Geisteswissenschaften kann der Bewahrung der kulturellen Kompetenzen der Studenten seinen Beitrag leisten. Unter dem Begriff „Geisteswissenschaften“ verstehen wir „Geschichte der Ukraine und ukrainischer Kultur“, „Politologie“, „Soziologie“, „Psychologie“ und „Rhetorik“. Die genannten Disziplinen entwickeln folgende Fähigkeiten:

- kritisches Denken. Es ist sehr wichtig, eigene Meinung zu haben und sie äußern zu können. Besonders aktuell ist es in unserer Informationsgesellschaft, wo die Menge der gefertigten Daten jede zwei Minuten verdoppelt, und wie wir derzeit wissen, kann sich im Augenblick grundsätzlich verändern. Deswegen soll ein Student immer skeptisch sein. Daraus ergibt sich die nächste Fähigkeit;

- Forschungsfähigkeit. Wie die Praxis zeigt, versteht ein Student im ersten Studienjahr kaum den Prozess des Wissenserwerbs, der häufig so bedeutend ist, dass der Studierende einfach die Information aus Internet kopiert, beseitigt dadurch den Stellenwert des Wissens und das Hochschulausbildungsprestige. Geisteswissenschaftsstudium, insbesondere die Momenten, die viele Gegenpositionen in der Fachliteratur haben, erfordert die Teilnahme des Studenten an öffentlicher Diskussion und infolge dessen die Bildung seines Standpunktes. Der Student soll die

Fachliteratur so viel wie möglich studieren, und direkt im Unterricht seine eigene Meinung äußern. Für die moderne Ukraine ist es sehr aktuell, besonders im Lichte einer hybriden Gefahr und des Kampfes für unsere Selbstidentität. Wir sollen nicht zulassen, wovor uns E. M. Jakobsson warnt, dass die McDonaldisierung die Institutionen betrifft, wo wir die Angestellten haben, die sich stillschweigend in das Diktat der Leitung finden, das heißt, dass Angestellte wie auch Bürger sich leichter steuern lassen, wenn sie nicht in der Lage sind, historische Muster und Prozesse wiederzuerkennen [5];

- kommunikative Fähigkeiten;
- Fähigkeiten im Team zu arbeiten. Diese Fähigkeit braucht unbedingt jeder Hochschulabsolvent, um sich auf modernem Arbeitsmarkt realisieren zu können;
- patriotische Erziehung. Sie soll das Verständnis des zivilisatorischen Platzes der Ukraine in der Welt geben, insbesondere im Kontext der internationalen Beziehungen, die seit dem Zusammenbruch der Sowjetunion und der Bildung der politischen Multipolarität der Welt entstanden (laut S. P. Huntington [4]).

Also, der Lehrstuhl für Geisteswissenschaften der Universität kann die hochgebildeten, hochmoralischen und patriotischen Fachkräfte, die für ein lebenslanges Lernen bereit sind, ausbilden helfen.

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REASONS FOR THE APPEARANCE OF NEOLOGISMS

The modern world is full of active changes of political, economic, social and scientific and technical nature. This entails the emergence of new words in language and rethinking of old concepts.

California-based Global Language Monitor found that a new word appears every 98 minutes in the vocabulary of the modern world language. The vocabulary of the English language can increase by thousands and even tens of thousands of words per year. Scientists explain such a large number of neologisms in the vocabulary of the

modern language by the existence of its various variants. For example in American English or Chinese English there are a lot of words that describe their realities and are absent in the standard British English. A study of neologisms of recent decades shows that the vector of development of the English language is changing towards creating new words from its own resources[2].

The first neologisms in dictionaries appeared in 1604. Early neologism dictionaries were: Table Alphabeticall (1604, Robert Cawdrey), English Expositor (1616, John Bullokar) and The English Dictionarie (1623, Henry Cockeram). These dictionaries called some features of neologisms, but the real study of neologisms began in the 20th century, after about 200 years.

There are many reasons for the emergence of new words. Some of them have internal or linguistic reasons (phonological, morphosyntactic, lexical or semantic). Others are external, which we will consider.

M.S. Makmakhon highlighted the following reasons for semantic changes:

- language;
- historical (divided into “ideas” and “scientific concepts”);
- social;
- psychological (divided into "emotional factors" and "taboos");
- external exposure;
- the need for new words.

The emergence of neologisms goes through three stages: creation, testing and consolidation [1]. Initially, unstable neologism is created and used only by a limited audience. M.N. Epstein calls such neologism "protologism". Protologism is a newly created word which has not yet gained any wide acceptance. It is a prototype or a hypothetical projection of a new lexical unit before it may become current in writing or speech. [3].

In the end, neologism becomes "stable", recognizable, gaining universal recognition. Evidence of the stability of neologism is its appearance in glossaries and dictionaries. But, this stage may not be the last, and thus could be proposed a scale of novelty, depending on the acceptance of neologism in society and its longevity.

Neologisms often arise in the media, advertising and technical fields, being a "response to an emerging need." For example, the necessity to create already lexicalized neologism PC (Personal Computer) appeared only after the computer became available to everyone.

It must be remembered that a holistic picture of the state of the lexical stock of the language and the dynamics of the emergence of neologisms in it can be obtained only with a comprehensive study of intralinguistic and extralinguistic factors, since they are in constant interaction and mutual influence.

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СУЧАСНІ ДОСЛІДЖЕННЯ В СФЕРІ СОЦІАЛЬНО-ЕКОНОМІЧНИХ НАУК ТА ІНФОРМАЦІЙНИХ ТЕХНОЛОГІЙ

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INNOVATIVE ENTWICKLUNG DES UNTERNEHMENS

Die Wirtschaft eines Landes ist ohne innovative Entwicklung kaum vorstellbar. In der internationalen Praxis gibt es Gesetzgebungsakte, die günstige Bedingungen für die Verbesserung der Produktion schaffen. Es ist eine Art Motivation für verschiedene Faktoren der wirtschaftlichen, wissenschaftlichen und technologischen Entwicklung.

Innovative Anpassungen sind sehr wichtig. Zum einen tragen sie zur Wettbewerbsfähigkeit der Unternehmen und zu ihrem Exportpotential bei und garantieren auch das Erreichen hoher wirtschaftlicher Entwicklungsraten. Moderne Unternehmen brauchen intensive Innovation, eine effektive Organisation von Forschung und Entwicklung, die Reduzierung von Innovationsrisiken.

In den letzten Jahren ist in der Ukraine ein starker Rückgang des Bruttoinlandsprodukts zu verzeichnen. Eine Möglichkeit zur Steigerung ist daher genau die Aktivierung der Innovationstätigkeit im Produktionsbereich der Regionen, da dort die zusätzlichen Kosten des Produkts entstehen.

Betrachten Sie die Interpretation des Begriffs "Innovation". Dies ist eine Aktivität, die auf die Entwicklung, Einführung und Entwicklung neuer Produkte oder Technologien abzielt. Dieses Konzept als neue wirtschaftliche Kategorie wurde vom österreichischen Wissenschaftler Josef Schumpeter (1883-1950) verwendet und eingeführt. Dieses Wort wurde in den dreißiger Jahren des zwanzigsten Jahrhunderts verbreitet. Der Wissenschaftler betrachtete Innovation als die Hauptgewinnquelle, und sie ist das Ergebnis der Einführung von Innovationen ohne Entwicklung. Es gibt keinen Gewinn. Ohne Gewinn gibt es keine Entwicklung. Der Autor hat 5 Haupttypen von Innovationen:

- Veröffentlichung neuer oder erheblich verbesserte Produktion;
- die Entwicklung neuer Arten von Geräten und Technologien;
- Eroberung oder Schaffung neuer Märkte
- Öffnung neuer oder Zugang zu bestehenden Rohstoffquellen;
- Schaffung einer neuen Industrieorganisation (z. B. Sicherung eines Unternehmensmonopols oder Entzug eines konkurrierenden Unternehmens eines solchen Status). [1]

ENTWICKLUNGSBEDINGUNGEN

Einer der Hauptfaktoren für die Entwicklung eines innovativen Unternehmertums ist die wissenschaftliche und technische Spezialisierung. Dies bedeutet nicht nur die Spezialisierung auf bestimmte High-Tech-Waren und -Dienstleistungen, sondern auch die Definition vorrangiger Branchen, in denen sich die Bemühungen zuerst konzentrieren. Es sei darauf hingewiesen, dass jedes Land seine eigene Spezialisierung hat, die auf der Entwicklung kritischer Technologien und der internationalen Arbeitsteilung beruht. Innovatives Unternehmertum kann nicht auf einer Branche oder einem Tätigkeitsbereich basieren, da eine solche Spezialisierung die Länder kritisch von der Nachfrage nach Industrieproduktion abhängig macht. Im Gegenteil, eine breite wissenschaftliche und technologische Spezialisierung bedeutet mehr Flexibilität, Stabilität und Unabhängigkeit des Landes auf dem Weltmarkt.

