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CHANGES OF ERYTHROCYTES FORM IN PSORIASIS AND INFLUENCE OF INTRAVASCULAR LASER IRRADIATION OF BLOOD ON ITS CORRECTION

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It is shown by method of light microscopy, thick drop and morphometry, that marked shifts in proportion of discocytes – normal RBC and pathological forms takes place in peripheral blood of patients with psoriasis. It was revealed, that the changes occur more in the blood obtained from psoriatic plaque than in the blood from finger. Intravascular irradiation of blood leads to normalization of discocytes and pathological RBC as in peripheral blood, as well as in blood obtained from psoriatic plaques.

Keywords: erythrocyte, psoriasis, laser irradiation of blood

One of the most effective methods proposed for treatment of psoriasis is the photo – therapy [3, 6, 7]. Laser therapy is most effective type of phototherapy. It has been successfully used in the treatment of patients with psoriasis [2, 3, 7].

Fundamentals of therapeutic action of low-intensive laser irradiation (LILI) are the anti-inflammatory, anti-allergic and immunostimulating effects on the organism [1-3].

Intravascular laser irradiation of blood (ILIB) is the most effective method of laser therapy. The clinical efficacy of ILIB in the treatment of psoriasis, and especially its arthropathic form was established. [2, 3, 6, 7].

Erythrocytes are the most numerous and most differentiated cells of human body. They react to different pathological conditions, including diseases of the skin. Reaction of erythrocytes primarily, reflected as a lower proportion of discocytes – the main form of the red blood cells (RBC) in norm and increased of proportion their pathological forms – stomatocytes, echinocytes and of other [1].

However, alterations of the shape of RBC in psoriasis, as in the peripheral blood, and blood from the lesion zone were not studied. The influence of ILIB on erythrocytes, used in complex treatment of patients with psoriasis, was not studied as well.

The purpose of this study was to examine forms of erythrocytes in the area of psoriatic plaques and in peripheral blood, their changes in complex treatment of with application of ILIB.

Materials and methods of research

30 patients with psoriasis were under our observation. In 5 patients the process was limited and localized in the elbow and knee joints, in two patients process was localized on the palms and soles, in 23 patients process was diffuse, 2 patients were with lesions of the scalp. The age of patients was from 16 to 27. Ration of gender: male – 25, female 5. The duration of the pathological process ranged from 1 to 3 years.

Studies of anamnestic data have shown that 16 patients had prior hepatitis A, carried out in childhood.

At the time of examination, 11 patients were identified to have hypoacidic gastritis, 8 patients had cholecystitis (according to USI data), 2 patients had moderate degree anemia, and 1 patient had chronic pyelonephritis. In this regard, a comprehensive treatment, along with ILIB was initiated: Essensialle Forte capsules, tablets of Allachol, Gros-fillin (pentoksifilin), etc. Topically – sinaflan ointment.

«Matrix – VLOK», (produced by a research – research center «Matrix», Russia) was used for ILIB purposes. It has the head KL-VLOK (output power 1,5 MW, the wavelength of 0,63 microns, exposure 20 min). Intravenous irradiation was carried out using special light guide and with Teflon-coated needles KIVL-01.

The procedure ILIB (output power was 2 mW, wavelength is 0,63 μm , exposure 15 minutes) was performed on a daily basis. There were 10-15 sessions in a course.

Evaluation of the ILIB influence efficacy was judged by the change in the ratio of peripheral blood erythrocytes. For that purpose, we used scanning electron microscopy (SEM) and the express – method of «thick drop» (EMTD).

The technique of EMTD was developed in the laboratory of pathologic anatomy of RSCS named after acad. V. Vakhidov, Republic of Uzbekistan. It is patented in the patent offices of the Republic of Uzbekistan «Method of determining the shape of RBC» № МКИ 6 and 61 B 10/00, as well as the software – «Express diagnosis of RBC forms» № ED-5-05. To do this, the pad of ring finger or human psoriatic plaques punctured with scarificator and 2-3 drops of received blood are placed in 2 ml fixating 2,5% solution of glutaraldehyde prepared on phosphate buffer (pH 7,4). A drop of fixed unstained blood then placed on a slide and covered with a coverslip.

The proposed technique, allows saving the natural state of erythrocyte to a certain extent and having them approximately same with those in the vascular lumen. This, in turn, facilitates more adequate assessment of the erythrocytes' functional morphology. This method is applicable as for qualitative study of erythrocyte forms, as well as for morphometric study of ratios of normal and pathological forms.

It should also be emphasized, that using this method, the objective morphometric evaluation of RBC deformability can be obtained within 10-15 minutes with a simple light microscopy. This makes it possible, to monitor the structural and functional status of erythrocytes and other blood cells to assess the severity of a pathological process and the adequacy of the treatment. Previously conducted comparative studies of the erythrocytes counting in pe-

ipheral blood specimens with SEM and EMTD, have shown reliability of the last [1].

Morphometric counting of normal and pathological forms of erythrocytes ratios were carried out, using at least 1000 erythrocytes in each case with the subsequent statistical analysis. Results are given as mean \pm SEM the significance of differences between mean was evaluated by Student t test for unpaired data and by two – way analysis of variance (ANOVA) followed by Duncan's multiple range test.

The examination and photographing of light microscopic preparations were performed with usage of microscope «AXIOSKOP-1940» (Carl Zeiss), Germany, with a digital camera ProgRes, Capture Pro 2.6, attached to PC Pentium IV.

Peripheral blood erythrocytes in psoriasis were studied with the EMTD after medical treatment without ILIB application and with ILIB application. Blood was also taken from practically healthy volunteers – aged 20–30 years (total 8). Blood sampling was conducted in October – November and March – April in order to minimize the influences of too hot and too cold temperatures.

Results of research and their discussion

Studies of blood obtained from areas of psoriatic plaques, showed, that among many forms of RBC, the echinocytes with 3 or more processes were dominating (Fig. 1, 2).