Der nächste Faktor ist das Anpassungspotential. Es sichert die Nachhaltigkeit der Wirtschaft im Kontext eines auf Innovation basierenden systematischen Wachstums. Dieses Potenzial sollte die aufkommende systematische Unsicherheit und das strukturelle Ungleichgewicht verringern.

Ebenso wichtig ist die Bedingung, das Einkommensniveau der Bevölkerung zu erhöhen und eine stabile soziale Struktur der Gesellschaft zu gewährleisten. Dies wird das Volumen der verkauften innovativen Produkte erheblich erweitern. Sie werden allgemein verfügbar sein, was sich positiv auf die Geschwindigkeit der Kommerzialisierung von Innovationen auswirken wird.

UKRAINE

Die Wettbewerbsposition der Ukraine in der Weltrangliste ist heute instabil. Laut dem Weltwirtschaftsforum im Global Competitiveness Report 2017-2018 belegte die Ukraine unter 137 untersuchten Ländern den 81. Platz, was einem Anstieg von 4 Positionen gegenüber den Vorjahren entspricht. Nach Komponenten des Indikators, der die Effizienz der Märkte kennzeichnet - ein Schlüsselfaktor für das Stadium des Investitionswachstums (Industrialisierung) - belegt die Ukraine unter 137 Ländern den 101. Platz bei der Effizienz der Rohstoffmärkte, 120 bei der Effizienz der Finanzmärkte und 86 bei der Effizienz des Arbeitsmarktes.

Laut dem von Bloomberg im Jahr 2018 vorgelegten Innovationsindex belegt die Ukraine den 53. Platz unter 60 untersuchten Ländern. Darüber hinaus lag unser Land bei der Effizienz der Arbeit unter den 60 untersuchten Ländern an letzter Stelle.

Laut dem Global Innovation Index belegte die Ukraine im Jahr 2018 den 43. Platz und stieg somit sieben Plätze im Vergleich zum Vorjahr auf. Die Ukraine ist im Vorjahr um sechs Punkte gestiegen, was auf eine hohe Innovationseffizienz zurückzuführen ist.

[2]

Um 2017 innovativ zu sein, wurden Industrieunternehmen 703 neue Technologien von Industrieunternehmen und 129 im Ausland gekauft. Im Vergleich zu 2015 hat sich die Anzahl der außerhalb unseres Landes erworbenen Technologien fast verdoppelt. [3]

SCHLUSSFOLGERUNG

Aus dem obigen Material können wir daher den Schluss ziehen, dass die Entwicklung eines innovativen Unternehmertums sehr wichtig ist. Unter den Aufgaben, die angegangen werden sollten, um die Innovationstätigkeit der ukrainischen Regionen zu steigern, ist die Verbesserung des derzeit unterentwickelten institutionellen Umfelds im Kontext sowohl öffentlicher als auch privater Institutionen am wichtigsten. Derzeit ist die Ukraine kein hoch entwickeltes Land im Bereich Unternehmensinnovation und Innovation im Allgemeinen. Aber jedes Jahr wird das Ranking höher.

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DATA SECURITY AS A MODERN PROBLEM IN INFORMATION TECHNOLOGY SPHERE

Today humanity exists in “digital era”, thus the great majority of aspects of our daily lives had lost their physical representations and switched to an electronic form. Every branch of industry now evolves within the concept of the information technology, which provides significantly wider possibilities for business community. But opening new horizons predictably results in coming across entirely new problems, one of them being data security.

Rapid progress in technology sphere brought us to the state when society has developed a strong connection with the Internet, making it the most efficient but unsafe way to store and exchange data. Not only business has greatly advanced over the years, but such threat as a cyber criminality has appeared to be a real concern that is often remains underestimated.

Most people have experienced cyber-attacks of some sort[1]; identity thefts, sabotage, theft of the intellectual property are considered to be the most common threats nowadays. Nevertheless, the main targets of the criminals are big companies that operate with great amount of client data, including personal information. Any modern enterprise at a particular stage of business process works with such informational assets as personal data about workers, clients and business partners, information about contracts, deliveries and bank transactions, product development data etc. All this leads to exceedingly high demand in information security professionals and customized protection programs. The concept of CIA[2] (balanced protection of Confidentiality, Integrity and Availability) had been developed in order to manage the risks regarding cyber criminality[3]. However, the constant changing of technologies makes it impossible for professionals to develop an ultimate fundamental solution for this problem.

The latest surveys show that information threats are now having a tendency to go further and further “inward”. More and more companies are becoming outsourced; therefore a non-employee accessing a company’s internal system becomes a common practice. The amount of information stored and operations handled online grows rapidly every year, which makes a risk of a breach a lot greater of a concern. The internal risks are far more difficult to manage due to their “invisibility”[4].

All in all, in my personal opinion, dealing with challenges is an essential part of progress, as it shows that the information technology is not stagnating. The overall situation remains dynamic, providing the specialists with new problems to solve every day. However, the great news is every each of those problems can be solved by a human, since it was created by one.

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INDUSTRY OF COMPUTER GAMES: HISTORY OF ORIGIN AND DEVELOPMENT

The first computer games appeared at a dawn of a computer era, at the time of lamp computers. In 1952 A.S. Douglas as a part of the university dissertation created the OXO program working on the big EDSAC computer at the Cambridge University. It was the easiest way of realization of a game known as "tic-tac-toe", but until technologies did not allow producing compact and reliable computer systems, creation of games was destiny of certain keen research associates.

1970th

The beginning of game industry is considered to be started in 1971 of the game Computer Space on arcade machines. The next step on the way of formation of this industry was commercial success of game called "Pong" by Atari in 1972. In total 19 thousand arcade machines with this game were sold.

In the process of development of technologies and appearance of new devices (for the first time specialized and then multi-purposed), game industry developed and adapted to new realities.

The end of 1970th and the beginning of 1980th were "The golden era of arcade machines".

The new games had significant differences to the best from the first patterns of industry visually and in process of game.

Some of the most significant projects released during this period:

- "Computer Space" became the first video game in the world intended for mass user.
- The first game console "Magnavox Odyssey", created for home use.
- Multiplayer game "Empire" – Turn-Based Strategy (TBS), in which 8 players ran the space empire, trying to take dominant positions.
- "Maze War" – the first first-person view game.
- The first text role-playing game "Dungeon".
- "Colossal Cave Adventure" – started the new genre – "adventure".
- "Death Race" – the first game to be banned because of violence and cruelty in game process.
- Atari 2600 – second generation game console.
- Pocket game console – Microvision.

1980th

In the 1980s, with appearance of PCs, the direction of game development for them began to form. At first, the games were created by enthusiastic developers, but as the production and spread of personal systems increased, commercial game products began to be produced for them. The games for personal systems had

significant differences from classic arcade games. During this time new strategies and complex RPG worlds emerged. But still the basis of game industry were arcade machines and specialized game consoles.

The total world income of game industry in 1982 came close to 12 billion (close to 30 billion in 2012 prices).

Some of the most significant projects released during this period:

- Emerged a new genre "Rogue-like".
- IBM began to sell first PCs.
- Appeared console of the third generation – Nintendo Entertainment System (NES), and then its clone Dendy.
- Legendary game "Tetris".
- The new genre was born – "Japanese role-playing games" (jRPG). The first jRPG – "Dragon Quest".
- "Maniac Mansion" – the first adventure, where computer mouse was used to control.
- Sega Mega Drive – console of the fourth generation.

1990th

In 1990th the following development of digital technologies (the introduction of CD-ROM, the development 3D hardware of imaging technologies, emergence of the Internet) and spread of GUI oriented operating systems (Microsoft and Mac OS) led to a significant increase of games' share.

It is during this period all basic game genres and a great variety of game mechanics emerged.

A joint game in clubs or via the Internet became available. The Cybersport arises.

In the middle of 90-s, the first educational institution which trains video game developers appeared. DigiPen Institute of Technology opens in Vancouver in 1994.

Some of the most significant projects released during this period:

- Appeared a new genre "global strategy". The first pattern is "Civilization".
- 3D shooter with the first-person view - "Wolfenstein 3D".
- The first real-time strategy (RTS) – "Dune".
- The first horror game "Alone in the Dark".
- The fifth console generation – PlayStation (PS).
- "Warcraft: Orcs and Humans" – RTS, became the leader of the genre.
- The game "Highlander: The Last of the MacLeods" first applied motion capture technology used previously only in films.
- Ultima Online is the first truly massive and successful multiplayer online game.
- The cult RPG "Fallout" was released.

- "Half-Life" is the first game in which the plot was served directly inside the gameplay with no video inserts and text.

2000th

In the 2000s the main drivers of development of game industry became wide spread of the Internet and appearance of mobile devices sufficiently productive for game realization.

In 2003 a unique educational institute appeared (The Guildhall at SMU, Texas). It is unique in that Tom Hall, John Romero, Paul Jaquays, Tim Willits and Richard Bailey Gray (computer game designers) participated in the development of the curricula.

At this period development of the cybersport reached fantastic heights. It is interesting that after a few years of Star Craft release it became a national sport in South Korea, collecting entire stadiums for final matches.

During the period of greatest popularity gamers earned between \$20 and \$600 thousand a year.

Some of the most significant projects released during this period:

- Sony's game console PlayStation 2 and Microsoft released Xbox – the sixth generation.
- "The Elder Scrolls III: Morrowind" is released. It set new standards for RPG: a huge open world, worked out leveling system for character, an interesting main story.
- Xbox 360, Sony PlayStation 3 were available for sale and a bit later the Nintendo Wii – the seventh generation.
- "Fahrenheit: Indigo Prophecy" – an interactive film with different endings of the storyline and many options of events development.
- The legendary indie game "Minecraft" in the "sandbox" genre was released.
- Release of Sony PlayStation 4 and Xbox One – the eighth generation.
- A new game genre of survival shooters (Battle royal) is emerging. One of the first games - "PlayerUnknown's Battlegrounds".
- The virtual reality gaming industry (Oculus Rift, Sony Playstation VR, HTC Vive) began to develop. VR projects were released as "The Elder Scrolls V: Skyrim VR," Doom: VFR, "Fallout 4 VR."
- Game consoles PlayStation 5 and Xbox Series X were announced – it will be the ninth generation.

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THE USE OF A DOUBLE-DISK IMPULSE THEORY TO CALCULATE THE VERTICAL – AXIS WIND TURBINE

The construction of wind power plants is a promising trend in the development of alternative energy. The benefits of wind power include low operating costs, renewability and environmental friendliness. Therefore, research in this area is of great importance not only for Ukraine, but also for the whole world.

Currently, a number of methods for aerodynamic calculation of wind turbines of the vertical – axial type are known. They can be conditionally divided into two groups: the first group includes various versions of impulse theories, and the second group includes methods for the numerical integration of equations of fluid motion in various formulations.

The two-disk impulse theory is based on the equations on the change in momentum and kinetic energy, which are used separately for the windward part of the wind turbine and separately for the leeward – i.e. a wind turbine, as a mechanical object, is replaced by two conventional sections – “disks”, on which the flow interacts with the blades [1].

The implementation of the impulse theory under consideration leads to the following algorithm: the forces that act on the blades and traverses, on the one hand, are expressed through the aerodynamic coefficients of the blades and traverses, and on the other hand, the same forces are expressed using the momentum theorem for each of the sections. This method leads to a system of two transcendental equations that determine the magnitudes of the induced flow rates in the windward and leeward parts of a wind power installation. These equations by elimination are reduced to one transcendental equation, which is solved by the iteration method. The solution of the equation allows you to find the dependence of the induced speed in the windward and leeward parts of a given speed of the wind flow and the angular velocity of rotation of the wind wheel. Moreover, the theory under consideration is based on the initial data on the aerodynamic coefficients of the profiles selected for the blades and traverses in the entire range of angles of attack [3].

Among the advantages of the proposed pulsed method, we should first of all note its relative simplicity and acceptable accuracy in determining the energy characteristics of wind power plants. The time costs of machine time during its implementation are not comparable with the resource-intensive solution of an unsteady three-dimensional aerodynamic problem based on the Navier – Stokes equation system, which describes a real wind turbine [2].

The created calculation algorithm allows for a one-parameter study of the main energy parameters, the influence on them of the geometry of the blades and traverses, structural and climatic factors.

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TOURISM DEVELOPMENT IN SPAIN

Spain is a very popular country among tourists. Every year, the country is increasingly consolidating its position in the tourism sector. It is one of the countries most visited by tourists.

Spain's tourism market is formed mainly due to external demand, which is oriented towards the reception of foreign tourists. Tourists choose Spain as a renowned tourist destination because of the hotel's comfort, impeccable service, hospitality and care are the main factors that prevail when choosing a holiday country.

And relatively low prices are more decisive. Spain offers tourists different types of tours: from beach-resort, sightseeing, entertaining, skiing, cultural-entertaining to religious. Spain has a well-developed modern hotel base. Spain, like any country, has a unique culture and traditions, and its natural and climatic location contributes to its visit throughout the year. In Spain, thanks to its geographical location, there are three main climatic types – continental, oceanic and Mediterranean. The continental climate in the summer months attracts tourists from Northern Europe and is in high demand among the Spaniards themselves [4].

According to the National Institute of Statistics, 81.8 million tourists visited the kingdom in 2017, an increase of 8.6% over the previous year. Tourists' expenses also increased. The largest number of tourists went to Catalonia – 19 million people, which is 5% more than in 2016. 14.2 million people chose the Canary Islands, up 7.2% from a year earlier. Another 13.8 million people chose the Balearic Islands for a holiday, up 6.1% from a year ago. Further in the rating is Andalusia, it was visited by 11.5 million, an increase of 8.9%. 8.9 million tourists went to Valencia, which is 15.3% more than in 2016. The

flow to Madrid also increased significantly – by 15.8% to 6.7 million. 66.6 million tourists used air travel to enter Spain, which is 10.4% more than in 2016. Most of the tourists who visited Spain were citizens of the United Kingdom, the United States, Germany and France [2].

Outbound tourism in Spain, though growing, is still underdeveloped. Tourists from Spain visit mostly neighboring countries. The most popular country among the tourists of Spain is the closest to it Portugal – the country with which Spain has long shared cultural-historical roots and close ties. The direction of tourists to France is due to geographical proximity, well-developed motorways, the only language group. France is also dominated by 3-star hotels, which also attracts medium-income tourists, plus to that – border transparency, a single banking-currency system. In the meantime, it is worth noting that ski tourism is being developed in France, Austria and Germany (one of the main specializations of these countries in the tourism industry). This attracts tourists from different countries, including Spaniards. A large stream is directed to the UK, a country that is very unusual and largely unlike other European countries. It is an island state with a rather ancient and distinctive culture. Spaniards also prefer relatively cheap services in Morocco, Tunisia, Turkey and Greece [3].

Increase in income of the population has led to a rapid pace of domestic tourism development. The most popular among the population of Spain are coastal resorts, and among the regions are Valencia, Andalusia and Catalonia [1].

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THE MAIN PROBLEMS OF ARTIFICIAL INTELLIGENCE

Nowadays information technologies development is passing extremely fast. For example, Moore's law says, “the number of transistors on a computer chip doubling about every 18–24 months (in modern formulation)”. It means that computer chip performance would double approximately every 18 months (with no increase in power consumption). During the last 20 years, computer technologies have passed a great way, from being perceived as the scariest invention possible to becoming an essential

part of everyday life. But, unfortunately, even now such problems as fear of new technologies appear.