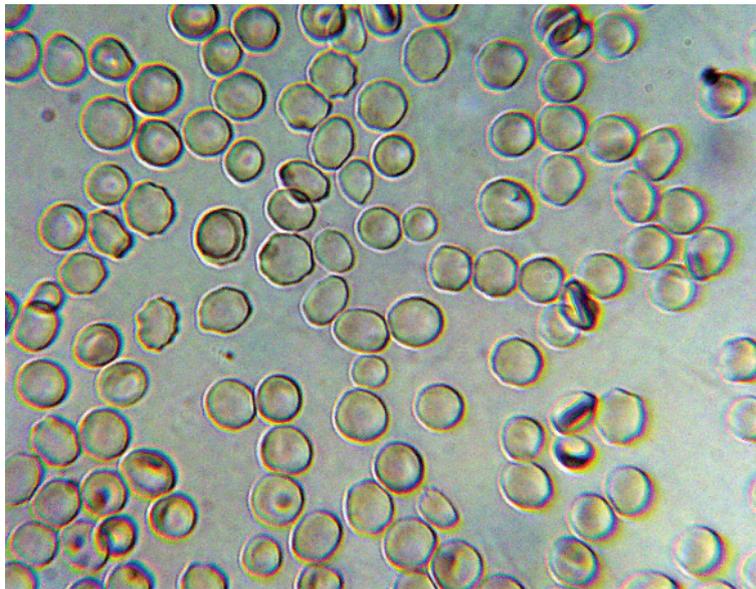


Fig. 1. Control. Blood from finger. 10×40. 1 gr

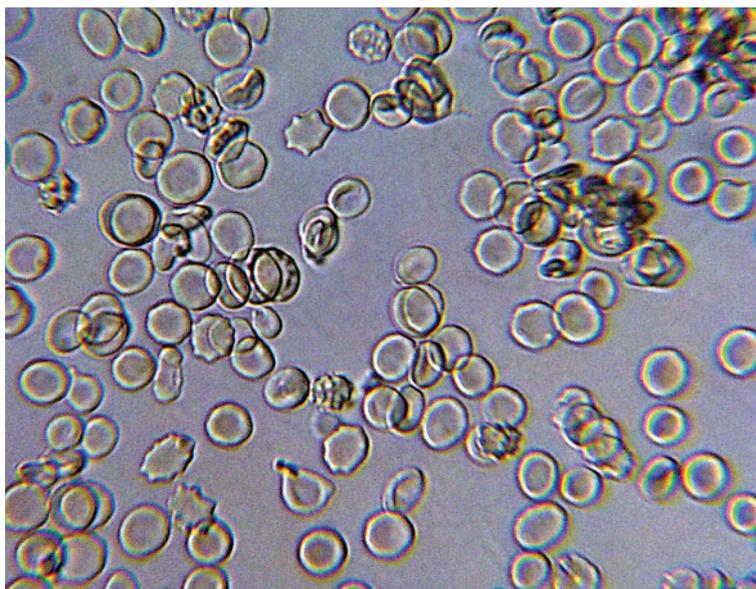


Fig. 2. Psoriasis, before treatment Blood from plaque. 5 g. 10×10. 5 gr

Similar studies of peripheral blood RBC, showed, that compared with the control group, patients with psoriasis had an essential decrease of discocytes' number and increase in the number of pathological forms of RBC – stomatocytes, RBC with comb, irreversible forms of RBC which are mainly echinocytes (Fig. 1, 3).

The implementation of combined therapy without the use of ILIB lead to improvement in general condition of patients and caused a decrease of specific elements. However, it did not lead to a significant normalization in the ratio of discocytes and pathological forms of erythrocytes (Fig. 4, Table).

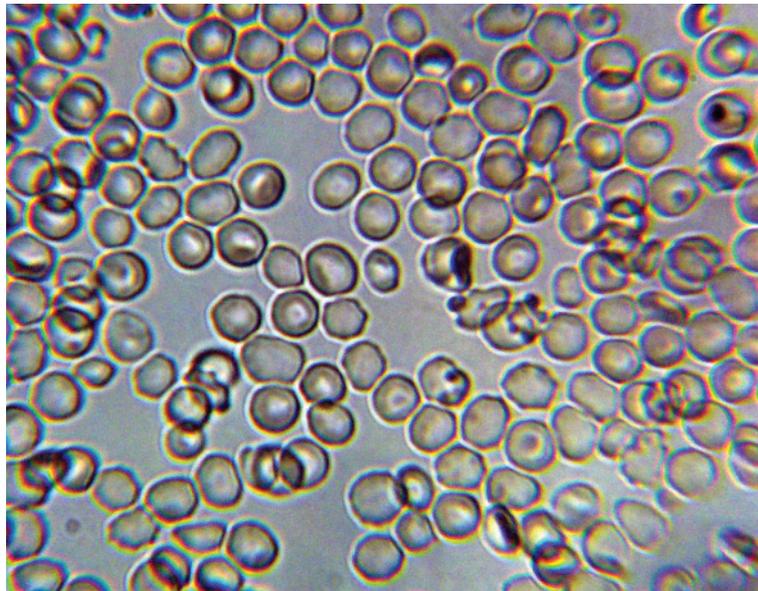


Fig. 3. Psoriasis, before treatment. Blood from finger 10×40. 2 gr



Fig. 4. Psoriasis, treatment without ILIB. Blood from finger. 10×40 3 gr

ILIB leads to normalize ratio discocyte and echinocytes. The number of discocytes practically rises to the control level, and the number of echinocytes reduces after 10-15 sessions. Rather high stay the numbers of RBC with a

comb and especially in the blood from plaques (Fig. 5, 6, Table).

After the course ILIB, patients had remained isolated small nodules which regressed by 20-22 day of combined treatment. In case

of scalp lesions subjective sensations were reduced by 5-6 days of treatment, desquamation and infiltration decreased on 14-15 days of treatment. The positive dynamics in patients with lesions of the palms and soles was ob-

served only on 15 day of treatment (decrease of hyperkeratosis, healing of fissures).

Photochemotherapy plays an important role in the correction of immune changes in skin disorders such as psoriasis.

Changes of RBC ratios in patients with psoriasis and under influence of ILIB

Forms of RBC	Control, blood taken from finger, 1 g M ± m	Psoriasis, before treatment. Blood from finger, 2 g M ± m	Psoriasis, treatment without ILIB. Blood from finger, 3 g M ± m	Psoriasis, 15 sessions of ILIB. Blood from finger, 4 g M ± m	Psoriasis, before treatment Blood from plaque, 5 g M ± m	Psoriasis, treatment without ILIB. Blood from plaque, 6 g M ± m	Psoriasis, 15 sessions of ILIB. Blood from plaque, 7 g M ± m
Discocytes	89 ± 1,7%	67 ± 1,8%*	69 ± 1,8%*	84 ± 2,3%***	64 ± 1,6%	68 ± 1,4%	76 ± 1,6%****
Echinocytes	9 ± 0,6%	23 ± 1%*	21 ± 1%*	10 ± 0,3%***	27 ± 1%	23 ± 1%	16 ± 1%****
Stomatocytes	1 ± 0,04%	4 ± 0,2%*	5 ± 0,2%*	2 ± 0,1%***	4 ± 0,2%	4 ± 0,2%	3 ± 0,2%****
RBC with crest	0,5 ± 0,01%	4 ± 0,3%*	3 ± 0,3%*	3 ± 0,1%	3 ± 0,3%	3 ± 0,1%	3 ± 0,3%****
Irreversible forms	0,5 ± 0,07%	2 ± 0,2%*	2 ± 0,2%*	1 ± 0,1%**	2 ± 0,2%	2 ± 0,2%	2 ± 0,2%****