Firstly, we have to understand what artificial intelligence means. We will use as a definition, that one that was given by John McCarthy in 1956: "...a machine behave in ways that would be called intelligent if a human were so behaving." [4]

But nowadays the only thing we have is artificial neural networks. It's a math model (and, of course, it's software or hardware incarnation), inspired by the biological neural networks that constitute animal brains. Although, we can say, that ANN is the most similar to AI technology. Mostly they are not very complicated programs, made with some cost function and activation function. [2] Moreover, they surpassed all our expectations, they can make such complicated actions that we couldn't expect. For example, in 1997 IBM Deep Blue won the world chess champion, since then ANN has won almost everywhere. It is used for a lot of tasks: different events prediction, speech recognition, also they help your smartphone to blur photos.

So, the main problem of AI is technological singularity. The technological singularity – also, simply, the singularity – is a hypothetical future point in time at which technological growth becomes uncontrollable and irreversible, resulting in unforeseeable changes to human civilization. Humanity is afraid to lose control. A lot of films tell us about the dangers of artificial intelligence, "Terminator", "Matrix", for example. Such a person as Stephen Hawking or Elon Musk tells about its danger and begs to stop its development. How we can speak about its creature when we haven't understood morality.

For example simple task for autopilot: there is a pregnant woman in front of it, no breaks, it can turn only in 5 standing on the pavement people.[1] People's opinions toward this task differ, and we can't tell exactly which decision are correct, we will have to teach it.

There are also some technical problems – we still have no idea how our brain is built (AI based on it). That's why we have no technologies to make more convenient ones. Nowadays we can copy a short chain of neurons, but there are more than 86 billion in our brain. [3] Even if we assume that we have solved all these problems, and figured out the moral, we have to discover if it has intellect.

Humanity did not encounter such a problem. We can't understand when we need to consider him to be alive, because we don't know what does it means. Also, if he is alive, we need to decide what place in our society he needs to take, and how can we protect ourselves. People are afraid that when AI discovers all our faults, it would become very angry and destroy us.

There are some variants to protect us. For example, the Three Laws of Robotics also known as Asimov's Laws. But they are quite controversial, and can't guarantee

our safeness. But the most difficult part is to understand what it is. There are some possible variants, the Turing test, for example. [1] But we can't know for sure if it works. For instance, the Chinese room thought experiment can make you doubt it. And the most important, we don't know what does consciousness and intelligence means, and how to measure it. There are a lot of different tests, but they can only show the skill to solve them.

And so, I'm sure, those technical problems will be able to solve. The most difficult part – to solve moral problems. Despite our unreadiness and fear, technology will continue to evolve. And we will have to study these questions sometimes. So we have to get ready for this. And one thinks I can say for sure, we can't stop technological development, we have to study live with it.

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FEATURES OF COOLING THE DETONATION ENGINE CHAMBER

In a detonation engine (DE), the combustion of the fuel mixture occurs in a detonation mode at high temperatures (above 4000 K). Due to the fact that the DE operates in a non-stationary mode and under low pressure of supply of components to the chamber, it is impossible to use the traditional system of regenerative cooling due to the lack of a turbine pump unit in the detonation engine installation [1]. Aircraft engines typically use air-cooling systems. Experimental testing of the design of a pulse detonation engine uses the system of blowing air. In well-known laboratory studies of DE with rotating waves have successfully used a flow-through system of cooling the chamber with water. However, the search for an effective full-blown rocket detonation engine cooling system is still ongoing.

Any detonation in gases is accompanied by the formation of a complex heterogeneous and unsteady flow structure behind its leading front. The only tool for solving such problems today is mathematical simulation with technologies of computational experiment [1].

Despite the importance of the high heating upon the DE structure, not much attention has been paid to cooling techniques. While most DEs are presently operating as ground demonstrators, any flight weight design must consider cooling methods carefully. The heat transfer problem is complicated by the cyclic nature of the flow processes in a pulse detonation chamber.

Minimizing the temperature of a fire wall is a determining factor in the performance and reliability of the chamber. At a certain temperature of the wall surface, there is an unauthorized deflagration ignition of a fresh portion of the fuel mixture, which is unacceptable. However, excessive intensification of heat transfer in the cooling path can significantly impair the thermal and hydraulic performance of the cooling system. The existence of the self-similarity regime is experimentally proved, when a change in the flow rate of the coolant over a wide range does not affect the change in the wall temperature. It has also been found that the use of a multi-chamber configuration leads to a decrease in wall temperature by increasing the surface area of heat transfer [2].

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THE SMART HOME CONCEPT

Smart home is a story about how high technologies make our world better and our daily routine easier. Some people still think that the concept of smart home is far-fetched or does not consider this to be efficient, while others have realized for themselves all the benefits of Smart home.

The history of Smart home dates back to the XX century. In 1961, Joel Spira and Ruth Spira patented the first dimmer. This device was invented to regulate the light automatically. In 1978, the first data transfer standard was developed by a Scotland company Pico Electronics. It was similar to programming language or operating system for the functionality of applications which controlled the work of household implements [1].

What is meant by the name “Smart home” now? It is a common name for all systems of home automation or a group of devices, that can include the control of lighting, heating, cooling, room ventilation, automatic alarm, and blocking entry [2].

A central controller is the main element of Smart home. It processes information, which is got from the special detectors. Programming code is downloaded to the controller and then the necessary system parameters are calculated. The information is sent to the server, which connects the controller with appliances. The server processes the received data, so the system speed and reliability depend on it. This component can also be connected to the computer in the house with the software. The Smart home is run in that way.

The architecture of Smart home is built around one powerful controller that is in charge of all dimensions of the house. It has a lot of outputs to connect all possible interfaces and implements. This kind of the Smart home is called centralized one.

These are more distributed systems. This means that all the gadgets have their own controllers with their own memory. Decentralized systems are found to be more stable because if one item is out of order, the work of the whole system is not at risk [3].

All components of Smart home can be connected with a wired or wireless communication. The first variant demands a vast amount of the cables. This fact can be a significant weakness as it needs large correction, addition or replacement of the leads. However, the wired communication costs less than the wireless one, has high data transfer speed and is very reliable.

The wireless type represents an interaction with the help of a radio signal. It has no need to use any cables. The exploitation of wireless system is therefore rather convenient. Despite this advantage, it is meaningful to ensure that the level of protection from external factors is really high and all the connections are secure [4]. Moreover, different gadgets can use different protocols for communications of the Smart home elements such as Bluetooth, Wi-Fi, X10, ZigBee, Z-Wave but there is not a universal standard.

The Smart home concept is a way of comfortable organization of household chores. Nowadays we can say with confidence that smart technologies and automation systems are not a prerogative of the certain people. The market is growing extremely quickly. Thus, new ready solutions will save the time, guarantee the security and make daily lives more pleasant for different customers.

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ANALYSE UND BEWERTUNG DER WIRKSAMKEIT DES MANAGEMENTSYSTEMS DEUTSCHER UND UKRAINISCHER UNTERNEHMEN

Derzeit ist es wichtig, Fragen der Optimierung des Unternehmensmanagements und methodische Ansätze für seine Bewertung zu berücksichtigen. Der Weg zur Steigerung der Wettbewerbsfähigkeit von Produkten liegt in der Verbesserung der Arbeit des Unternehmens. In diesem Zusammenhang müssen die wichtigsten Möglichkeiten dazu auf der Grundlage der Welterfahrungenausnutzung in Betracht gezogen werden.

Die meisten Manager glauben jedoch, dass strategisches Management nur in sehr großen Unternehmen notwendig ist. Dies ist der Grund, warum die Mehrheit der

ukrainischen Unternehmen, die sich in der Organisation manifestieren. Jedes Unternehmen in einem Markt muss die folgenden Grundsätze einhalten: Rentabilität und finanzielle Stabilität. Die wichtigsten internen Faktoren einer Organisation, die die Aufmerksamkeit des Managements erfordern, sind: Ziele, Struktur, Aufgaben und Technologie. Das Ergebnis des koordinierten Zusammenspiels aller Elemente des internen Umfelds sind Produkte, die die Nachfrage der Verbraucher befriedigen. Gegenstand meiner Forschung ist die bekannte und geliebte Süße - Milkschokolade. Gegenstand der Studie ist es, die Wettbewerbsfähigkeit dieses Produkts deutscher und ukrainischer Hersteller zu erforschen.

Zuerst betrachten Sie das bekannte deutsche Unternehmen «*Ritter Sport*». Hier sehen wir gute Werbung. Ein hohes Maß an Managementsystem wird seit 2004 durch IFS- und BRC-Zertifikate bestätigt, ein zertifiziertes Umweltmanagementsystem, 100%-er Umsatz für alle Geschäfte, Unterstützung der Markenpopularität beträgt 99%. Das berühmte Unternehmen hat auch seine eigene Website, die in 6 Sprachen verfügbar ist und auf der man alle Informationen finden kann. Es gibt ein gut entwickeltes internes und externes Umfeld von Organisationen.

Das Unternehmen der ukrainischen Herkunft ist «*Mondelis Ukraine*». Ein wenig bekanntes Unternehmen stellt ebenso leckere Schokolade her. Nach dem Preis unterscheidet sie sich von Ritter Sport praktisch nicht. Die Unterschiede von deutschen Pralinen sind wie folgt:

Fettgehalt. Nach den aktuellen Standards sollte Schokolade 31-33% Kakaobutter enthalten. Neue Standards bieten 18% Inhalt.

Neue Anforderungen. Nach den neuen Regeln müssen sie mindestens 25% Schokolade enthalten. Dies erhöht die Produktionskosten, darum verwenden die Hersteller jetzt die Schokoladenglasur: eine Mischung aus Kakaopulver und pflanzlichem Fett. Die Konditoren sind gezwungen, die Produktion solcher Produkte einzustellen oder auf der Verpackung anzugeben, dass es sich nicht um Schokolade handelt.

Der größte Einfluss auf die Bildung der Entwicklungstrends in der Industrie wird von den Einflussfaktoren der Verbraucher ausgeübt. Dementsprechend kann ein Unternehmen entweder eine Wettbewerbsstrategie formulieren oder eine Diversifizierungsstrategie, die sich auf Märkte konzentriert.

Während der SWOT-Analyse wurde die SWOT-Matrix erstellt, mit deren Hilfe die möglichen Entwicklungsstrategien von «*Mondelis Ukraine*» formuliert und aus diesen die optimale ausgewählt werden konnten. Die optimale Strategie für das Kriterium der maximalen Punktzahl ist also eine Strategie zur Stärkung der Marktpositionen. Das Unternehmen sollte durch zusätzliche Investitionen Maßnahmen ergreifen, um den Umfang der Aktivitäten zu erhöhen, um eine große Marktnische zu besetzen und damit seine Position zu stärken. Es wird auch empfohlen, dass das Unternehmen eine

Marketingabteilung einrichtet, um Marktforschung zu betreiben. Die Strategien entsprechen dem Zustand des externen Umfelds, des internen Potenzials und des von Mondelis Ukraine entwickelten Managementsystems und tragen auch dazu bei, die Schwächen des Unternehmens zu beseitigen. Durch die gemeinsame Umsetzung dieser Strategien kann das Unternehmen seine Ziele erreichen.

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DISTANCE LEARNING: LET'S TAKE A CLOSER LOOK AT EXISTING OPPORTUNITIES

Because of spreading pandemic, schools and universities have switched to the distance learning mode.

Modern technologies support new ways of learning that are learner-centred and can provide teachers and students with access to specialized materials outside of textbooks [2].

Distance learning involves the creation and use of an educational environment that contains various electronic sources of information, namely:

- distance learning courses;
- electronic textbooks;
- virtual libraries;
- databases of educational resources;
- teleconferences.

There are many tools to ensure that participants interact.

Some of them are already well-known platforms for communication, previously used for personal purposes:

- GO TO MEETING (<https://www.gotomeeting.com/>);
- Ding Talk (<https://www.dingtalk.com/en>);
- Jitsi Meet (<https://jitsi.org/>);
- ZOOM (<https://zoom.us/>).

Others are new specialized resources dedicated to the educational process [1]:

- Worksheets (<https://www.liveworksheets.com/>):

Live Worksheets allow you to convert workbooks created in doc, pdf, jpg and png formats to interactive self-testing material.

- SEESAW (<https://web.seesaw.me/get-seesaw-for-schools>):

Students can create their projects in all subject areas with this new toolbar.

- EVERNOTE (<https://evernote.com/intl/en/community/referral/>):

Evernote lets you focus on what is important and has the information needed at your fingertips. Students can type notes or scan handwritten text, add to-do lists, photos, images, web pages, audio files - all of which are easy to find.

- Edpuzzle (<https://edpuzzle.com/>):

Free service for creating video clips with audio and text elements, questions and tasks for them.

- PlayPosit (<https://go.playposit.com/>):

Virtual educational environment for creating and sharing interactive lessons.

- QUIZIZZ (<https://quizizz.com/join>):

At the start of a quiz in the classroom, students answer the questions as they move at their own pace, without being dependent on the speed of the answers of other participants.

However, as practice has shown, in Ukraine, in critical conditions, not specialized platforms remained more popular, but already familiar and convenient Zoom, MS Teams, Viber, etc.

In fact, as long as you involved, it doesn't matter which resource you use. Let's all just stay healthy and educated.

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VOICE ASSISTANTS. HOW AND WHY DO THEY USE NEURAL NETWORKS?

Voice assistants are increasingly entering our lives. The mass appearance of voice assistants began back in the days of the iPhone 4S and Siri that appeared in it. There are also other voice assistants like Alexa, Google Assistant, Alice, Portal, etc. All of them are united by one goal - to make the user's life more convenient.

So let's take a closer look at what a voice assistant is. Voice Assistant is a service based on artificial intelligence. It is able to recognize human speech and perform certain actions in response to a voice command. Most often, voice assistants are used in smartphones, applications or web browsers [1]. Voice assistants are activated by

special phrases ("Ok, Google", "Hi, Siri", "Alexa"). As a rule, voice assistants are able to: make calls, conduct dialogs, get directions, offer answers to user questions, etc.

How the voice assistant works

Each voice assistant has at least a microphone and a speaker: the first is needed to hear your commands, the second to answer you. The voice assistant is connected to the Internet, it can't work without constant access to the network. The device stores all settings in the local memory. It is important that the voice recognition system in most cases is local, device processes the sound and recognizes it by itself. In some cases, when a device can't independently recognize and decrypt a voice, it sends a recording to the cloud, because the servers have more performance and large databases for checking and selecting words.

Now, let's look at an example of a voice assistant like Google Assistant, we will analyze in more detail how this technology works and find out **how and why it uses neural networks**.

Google Assistant was introduced at the Google Developers Conference on May 18, 2016 [2]. In May 2018, Google introduced Duplex, the Google Assistant extension, thanks to which the digital assistant is ready to maintain a dialogue with a person without special treatment before each request. The assistant understands the semantic nuances of speech, is able to distinguish rudeness from polite handling, but most important - it can independently make calls and communicate with people who do not even suspect that the other end of the wire is not an interlocutor of flesh and blood, but a neural network.

A neural network is a sequence of neurons interconnected by synapses. The structure of the neural network came into the world of programming directly from biology [3]. Neural networks "learn" to perform tasks by considering examples, generally without being programmed with task-specific rules. Learning ability is one of the main advantages of neural networks over traditional algorithms. This technology has greatly improved the machine's ability to recognize spoken words, understand how these words are used, and even generate speech on its own. With Duplex, Google combines these various tasks into a single system [4]. Creating such a system requires large amounts of data, and Google may be using human callers to generate data that can help "educate" future versions of the system. Alice is another voice assistant that also uses the neural networks. Thanks to them, Alice can be asked "Where can I get coffee nearby?". Rather than "coffee house Cosmonaut Street".

What future awaits voice assistants?