Notes:

* Statistically significant ($P < 0,05$) compared with group 1;

** Statistically significant ($P < 0,05$) compared with group 2;

*** Statistically significant ($P < 0,05$) compared with group 3;

**** Statistically significant ($P < 0,05$) compared with Group 5.

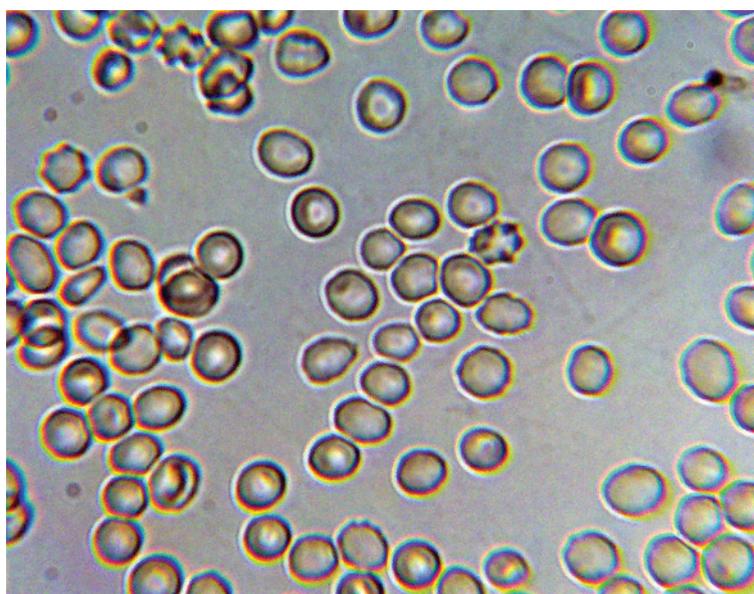


Fig. 5. Psoriasis, 15 sessions of ILIB. Blood from finger. 10×40 4 gr

It is known that the change in shape of RBC and transformation of discocytes into various pathological forms associated with shifts of physical and chemical properties and, consequently, the structures of their membranes.

The increase in the number of pathological forms of erythrocytes, leading to increased blood viscosity is the primary cause of its rheo-

logical property disturbances and consequently, the cause of microcirculatory disturbances.

Significant changes of peripheral blood RBC and their recovery after treatment was noted in some skin and venereal diseases.

The increase of pathological forms of erythrocytes was shown to take place in primary and secondary. Treatment of different forms of spher-

ilis with extencillin resulted in normalization of the peripheral blood RBC and the dominance of their normal forms – discocytes [1].

Significant changes in the shape of RBC of peripheral blood were identified also in various forms of eczema and neurodermatitis. It is shown, that peripheral blood of these patients contains dominant numbers of pathological forms of RBC – echinocytes and stomatocytes. Number discocytes in peripheral blood of patients with eczema are reduced by more than threefold. A statistically significant increase in the number of discocytes occurred after a course of traditional therapy. Complex treatment using laser therapy, led to normalization of the RBC forms – increase in the absolute number of discocytes. After 5 sessions the number of discocytes increased almost twice, and at the end of the laser therapy course their number in peripheral blood resumed to be dominant [1].

Studies carried out by SEM showed, that a decline of discocytes with increase of echinocytes takes place in rosacea.

The course of complex treatment of all rosacea forms led to statistically significant increase in the number of discocytes, whereas the content of echinocytes, stomatocytes and irreversible forms of RBC significantly reduced in peripheral blood [1].

The above mentioned allowed us to make a suggestion, that the change in the ratio of discocytes and pathological forms of erythrocytes may had place in psoriasis as well.

The studies of the RBC shape alterations in psoriasis, performed for the first time, showed that the changes happen as in the peripheral blood, as well as in the foci of psoriatic plaques. ILIB bring discocytes and pathological forms of RBC into proper correlation, both in the peripheral blood and in plaques.

The studies of the ILIB efficacy in the complex treatment of psoriasis showed, that

this type of laser therapy, leading to the normalization of the correlation values among normal and pathological forms of RBC, have an effective impact on the clinical manifestations of disease and causes stable remission.

Conclusions

1. The share of pathological forms of RBC significantly increases in peripheral blood of patients with psoriasis. And differences are greater in the blood obtained from the plaques than in blood obtained from a finger.

2. In the complex treatment of psoriasis, ILIB contributes to the normalization of the discocytes' proportion to pathological forms of erythrocytes.

3. The Express – Method of Thick Drop is a reliable way in estimation of the discocytes and pathological RBC ratio and the data obtained with the method can be used as a criterion for severity of the pathological process, as well as the effectiveness of the treatment.

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THE SMALL – FOR – DATE NEWBORNS' ENERGY METABOLISM ENZYMES ACTIVITY

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The cellular energy exchange research results at the newborns with SFDN have been presented. A total of 158 infants, of whom in 83% (e.g. 131) of the cases, having diagnosed, as the asymmetric one, and in 17,0% (e.g. 27) of the cases of the SFDN symmetric form have been examined. It was revealed, that the newborns had had the quite varying degree of the hypoxic – ischemic lesions of the central nervous system (CNS), having manifested by the following syndromes: the neuro – reflex hyper-excitability, the depression, the vegetative – visceral disorders, and the muscular dystonia. So, the cellular energy exchange parameters study has been shown their activity decrease, in comparison with the control group. The enzymes activity reduction at the infants with the symmetric SFDN form has considerably been higher, than those ones with the asymmetric form. The perinatal hypoxemia has been influenced in the way of the energy exchange.

Keywords: metabolism, enzymes, newborns

The intrauterine growth retardation (IUGR) is considered one of the most common causes of the newborns' high sickness rate and the babies' high incidence in the neonatal period, the nervous and the mental disorders of the children's development. In the later life's years, the abnormalities' high percentage, as physical, well as the psychomotor development has been revealed at this patients' group. [1, 2].

At present, the intrauterine growth retardation (IUGR) is considered by the experts and the specialists, as the disease, having accompanied by the rather serious and the severe metabolic ones, including the dis-energy violations [3, 4, 5, 6, 7, 8].