At the moment, we are dealing with the first generation of voice assistants. They do a good job with simple tasks, but they still cannot do multi-stage logical constructions. I agree with the opinion of Niels Lenke and believe that the assistants of

the next generation will become more intelligent and at the same time specialized. For example, a virtual assistant in the on-board computer of the car will ideally understand the context of phrases related to the traffic situation. But a virtual assistant serving clients in the bank simply does not need such knowledge.

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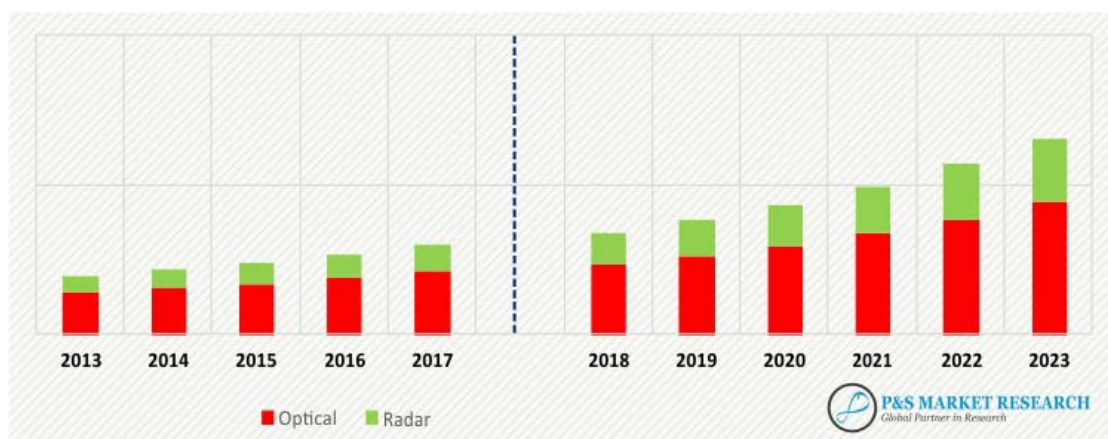
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SATELLITE IMAGERY TRENDS

Now space monitoring is one of the most successfully and dynamically developing innovative industries. Space imagery and space monitoring are increasingly used in a variety of industries, state, regional and municipal planning and management. The need to use remote sensing data to improve the quality of management is beyond doubt. Space monitoring allows obtaining uniform and comparable in quality objective information at a time for vast territories, which is practically unattainable with any ground-based surveys .[1]

According to a consulting firm with business analysis, Prescient & Strategic Intelligence, the global market for commercial satellite imagery was estimated at \$ 2,411.8 million in 2017, and is projected to run during 2018-2023. This figure will increase by 14.2%. (Fig. 1) Market growth is mainly due to high advances in satellite image technology and the expansion of geospatial information analysis capabilities .

Fig. 1 Global Commercial Satellite Development (2013 - 2023).



The market for commercial image satellites is gaining momentum with the growing need for analytics of satellite imagery data for industries that need critical information about various geospatial and environmental conditions for effective resource management. [2]

Most of the revenues, namely 49% in 2017, come from the military industry due to increased threats of terrorism. During the forecast period, the fastest growth is expected to be in the area of disaster management and disaster prevention. [3]

To date, the major players that operate in the market of commercial satellite imagery, there is the Digital Globe Inc ., Planet Lab Inc ., SpaceknowInc. And Blacksky Global.

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THE FIRST IMAGE OF A BLACK HOLE

What is a black hole?

- 1) A black hole is an area of space from which nothing, not even light, can escape;
- 2) Despite the designation, they are not empty but consist of a huge amount of matter densely packed into a small area, giving it an immense gravitational pull;
- 3) There is an area of space beyond the black hole called the event horizon. This is a "point of no return", beyond which it is impossible to escape the gravitational impact of the black hole.

When Albert Einstein first published the general theory of relativity in 1915, he likely couldn't imagine that 100 years later, astronomers would test the predictions of this theory using some of the most sophisticated instruments ever built—and the theory would pass all tests. The general theory of relativity describes the universe as a "fabric" of temporal space, distorted by large masses. It is this distortion that causes gravity, not the intrinsic property of mass, as Isaac Newton believed.

On April 10, 2019, astronomers released the first photo of a black hole that is located at the center of the galaxy Messier 87 (M87), in the constellation Virgo — the galaxy is located at a distance of about 50 million light years from Earth.

Its diameter is more than 40 billion kilometers, which is three million times the size of the Earth, scientists have called it a "monster".

A team of 200 scientists pointed the networked telescopes at M87 and scanned its heart over a period of 10 days.

It was captured by the Event Horizon Telescope (EHT), a network of eight linked telescopes.

Each telescope used for the EHT had to be highly synchronized with the others to a fraction of a millimeter using an atomic clock recorded at standard GPS time. This degree of accuracy makes the EHT capable of resolving objects about 4,000 times better than the Hubble Space Telescope. As each telescope acquired data from the target black hole, the digitized data and time stamp were recorded on computer disk. Gathering data for four days around the world gave the team a substantial amount of data to process.

The information they gathered was too large to be sent online. Instead, the data was stored on hundreds of hard drives that were flown to central processing centres in Boston, US, and Bonn, Germany, to assemble the information. Katie Bouman, a PhD student at MIT, developed an algorithm that combined together the data from the EHT. Without her contribution, the project would not have been possible. Prof Doeleman described the achievement as "an extraordinary scientific feat".

The study of mysterious structures in the universe provides insight into physics and allows us to test observation methods and theories, such as Einstein's theory of general relativity. Massive objects deform space-time in their vicinity, and although the theory of general relativity proved its accuracy for smaller-mass objects, such as Earth and the Sun, the theory has not yet been directly proved for black holes and other regions containing dense matter.

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MODELING AND CONSTRUCTION OF ARTIFICIAL NEURAL NETWORKS FOR TRAFFIC SIGNS RECOGNITION

The development of artificial intelligence systems and machine learning algorithms makes it possible to widely use neural networks in solving problems of forecasting, classification, clustering, decision making, and the like. It is known that the choice of the model and structure of a neural network, its training algorithms significantly affects the speed of the network and the quality of decisions made. Therefore, the development of approaches aimed at improving the quality of the network is an urgent task.

The article considers the problem of choosing a topology and setting parameters of the neural network learning algorithm, which is built for character recognition during traffic. The object of study is models of neural networks and the basic algorithms used in the operation of a neural network. The subject of the study is the behavior of the structural elements of the network during training and use to identify patterns between the state of neural weights and their influence on the recognition result.

To solve the problems, a neural network model was used. This system consists of two modules: an image processing module for identifying a site that supposedly contains a road sign, and a classification module. The neural network that underlies the recognition module is based on the perceptron. Due to the flexible structure of its implementation, you can configure network parameters using interfaces. Variable parameters include the learning assessment indicator, the type of activation function and its derivative, the condition for termination of education, and the like. Setting these parameters through comprehensive tests can improve network quality.

During testing, two states of the neural network were revealed in which its ability to recognize images deteriorated, namely: redundancy or insufficiency of quantitative indicators of the network structure - the number of layers, the number of neurons in each of the layers. Besides, the parameters of the activation function, the parameters of the error metric, and the training stage had a significant impact on the ability to solve

the recognition problem. By testing the data network and analyzing the recognition results, the combination of the linear unit leakage function with a rectified rectifier (LReLU) for the inner layers and the sigmoid function on the input and output layers of the network was chosen as the activation functions. Based on the results of testing the network, recommendations were made on the optimal topology - the network consists of an input, output, and two hidden layers. An increase in the number of layers of neurons introduces extraneous noise into the system. To optimize these characteristics, autonomous methods have been proposed, such as: changing the number of layers and neurons in a layer, in turn, changing the parameters of activation functions, preliminary testing of a solution to a problem using a network with various combinations of its parameters. ,

During testing, with some combinations of the parameters of the neural network, it was found that the weights of the bonds between the inner layers acquire zero values, excluding neurons from the calculations. The fact requires an analysis of the reasons for the formation of such compounds and the search for ways to prevent them, identifying patterns and consequences of the influence of such compounds on the network.