One of the most significant mechanisms, having led to the different and the various metabolic shifts at the intrauterine growth retardation (IUGR), is the hypoxic – ischemic lesions of the central nervous system (CNS). In the basis of the further formation, which are laid the cerebro-vascular disorders and the brain blood circulation strokes. [1, 2, 3].

So, the latent energy deficit presence has the negative impact upon the post – adaptation period course at the newborns with SFDN.

That is why, the cellular metabolism enzymes identification in the human blood is the major one in the energy deficient state diagnostics.

In connection with the above – stated material, the main purpose of the study has been – the cellular energy change enzymes' activity study at the newborns with the SFDN, on the basis of the comparative analysis with the healthy children.

Materials and methods of research

Thus, a total of the 316 infants and the newborns have been examined, on the basis of the 1-st Municipal Perinatal Center of the Tashkent city and the Republic Specialized Scientific and the Practical Medical Center of the Obstetrics and Gynecology.

So, the children's state and their condition at the birth have been determined by the «Apgar» scale on the

1-st and the 5-th minutes of the infants' life. Then, the born infant's status has been assessed, on the basis of these general clinical and the neurological examinations. After that, the biological maturity has been assessed by the «Ballard» scale. The newborns' physical development evaluation and the intrauterine growth retardation (IUGR) classification have been carried out, in accordance with the WHO recommendations. The nervous system pathology assessment has been carried out, according to the nervous system perinatal lesions classification at the small infants and the young children, having suggested by the Russian Association of Perinatal Medicine Specialists and Experts (e.g. 2000).

The main study group has been made up 158 newborns with the intrauterine growth retardation (IUGR) and the control group – 158 born infants and the babies, who had no any clinical manifestations of the SFDN ones. In the main study group, having consisted in 158 small children has been diagnosed with the asymmetric one – in 83,0%, and in 17,0% cases, the symmetric form of the intrauterine growth retardation (IUGR).

So, the examined infants and the newborns have been matched by the gestational age. Thus, the infants and the newborns with the symmetric form have been consistent with the gestational age period 35–36 weeks (e.g. 245–252 days), the ones with the asymmetric form have been consistent with the gestational age period 36–37 weeks (e.g. 252–259 days), the control group small children have been corresponded to the gestational age period 38–40 weeks (e.g. 266–280 days).

So, the infants' and the newborns' average body weight (BW) with the intrauterine growth retardation (IUGR) has been made up 2,417 g, the average body length – 46,05 cm, the head circumference – 32,4 cm, the chest circumference – 30,9 cm.

So, the infants' and the newborns' average body weight (BW) from the control group has been made up 3,912,0 g, the average body length – 53,2 cm, the head circumference – 33,9 cm, the chest circumference – 32,7 cm, the small children's morphological and the functional maturity has been consistent with their gestational age.

At the children with the asymmetric form of the intrauterine growth retardation (IUGR), the average body weight (BW) has been made up 2,390,6 g, the average length – 47,2 cm, the head circumference – 32,4 cm, the chest circumference – 30,8 cm. The newborns' and infants' anthropometric indicators with the symmetric form of the development delay have been made up, respective-

ly, 2,445,7 g, 44,9 cm, 32,4 cm, and 31,0 cm. The significantly lower rates of the body's weight and length have been revealed at these small children, in comparable with the newborns and the infants with the asymmetric form of the intrauterine growth retardation (IUGR).

The cytochemical analysis of the mitochondrial enzymes activity has been carried out by the reagents sets of the «Himtechmash» MRPC LLC company, the «IREA» State Research Institute: the succinate dehydrogenase – CDG, the alpha-glycerophosphate dehydrogenase – GPHDG, the glutamate dehydrogenase – GDG, the lactate dehydrogenase – LDG of the peripheral blood leukocytes (e.g. the method of Pierce (1957) in the Nartsisov R.P. modification (1986)) with the subsequent visual morphometry (e.g. the «VIDEOTEST» programs package, the Sukhorukov V.S., Tozliyan E.V. technique).

The enzymatic activity at the visual morphometry is expressed in the standard units, corresponding to the average number of the formazane granules, having had the cytochemical reaction product. So, the basic information on the enzymes activity in the peripheral blood lymphocytes are obtained at the mean value, which is equal to the granules number ratio in each cell to the cells number.

In addition to the mean value determination of the enzymes activity (e.g. in the standard units), the specific factors K1 (e.g. GPHDG/CDG), K2 (e.g. GDG/CDG), K3 (e.g. GPHDG/GDG) have been determined. So, these factors identification is allowed to be determined the relationship between the mitochondrial enzymes, which is increased the method sensitivity. The enzymes are reflected the activity of the different pathways of the cellular energy transfer that is why, their relationship definition is improved the cytochemical method diagnostic value [3].

The cytochemical reaction statement has been performed in the genetic laboratory of the «Mother and Child Screening» National Center.

The results statistical processing and the analysis is included the reliability assessment of the different mean values measurements by the Student's test with the given level of the reliability (e.g. $p < 0,05$).

Results of research and their discussion

In retrospect, it has been revealed during the examination, that the average gestational period at the delivery in the newborns and the infants with the symmetric form has been made up 36,1 weeks (e.g. 252,1 days), and with the asymmetric form, respectively, 37,3 weeks (e.g. 259,3 days). The Cesarean section operation has been performed at 58 she-patients. So, the newborns and the infants with the asymmetric intrauterine growth retardation (IUGR) form have been born with the estimate by the «Apgar» scale less 6,9 points, the newborns and the infants with the symmetric form, respectively, – 6,7 points, 53 she-patients (33,5%) have been needed in the intensive care unit transfer, 66,5% (e.g. 105 ones) have been transferred at the second phase of the patients' management with due respect to both medical treatment and the general care. The degree of the perinatal CNS lesions in the 22,2% cases has been regarded, as the mild one, in 53,2% – as the medium – heavy one, and at 24,6 – as the severe one, respectively.

So, the studies have been shown, that the newborns and the infants with the SFDN have often been born in the asphyxia of the varying extent, than in the control group, though in the main group in 2 times more often it has been observed in the children born asphyxiated in the moderate and the severe degrees. In the control group, mainly, the children have been born with the estimate by the «Apgar» scale 8–10 points.

Every 3-rd infant with the intrauterine growth retardation (IUGR) at their birth the resuscitation measures have been carried out, in the form of the mucus suction from the upper respiratory tract, the humidified oxygen supply, and the artificial pulmonary ventilation. Then, the both newborns have been needed in the closed chest cardiac massage, the epinephrine administration, and also the circulating blood volume substitutes.