According to the results of studies, it was found that the most significant indicator of network quality is the dependence of network error on the era of learning; more promising is the in-depth growth of the network, which contributes to the improvement of nonlinear properties; Both topological network parameters and error metric parameters are subject to optimization, which determines the effectiveness of training.

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SMALL COMPUTERS

If a new piece of technology appears, it always seems strange at first. The science fiction writer Arthur Clarke said that "Any technology, no matter how primitive it is, is magic to those who don't understand it". However, we soon get used to it. We go to shop at supermarkets every day and hardly notice what happens at the

checkout as a laser scans our products. In the 60s, when the barcodes that make it possible were introduced, people thought it was an amazing idea.

The same is true of many things being developed today. If you knew what technology companies were working on, you would be surprised. One area where progress is being made very quickly today is wearable computers. From machines the size of rooms, computers have become smaller, cheaper and smarter. And a number of scientists and investors are trying to find new ways to build them into clothes, watches and headsets. If they succeed, it will mean a new area in computing.

One exciting idea is *EyeTap*. *EyeTap* technology was developed by Professor Steve Mann from Toronto University. What is *EyeTap*? *EyeTap* is a device in the form of glasses, which allows you to intercept the image entering the eye, and after processing it through a computer, pass it further into the eye. The main features of *EyeTap* - video recording "from the eye" and the ability to overlay computer graphics on the original image in real time.

Imagine that you are at a football match. If you wear *EyeTap*, you can do several things. You can look at information and player statistics you are watching at the moment. You can read comments from other spectators which their *EyeTaps* transmit instantly around the stadium. Your own opinion can be added for everyone to read. And you can do all this without missing a single moment of the action on the football field. When the match gets a bit boring, you and your computer are already online, so you can check your email and surf the internet without leaving your seat.

The EyeTap also means that learning languages changes. At the moment, learning a foreign language means many hours of hard work. With a wearable computer, all these efforts become unnecessary. If you need to know a word or phrase, *the EyeTap* will instantly display it for you. You might be able to program your wearable computer to speak for you. Tourists will never be fixated on words again.

The EyeTap is just one example of how computers become a part of every moment of our lives. But not without problems. The idea of wearable computers raises some difficult questions. Will we need other people's permission to record them every second? Do we really want to be connected to a computer and to the internet every minute of every day? I think that we can be dependent on this technology to help us in almost every aspect of our lives. It will probably be great if everything works well. But what happens when we get to point where we need this technology for even simple tasks and then everything starts to break down?

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OBTAINING NANOTUBES

There are three basic methods for producing nanotubes: electric arc sputtering of graphite, laser evaporation of graphite, and chemical vapor deposition[1]. The development of methods for the synthesis of carbon nanotubes went by reducing the synthesis temperatures[2]. For the first time nanotubes were found using the first method, that is, electrospray, the essence of which is the evaporation of one of the graphite rods in an electric arc and the formation of carbon buildup on the other, cooled, and on the walls of the chamber[3]. This method is most widespread in its simplicity and accessibility, but against the background of the growing popularity of the third method - chemical vapor deposition, with a percentage of carbon in the composition, through a hot quartz tube, in which a plate with a catalytic surface is placed, where pairs of nanotubes settle. The method has become so successful by producing a large number of nanotubes of the same size at a time, which is of course very practical. The last method, laser evaporation, involves the interaction of a laser beam in a quartz tube with a heated graphite target as a result of its evaporation, and settling on a cooled collector. The advantage of this method is that by controlling the laser pulse power, it is possible to obtain nanotubes of the desired diameter. It was by this method that scientists tried to add nickel and cobalt to the graphite, which increased the number of nanotubes to 70-90 percent[4]. Therefore, in the method of chemical deposition is often used as a catalyst for metal dust, and in the previous method of laser evaporation, the collector is made of copper.

This is how the first works on obtaining nanotubes appeared with the low-temperature method - the method of catalytic pyrolysis of hydrocarbons, where the metal groups of the iron group were used as a catalyst. At present one of the main tasks in obtaining nanotubes is to find a method for their mass production.

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USING ANALYTICAL METHODS FOR SOLVING MECHANICAL PROBLEMS ON THE EXAMPLE OF PLATES AND SHELLS WITH HOLES AND INCLUSIONS

Thin-walled structures, whose elements are plates and shells, have been widely used in various fields of engineering – aviation, construction, shipbuilding, mechanical engineering, oil industry, etc. On constructive or technological considerations are often disrupted continuity of structures with different types of holes and inclusions. Violation of continuity (holes, pores, cracks) and presence in the material of different inclusions is a factor that causes the heterogeneity of the structure and has a significant effect on stress concentration and deformation processes and the destruction of solids [1]. Thin inclusions can be considered filled with material of pores, cracks as well initial geometric imperfections (deviation from perfect). Note that continuity and geometric imperfections can occur during technological operations of manufacture and operation elements of structures.

Particular attention should be paid to inclusion. Inclusions and cracks can model defects that occur at the interface. Elements of modern technology are often thin plates that are weakened holes and inclusions of various shapes. When loading such plates near the holes and inclusions there is a concentration of stresses that can cause unacceptable deformation or even destruction. The problem of determining the stress concentrations near the holes in the plates, subjected to internal and external pressure is extremely important class of engineering problems [2, 3].

In the design of many thin-walled structures arises the need to use thin plates with holes of different shapes that reduces the strength of structures. To save the necessary strengths have to use all kinds of reinforcing elements.

To solve the problems of determining the stress-strain state (SSS) plates and shells use numerical and analytical methods. Various analytical methods for calculating the SSS of plates with holes and inclusions have been investigated. However finding analytic solutions to these tasks are only possible in certain cases the geometric shape of the plates, holes and inclusions, load and mounting conditions. For the engineering practice of calculation it is important to use numerical methods. To the most versatile and common numerical methods for solving mechanical problems deformed solids include the variational-grid method finite elements (MFE), variational difference methods, method of boundary integral equations. These methods are broad used in the study of SSS plates and shells with inhomogeneities in the form of holes and inclusions. In particular, they are effective projection-iterative MFE implementation schemes and multi-grid algorithms [4].

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THE CHOICE OF MATERIAL FOR THE MANUFACTURE OF CHARBALLONS

The development of rocket and space technology requires the use of promising new materials. The following studies were carried out in the work:

- The choice of material for the manufacture of balloons;
- Development of the manufacturing process of the product

Charaballon is designed to store nitrogen or helium gases in a liquid state. They are the main elements of the boost system, which maintains the necessary pressure in the RKLA fuel tanks.

Based on the operating conditions, the product material must meet the following requirements:

- have a minimum weight;
- high corrosion resistance;

-good digestibility;

Aluminum and titanium alloys have the lowest density, however aluminum alone does not resist corrosion cracking well, while titanium forms a dense Ti O₂ protective film on the surface, due to which its corrosion resistance is higher.

Thus, BT6C alloy was chosen as the material for making the balloon.

This alloy is classified as welded.

To increase the complex of mechanical properties, it is necessary to conduct thermal treatment.

Al is an ALPHA stabilizer due to its solubility in the ALPHA phase, as it increases the region of its existence to a temperature of 1080C.

Vanadium V lowers the polymorphic transformation temperature of Ti, expanding the BETA-solid solution region, while also increasing the heat resistance and thermal stability of the alloy.

After heat treatment, it is necessary to conduct a flaw detection of the inner and outer surfaces of the hemispheres. This method allows you to detect surface and through defects.

Subsequent x-ray control was carried out to determine the location of the heterogeneity (segregation) of the material.

Mechanical tests were carried out on samples cut from sheet blanks.

Samples for tensile tests were performed on a MUP-20 machine at a load of 5 tons.

Based on the results of the research, the following conclusions can be drawn:

- 1) Based on the operating conditions of the charaballon, the material for its manufacture is selected - VTBS two-phase titanium alloy;
- 2) The hemisphere manufacturing process is developed - hot stamping in several stages;
- 3) The hemispherical heat treatment modes have been developed;
- 4) The microstructure of VTBS alloy is studied after heat treatment.