The indicators have been improved on the 5-th minute of all the examined infants' life with the SFDN, however the resuscitation measures have been continued to be done for the newborns and the infants from the main group, in the form of the artificial pulmonary ventilation and the humidified oxygen supply. It should be noted, that to the 5-th minute of their life in half of the newborns and the infants the asphyxia state of the moderate severity had been maintained, whereas such newborns and the infants were not at all in the control group.

The dysembryogenesis stigmata have been detected at the newborns children and the infants with the intrauterine growth retardation (IUGR). The range from 3 to 5 stigmata has been observed at the newborns and the infants with the asymmetric form, and at the children with the symmetric form – the range from 4 to 7 ones. The low – lying, and the different – sized, the deformed floors of the auricles, the short hair stature on the head, the turned – up nose, the «Gothic» palate, the overhanging occipital bone, the eyes and the nipples hypertelorism, the progenia (or the prognathism), the narrow palpebral fissures, the sandal – formed fissure have been the most frequently met.

The trophic disasters of the skin have been found at 34 from 158 newborn children and the infants with the developmental delay of 27 infants with no signs of the SFDN, with no any significant differences in the groups have not been found.

So, it has been revealed, in analyzing the body weight (e.g. BW) dynamics at the examined newborns and the infants that the indicator, such as the maximum body mass decrease in 8% cases has been made up 5–8%, and it has been the same in all the examined groups. The maximum loss indicator of the body weight (e.g. BW) (e.g. in 24 hours) has

been higher at the newborns and the infants of the main group, than in the control one. So, it should be noted, that the recovery period duration of the initial body weight (e.g. BW) has been significantly greater, than at the newborns and the infants with the intrauterine growth retardation (IUGR) up to 5 days (e.g. 120 hours), which is significantly greater, than in the control group. The body weight (BW) dynamics at the newborns and the infants with the quite different clinical forms of the intrauterine growth retardation (IUGR) has not been significantly different.

So, almost all the newborns and the infants with SFDN after their birth, have been placed into the couveuses or the infant incubators.

The appearance days of the suckling reflex at the newborns and the infants have been quite different. In the main group, due to the severity condition, no one infant has been attached to the chest. All the children with the intrauterine growth retardation (IUGR) have been on the tube feeding, and there had not such small children among the newborns and the infants of the control group. Moreover, the sucking reflex recovery has been dependent upon the SFDN form. Additionally, it was revealed, that the sucking reflex recovery had been faster at the newborns and the infants with the asymmetric form of the intrauterine growth retardation (IUGR) (e.g. $19 \pm 1,3$ days and nights or $456 \pm 24,3$ hours), than at the newborns and the infants with the symmetric form (e.g. $28 \pm 2,6$ days and nights or $672 \pm 48,6$ hours; $p < 0,001$).

So, the hepatitis has had the conjugation character at all the newborn children and the infants. The newborn babies and the infants with the intrauterine growth retardation (IUGR) have had a longer period of jaundice, than the newborns children and the infants without any developmental delays. Besides, the general and the indirect bilirubin levels have been significantly higher at the newborns and the infants from the main group. So, no the significant differences in the hepatitis syndrome characteristics at the newborns and the infants with the various forms of the intrauterine growth retardation (IUGR) have been received.

Practically, all the examined small children have had the hypoxic – ischemic CNS lesions signs with the severity different degrees. So, the CNS mid degree of the lesion has been observed in two times more often at the newborns and the infants with the SFDN, in comparison with the control group. The CNS lesion average degree involvement has been more common at the newborns and the infants from the main group. So, it should be noted, that the hypoxic – ischemic CNS damage of the se-

vere degree has been showed at 8 newborns and the infants of the main group, whereas such lesions have not been observed at all in the control group. Besides, 6 newborns and the infants with the symmetric form of the intrauterine growth retardation (IUGR) have had the hypoxic – hemorrhagic CNS lesions involvement with the intracranial hemorrhage signs. The depression syndrome, having associated with the hypoxic factors exposure, has mainly been dominated among the CNS lesions involvement syndromes at the newborns and the infants.

The motor activity has been reduced at 42,4% (e.g. 67) newborn children and the infants with the intrauterine growth retardation (IUGR). The muscular tension has been changed for all the small children of the main group, and the muscular hypotonia has been occurred at 67% (e.g. 106) small children, and the muscular hypertension – only at 32,9% (e.g. 52). So, it should to be emphasized, that the muscular hypotension, as the result of more severe CNS lesions, has been observed at all the newborns and the infants with the symmetric form of the intrauterine growth retardation (IUGR). And the hyporeflexia and the rapid exhaustion of the unconditioned reflexes have been observed at all the newborns and the infants, as the main group, well as the comparison group.

So, the CNS depression syndrome at the newborns and the infants in the control group has been met almost in 4 times less, likely, than at the newborns and the infants of the main group. The motor activity has been defined also in 2 times less. The unconditioned reflexes have significantly more caused at the newborns and the infants of the control group, than at the newborns and the infants of the main group. (see the Table 1).

As it can be seen from the presented data, the vegetative – visceral disorders syndrome has been diagnosed at the 39,8% (e.g. 63) newborns and the infants with the intrauterine growth retardation (IUGR). It has been manifested by the microcirculation, the thermoregulation, and the gastrointestinal tract motor activity disorders. The microcirculatory disorders (e.g. the «mottled» skins, the pallor, the acrocyanosis) and the thermoregulation disturbances equally likely have often been distributed, which required the need for their presence in the couveuses or in the infant incubators. The gastrointestinal tract dysmotility, in the form of the regurgitations and the constipations in 2 times more likely have been registered at the newborns and the infants of the main group, than at the small children from the control group.

Table 1

The CNS Post – Hypoxic Lesion Syndromes at the Newborns with SFDN

Syndromes	The Main group, (n = 158)		The Control group, (n = 158)		P
	Abs.	%	Abs.	%	
Increased neuro – reflex excitability	40	25,3 ± 3,5	19	12,0 ± 2,6	< 0,01
Depressions	88	55,7 ± 3,9	22	13,9 ± 2,7	< 0,01
Vegetative – visceral disorders	63	39,9 ± 3,8	28	17,7 ± 3,0	< 0,01
The muscular dystonia:					
– hypotonia	106	67,1 ± 3,7	38	24,1 ± 3,4	< 0,01
– hypertonia	52	32,9 ± 3,7	24	15,2 ± 2,8	< 0,01

More common mild degree has significantly been met at the small children with the asymmetric form of the intrauterine growth retardation (IUGR), and fairly rare – the moderate and the severe CNS lesions involvement, in comparison with newborns and the infants, having had the symmetric form. The depression syndrome with more severe developmental delay has been met at the newborns and the infants almost in 2 times more likely, than the increased neuron – reflex excitability. The mo-

tor activity violation has been observed almost at all the small newborns and the infants. (see, the Table 2).

The indicators study of the cellular energy has been revealed the enzymes activity reduction at the 80 newborns and the infants, in comparison with the control group. So, the enzymes activity at the newborns and the infants with the symmetric form of the SFDN has been lower, in comparison to those with the asymmetric form. (see, the Table 2).

Table 2

The Energy Exchange Enzymes Activity Indicators at the Newborns with SFDN

The Enzymes Activity	The SFDN Forms		The Control group, (n = 23)
	Asymmetric (n = 67)	Symmetric (n = 13)	
CDG	18,67 ± 0,46*	18,26 ± 0,54**	22,29 ± 0,14
GDG	14,2 ± 0,47*	13,7 ± 0,8**	14,9 ± 0,27
GDPHG	13,1 ± 0,93**	14,1 ± 0,36*	15,1 ± 0,25
LDG	18,9 ± 0,44*	17,59 ± 0,91**	21,27 ± 0,64
GPHDG/CDG (K1)	0,77 ± 0,03*	0,78 ± 0,02**	0,68 ± 0,01
GDG/CDG (K2)	0,79 ± 0,03*	0,70 ± 0,03**	0,67 ± 0,01
GPHDG/GDG (K3)	1,0 ± 0,04	0,98 ± 0,07	1,0 ± 0,02

Note. * – the data accuracy, compared to the control (* – P < 0,05; ** – P < 0,01).

It should to be noted, that the GPHDG content at the small children with the symmetric form has been higher, in comparison with the asymmetric form of the SFDN, which is consistent with the researches' several data [5].

Thus, the obtained results showed that the more significant cellular metabolism disturbances had been detected at the newborns and the infants with the SFDN. It was also revealed, that the enzymes activity indicators with the symmetric form had significantly been lower, in comparison with the small children, having had the asymmetric form of the SFDN.

The activity changes of the succinate dehydrogenase – CDG at the symmetric form is characterized by the progressive depression of

the aerobic metabolic pathway. In parallel, the lactate dehydrogenase – LDG level is also reduced. As a whole, this is reflected the inhibition, as the aerobic, well as the anaerobic cellular energy change of the pathway, that is the energy «catastrophe» for the cell [5].

Thus, the identified changes of the bioenergetic exchange rates are shown on the cytochemical activity indicators decrease of the lymphocytes mitochondria of the newborns and the infants with the SFDN. So, the most significant changes have been detected at the newborns and the infants with the symmetric form. Then, the perinatal hypoxemia is usually exacerbated by the metabolic disorders, which are accompanied by the changes in the energy and the electrolyte balance of the cells.

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Materials of Conferences

**COMPARATIVE EVALUATION
OF ANTIBIOTIC RESISTANCE
OF NASOPHARYNGEAL
ISOLATES S. AUREUS THAT REFER
TO MRSA (METHICILLIN-RESISTANT)
AND MSSA (METHICILLIN-VULNERABLE)**

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Resistance against antibiotics *S. aureus* is one of the most important problems of modern infectology and the greatest significance has its resistance against betalactame antibiotics [1, 5, 10]. Multiple literature sources testify that resistance of MRSA variants of *S. aureus* against betalactame antibiotics is often combined with resistance against many other classes and groups of antibiotics [1, 5, 7, 10]. Resistance against antibiotics *S. aureus* that were outlined from bearers among medical personnel is slightly described in literature, though they play an important part as infection sources in hospitals [2, 8, 9]. In our region data on MRSA resistance against antimicrobial preparations is almost absolutely absent. Therefore, the work objective was to define antibiograms of nasopharyngeal isolates *S. aureus* and find out if there are differences in these characteristics among local hospital strains of MRSA and MSSA.

Methods and materials. In 3 years (2004-2006) 9531 people from medical personnel of different treatment-prophylactic institutions (TPI) of surgery profile of the city of Ugrech of Khoremskaya region were inspected for nasopharyngeal bearing of *S. aureus*. Data of 5329 persons who were outside clinic environment (healthy pregnant women on their initial appeal for consultation) served as a control. Discharge and identification of staphylococcus was carried out via general methods [4]. Disc-diffusion method with usage of Muller-Hinton environment and commercial discs with antibiotics (HIMEDIA, India, Russia) was used to define antibiotic resistance. Discs with oxacillin with load of 1mg per 1 disc were used to reveal MRSA, screening on agar with 4% NaCl and oxacillin of 6mg/ml were used to confirm the received data. Methods of antibiotic resistance definition and selection of the tested antibiotics was carried out according to Methodical guides 4.2. 1890-04 [3], a number of betalactame antibiotics was studied additionally. In comparison of two alternative indicators (MRSA and MSSA strains) difference reliability was defined with the criteria χ^2 [7].

Research results. Nasopharyngeal bearing of *S. aureus* was revealed among 321 employee of TPI (3,4%) and among 102 (1,9) healthy persons. A significant difference ($p < 0,05$) in specific weight of MRSA was registered in two studied groups: among medical personnel – 13,7% (44 strains of 321); among healthy women – 4,9% (5 strains of 102). Antibiograms were studied among all of 49 MRSA and, selectively, among 110 – of isolates from nasopharynx of medical personnel. Oxacillin-vulnerable *S. aureus* in 100% of cases were sensible to vancomycin, and then, in decrease, the smallest number of resistant MSSA was registered for fusidine, levofloxacin, rifampicin, and doxycycline. Generally, sensitivity of MSSA to a prevailing majority of antibiotics was on a high level – to macrolids and lincosamids (88,6–61,0%), to fluoroquinolones (91,7–82,2%), betalactams (71,6–80,0%).

While studying MRSA, the results differed significantly from the previous ones, though vancomycin, as for MSSA was 100%-effective. Oxacillin-resistant *S. aureus* showed sensitivity to representatives of betalactam class in limits from 18,4% (ampicillin) to 62,5% (ceftazidime).

A comparison of the two studied strain groups is shown in table.