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THE USE OF NEURAL NETWORK TECHNOLOGIES IN THE RECOGNITION OF EMOTIONS

One of the main ways of recognizing another person's emotions is by analyzing visual information. Therefore, the automation of this process should obviously be based on the use of computer vision methods and tools. Recognition of human emotions naturally allows to increase the degree of intellectualization of their interaction, for example, to ensure correct response to the human condition. It is especially important to correctly determine the condition of a person in cases of danger to his life.

Most modern information technologies in the field of emotional science are based on seven basic emotions and microexpression of the face, which reflects our emotions at a level beyond the control of the brain. The method of emotion coding developed by Paul Ekman and Wallace Friesen - "Facial Coding System" (FACS) is analyzed [1]. This system is the most common standard for classifying facial expressions of a person and is actively used in the field of computer animation and psychology.

There are a lot of requirements for technologies for recognizing human emotions - in addition to accuracy and speed of recognition, the technology must be resistant to changes in lighting and head position. It is known that not all systems can cope with this task. This drawback is overcome thanks to the convolutional neural network [2].

With the greatest accuracy with the task of recognizing faces and emotions cope convolutional neural networks, which, thanks to mathematical convolution operations, are resistant to the position of the head and face on the incoming photo.

The features of the convolutional neural network, which consist in the alternation of convolutional and subsample layers, as well as the unidirectionality and multilayer network, are analyzed. It is known that the special architecture of the convolutional neural network is aimed at pattern recognition [3].

The technologies of emotion recognition based on the convolutional neural network are analyzed, namely: EmoPy technology and FindFace technology.

FindFace technology is based on the NtechLab algorithm. This technology has high accuracy and recognition speed, the algorithm is able to detect an unlimited number of faces in the frame, does not depend on age-related changes in the face, head rotation and lighting quality. NtechLab uses its own Liveness detection technology in its products, which makes it possible to distinguish the face of a living person from a photo [4].

EmoPy technology is built on a convolutional neural network, which is trained on the Microsoft FER2013 and Cohn-Kanade datasets. The result of emotion recognition using this technology directly depends on the quantity and quality of training data. It has a bias towards the emotions of happiness, disgust and surprise, which were recognized in 9 out of 10 cases. Regarding other emotions, the technology did not show such a successful result [5].

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ARTIFICIAL INTELLIGENCE TODAY

Nowadays, everyone knows about artificial intelligence (Further abbreviated AI). Today we have algorithms to identify faces. Tomorrow we will see cars without drivers, AI will drive our cars. So what is artificial intelligence capable of?

Due to the increase in computing power of modern computers we can create more and more complicated programs. For example, simulation of quantum physics processes or collecting and processing millions of user queries, as Google does. But, is it enough for neural networks and artificial intelligence? It goes without saying that it is able to self-learning and solving composite tasks. Banks use artificial intelligence systems (SII) in insurance activities (actuarial mathematics), when playing on the stock exchange and property management. Pattern recognition methods (including both more complex and specialized ones, as well as neural networks) are widely used in optical and acoustic recognition (including text and speech), medical diagnostics, spam filters, in air defense systems (target determination), and to ensure a number of other national security problems. Computer game developers use incompletely trained AI. This forms the concept of “Game Artificial Intelligence”. The standard tasks of AI in games are finding the path in two-dimensional or three-dimensional space, simulating the behavior of a combat unit, calculating the correct economic strategy, and so on [1].

The main question is whether a neural network can replace a person? I think so, but not in every matter. Many people are scared to lose their job or even a place in society. In sci-fi literature, AI is most often portrayed as a force that tries to overthrow human power (Omnius, HAL 9000 in the 2001 “*Space Odyssey*”, “*Skynet*”, “*Colossus*”, “*The Matrix*”, and a replicant in “*Blade Runner*”, Iskina in “*Hyperion*”), Or a serving humanoid (C-3PO, Data, KITT and KARR, “*Bicentennial Man*”). The inevitability of dominating the world of artificial intelligence, which has gotten out of control, is disputed by researchers such as science fiction writer Isaac Asimov and cybernetic Kevin Warwick, known for numerous experiments on the integration of machines and living entities. Some science fiction writers, such as Vernor Winge, also pondered the consequences of the advent of AI, which could cause dramatic changes in society. This period is called technological singularity.

The result of all of the above is that artificial intelligence technologies are developing, but we are afraid of this, based on guesses. We should not be afraid, but accept it and learn how to use it. And artificial intelligence will help us take another step into the bright future.

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HALL THRUSTER ST-25 DEVELOPED BY SPACE ELECTRIC THRUSTER SYSTEMS (SETS)

In accordance with the tendency to reduce the mass of the spacecraft mass, on board of which the available power does not exceed several hundred watts, it is advisable to use low-power electric thrusters. On spacecraft, Hall-effect thrusters are most widely used. A low-power Hall-effect thruster (150-200 W) was developed and tested. It provides the following parameters: thrust 6.5-10 mN, specific impulse 1160-1300 s and efficiency 28-34%.

Electromagnets are most often used as a source of magnetic induction in Hall-effect thruster, the main advantage of which is the possibility of selecting the necessary value of magnetic induction and the possibility of adjusting the geometry of the lines of magnetic induction in the accelerating channel to obtain maximum thruster

efficiency. During low power thrusters design, there is a problem of placement and layout of the central coil. In development thruster, instead of a central magnetizing coil, a permanent magnet is used. This helped to significantly reduce thruster power consumption. It is known that the disadvantage of a permanent magnet is the instability of magnetic induction with a significant increase in operating temperature. During the development of the thruster, various materials were analyzed for constructing the magnetic system, namely Alnico (AlNiCoFe), neodymium (NdFeB) and samarium-cobalt (SmCo) magnets.

As a result of the analysis, a samarium-cobalt magnet was selected, which admits a high working temperature (up to + 350 ° C), because The Curie point for this material is 850 ° C, and also having resistance to demagnetization (high coercive force).

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SOLENOID VALVE FOR THE XENON FEED SYSTEM

The feed system is a key part of an electric propulsion system. There are different variations of xenon feed systems (bang-bang, with pressure regulator etc.) which contain pressure sensors, temperature sensors, flow restrictors, a tank and valves. But among all this subsystems, it is the valve lifetime and the amount of working substance in the tank that determine the lifetime of the feed system and, accordingly, of the propulsion system. If the amount of working substance is selected on the basis of the requirements for each specific mission, *the* valve parameters must be satisfying for various missions. Accordingly, the valves must have low power consumption, high reliability (more than 10^6 cycles), low weight and dimensions.

The existing models of solenoid valves on the market of Electric Propulsion have been evaluated. The conclusion was made that the number of solenoid valves and manufacturer companies is very limited. And existing models either have a large mass and dimensions or are sold only with the full system and incredibly expensive.

It has been decided to design membrane valve in order to increase the lifetime. For solenoid valves, the membrane implement two functions: the first provides a closing force, and the other provides a sealing force. In order to improve the closing reaction, it is necessary to maximize the spring force. The valve design was calculated for the response time and allowable force on the sealing element. To confirm the predetermined characteristics, the tests of the manufactured valve design were made. The main characteristics are presented in table. 1.

Table 1

Valvetype	1-Way Normally Closed
Operating working substance	Xe, Ar, Kr, He, N ₂ , Air
Maximum operating pressure, bar	260
Temperature range, °C	-10 to +40
Response time, ms	<5
Actuation voltage, V	12 to 24
Operating voltage, V	7+1
Power consumption (operating), W	<1
External leakage, sccm of He	$<7,92 \times 10^{-5}$
Internal leakage, sccm of He, max.	<0,025
Life cycles	>1000000
Dimensions (without connectors), mm	Ø 15,5 x 22
Mass, kg	0,025

The laboratory model of lightweight universal valve has been developed, manufactured and successfully tested. Lifetime tests confirmed the valve's performance over more than 1,000,000 cycles. Burst tests have confirmed that the valve can be used in feed systems with different control techniques (e.g. “bang-bang”) for high (up to 260 bar) and low-pressure propulsion systems. Also, actuation tests showed a quick response time (1-5 ms for pressure 1-260 bar) of the valve.

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