As it is shown, statistically-reliable differences referred to almost all betalactam antibiotics (except ceftazidim) and many antibiotics of other groups. The greatest was the difference in number of strains that are resistant to ampicillin – 81,6% for MRSA and 21,8% for MSSA ($p < 0,01$). Resistance indexes were more than two times higher against such antibiotics as amoxiclav, cefazolin, cefuroxime, ceftriaxone, erythromycin, ciprofloxacin, doxycycline, and levomycitine ($p > 0,05$ and $p < 0,01$). The most effective preparations against MRSA and MSSA, except vancomycin, were fusidine (6,1 and 5,0% of resistant) and clindamycin (11,5 and 11,4%). Thus, it has been established that in terms of the studied region nasopharyngeal bearing of *S. aureus* among personnel of TPI of surgery profile is low (3,4%) but exceeds this indication among healthy people who are outside hospital environment almost two times (1,9%). Along with that, a significantly higher specific weight of dangerous MRSA-variants was revealed among inner-hospital isolates *S. aureus* (13,7%) than among outer-hospital isolates (4,9%), as well as their higher resistance against antibiotics. It has also been found that carried staphylococcus that refer to MRSA, unlike MSSA, apart from resistance against betalactam antibiotics, have an expressed resistance against antibiotics of different groups. All MRSA and MSSA strains preserve sensitivity to vancomycine.

Comparison of MRSA and MSSA antibiotic resistance

Antibiotic	MRSA		MSSA		Difference reliability
	Abs R	%	Abs R	%	
Vancomycin	-(49)	-	-(49)	-	-
Ampicillin	40 (49)	81,6	24 (110)	21,8	$X^2 = 47,9, p < 0,01$
Amoxiclav	20 (40)	50,0	21 (110)	21,8	$X^2 = 9,9, p < 0,01$
Ceftazidime	14 (40)	35,0	19 (90)	21,1	$p > 0,05$
Cefuroxime	18 (45)	40,0	17 (95)	17,9	$X^2 = 6,8, p < 0,05$
Ceftriaxone	29 (49)	59,2	27(95)	28,4	$X^2 = 11,6, p < 0,01$
Cefazolin	32 (49)	65,3	29 (110)	26,4	$X^2 = 11,7, p < 0,01$
Erythromycin	32 (49)	65,3	38 (110)	34,5	$X^2 = 11,8, p < 0,01$
Lincomycin	14 (49)	28,6	29 (110)	26,4	$p > 0,05$
Clindamycin	4 (35)	11,5	8 (70)	11,4	-
Ciprofloxacin	18 (49)	36,7	13 (90)	14,5	$X^2 = 7,8, p < 0,01$
Levofloxacin	9 (49)	18,4	4 (60)	6,7	$X^2 = 2,4, p > 0,05$
Fuzidin	3 (49)	6,1	5 (100)	5,0	-
Co-trimoxazole	11(40)	27,5	20 (100)	20,0	-
Doxycycline	14 (40)	35,0	12 (110)	10,9	$X^2 = 10,2, p < 0,01$
Rifampicin	10 (49)	20,4	10 (110)	9,1	$X^2 = 2,9, p > 0,05$
Gentamycin	11 (49)	22,1	16 (110)	14,5	$p > 0,05$
Chloromycetin	29 (49)	59,2	26 (110)	23,6	$X^2 = 14,2, p < 0,05$

Note: R – resistant; () – number of studied strains.

Resume. Frequency of nasopharyngeal bearing of *S. aureus* by medical personnel of surgery clinics in terms of city of Ugrech of Khoremsk region of Uzbekistan equaled 3,4% (321 of 9531 studied persons in three years); same index among healthy people out from hospital environment equaled 1,9% (102 of 5329 persons). A significantly higher specific weight of MRSA (44–13,7%) was revealed among inner-hospital isolates in comparison to outer-hospital isolates (5–4,9%). Among 49 MRSA and, selectively, among 110 MSSA sensitivity to 18 antibiotics was studied from nasopharynx of medical workers. It has been shown that resistance was reliably higher ($p < 0,05$ and $p < 0,01$) among MRSA than MSSA against betalactams (amoxiclav, cefazolin, cefuroxime, ceftriaxone) and antibiotics of other groups: against erythromicine (65,3 and 34,5%), ciprofloxacin (37,6 and 14,5%), doxycycline (35,0 and 10,9%), and levomecetin (59,2 and 23,6%). All MRSA and MSSA strains preserve 100% sensitivity to vankomicin, and prevailing majority – to fuzidin (only 6,1 and 5,0% of resistant) and clindamycin (11,5 and 11,4%).

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**DEEP FEMORAL ARTERY
AS THE ALTERNATIVE WAY
FOR SHUNTING**

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The results of surgical treatment of 121 patients with atherosclerotic lesions of lower limbs' arteries were studied. Surgical treatment was conducted on those patients using DFA as the sole recipient. By incorporating DFA into the bloodstream, 164 limbs were revascularized. To determine the functional abilities of the collateral system and to forecast the outcomes of revascularization via the DFA, C.H. Boren (1980) brought forward DPPI (deep femoral-popliteal pressure index), which is calculated on the basis of Doppler ultrasound.

The study identified two groups: group I (control) included 81 (49.39%) revascularized limb. In this group before reconstruction $DPPI \leq 0,4$ and in group II (study) – 83 (50,61%) $DPPI > 0,4$. The average values of ABI (ankle-branch index) in the treatment groups in the preoperative period were: $0,34 \pm 0,07$ in control group; $0,32 \pm 0,04$ in the study group.

Postoperative mortality was 9,1% (11 patients) – by MI (myocardial infarction) 7 (5,78%), from a brain-stroke (0,83%), 1 (0,83%) from thrombosis of mesenteric vessels and 2 (1,66%) cases of death due to other causes. In the group with a good functional state of the DPCN ($DPPI \leq 0,4$) more

marked clinical improvement occurred than in the group with a poor functional state of the DPCN ($DPPI > 0,4$) (study group), where 12,5% impairment was observed.

It was noted that the progression of ischemia in patients with ChCILL (chronic critical ischemia of lower limbs) led to the need for amputations at various levels. In the control group during the first year the degree of saved limbs decreased by 7.44%, while the study group – by 10,85%. During one to three years, the figure was 13,61% and 12,04% respectively, i.e. an average of 6,8% and 6,02% for one year. Thus, the rate of lost limbs per year in the control group fell only 8,6%, and in the study group – by 44%, or by 1,8 times. According to the presented in the control group the mean value during the first ABI per month increased by 58,8%, and in the study group – by 28,1%. During the first six months the growth in the ABI was 5,5 and 14,6%, respectively, during the second half of the year – 3,5 and 21,7%. During one year it was increased by ABI 9,26% and 36,9%, and during the next two years there has been some decline – by 0,85 and 0,9% respectively (average for year). The described increase of ABI is caused by the development of lower limb's collateral network from recovery of main bloodstream in DFA. Further reduction of these indicators is likely due to natural progressive atherosclerotic process.

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SEGMENTARY CONSTRUCTION AS CONSTITUTION OF LYMPHATIC SYSTEM

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Lymphatic system consists of segments of two types – general (systemic or periarterial) and special (own, local or intervalvar). The segments organize all reactions of the system on influences of its environment including pushes of lymph flow.

Keywords: lymphatic system, segment, valve, artery

It is known many facts about structure of lymphatic system (LSy) in man and animals [2, 5, 6]. It is proposed mush models of function of LSy as part of cardiovascular system, but mainly of lymphatic vessels (LV) – lymphatic hearts by L. Ranvier or lymphangions as valvar segments, functional units of LV according E. Horstmann and H. Mislin [1, 4, 6]. These models characterize organization of LSy in different aspects, but generally accepted conception about organization of LSy at whole is absent. In this article I want to point on common in structure of all sections of lymphatic bed (LB) independently from their regional and organic belonging, in order to establish the main principle of general construction of LSy in mammals.

Topographico-genetic features of LB. LV and lymph nodes (LN) usually lie about blood vessels. And this is not accidentally. Primary veins always accompany arteries of embryo, part of its veins are turned off blood flow with formation of primary LV. Blood vessels invaginate in lumen of these LV with anlage LN in fetuses. External wall of marginal sinus in anlage of LN (wall of maternal LV) transformates into capsule of LN (~ wall of definitive LV), internal wall of marginal sinus of LN is infiltrated by lymphocytes, which migrate from blood microvessels of stromal anlage of LN (invagination in lumen of maternal LV) [5]. Arteries with the most high blood pressure, the most thick and compact walls among all vessels:

1) dominate in interactions with veins and LB, contact (fragmentation of embryonic vessels and direct massage of definitive vessels) and distant (over capillaries and tissue channels, blood supplying of tissues and organs in environment of LB as its external cuff – lymphization and «undirect» massage of LB);

2) more stable to pressure of surrounding organs and as pivot preserve stability of vascular bundles.

Definitive microcirculatory bed, as primary vascular bed in early embryos, has net-form architecture, comparatively thin, gentle differentiative walls. Most large, magistral arteriolar and venulae, their branches and tributaries divide mesentery on microdistricts

of microcirculatory bed. Terminal arteriolar come off outline of the microdistricts. Their outline vascular bundles include LV of I order. The LV lie offer on their outlying area, at one or both sides from magistral venulae, and lymphatic capillaries – on the outside of balls of blood capillaries. Lymphatic capillaries fuse into lymphatic postcapillaries, which move towards the outline vascular bundle of the microdistrict, offer along collective venulae. LB has similar construction in organs with multilayers structure. Thus all LB, beginning from its roots, lie collaterally to the blood vessels. In definitive microcirculatory bed LV accompany offer venulae as in anlage of LB in embryo.

After bounds of organs large LV more and offer are orientated on aorta and its branches: thoracic duct and its roots, lumbar trunks, pass along descending aorta, vascular bundles of all main parts (regions) of human or animal body and to all organs form about aortic branches and their branchings. That construction of cardiovascular system, and LSy as its part, originates already in embryos (Fig. 1): branches of dorsal aorta grow to somites, adjoining parts (segments) of neural and intestinal tubes, their derivatives; drainage vessels, venous and lymphatic, are orientated on these branches of arterial tree.

Morfogenetic folding adaptation of LB – formation of valves: periodic knocks against of lymph anti-flows cause repeated local lymphodynamic strokes and overstretching of walls of LB, arising and increasing of their residual deformations with look as circular folds [6]. Valves limit lymph flow back and thus prevent destructive lymphodynamic strokes. As long ago as XIX centure A.Haller observes rythmical contractions of segments of LV between neighbouring valves and voices supposition, that such segments present lymph pumps. At this time L. Ranvier describes lymph hearts in LV of mammals. According E. Horstmann a. H. Mislin, they are valvar segments or lymphangions, functional units of LV: distal valve limits lymph flow back, more proximal muscular cuff supports direct lymph flow. I think, that lymphangions are intervalvar segments of

LV, which include both neighbouring valves of the segment, entrance and exit, because lymphangions function only with participation of both their neighbouring valves (Webb R, 1932) [6], as industrial pump. What is more, LB has segmentary construction on all extent.

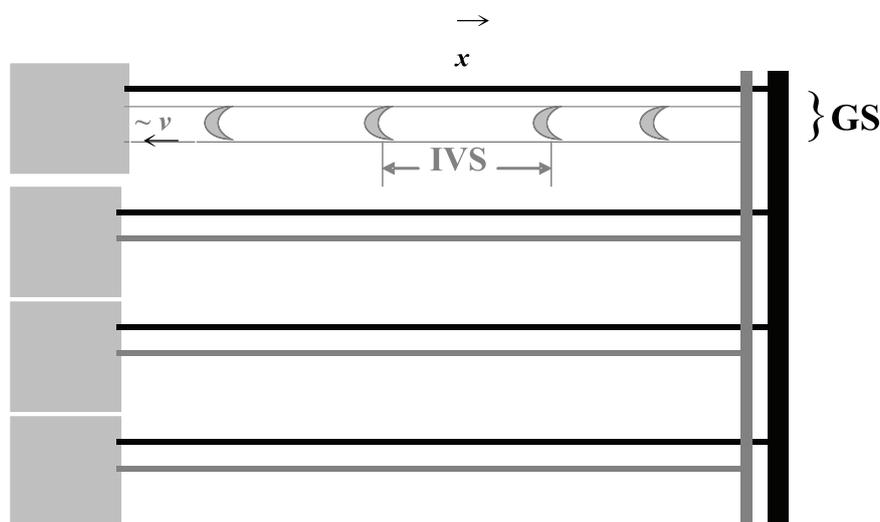


Fig. 1. Segmentary morphogenesis of lymphatic bed (scheme): gray squares – somites and their derivatives; gray lines – lymphatic vessels and their walls; black lines – arteries; IVS – intervalvar (special) segment; $\sim v$ – oscillations (of speed) of lymph flow with connection of functional activity of somite and their derivatives, including oscillations of tissue fluid production, valves are on the way of reverse lymph flow; *GS* – general segment (of lymphatic system); x – place of own segment of lymphatic bed about main (segmentary) artery of general segment, direct of its growth determines topography and state of lymphatic bed in composition of general segment. Morphogenesis of lymphatic bed is described by formulæ of its work ($A = 1/2 mv^2 + 1/2 kx^2$) as derivate of kinetic and potential energy of developing system

Valves divide LB on intervalvar segments with different structure: lymphatic postcapillaries consist of unmuscular intervalvar segments, which organize passive lymph flow out network of lymphatic capillaries; LV consist of muscular intervalvar segments or lymphangions, which may be contract themselves by deficit of energy of extravasal factors and actively move lymph to veins; LN is nodal or lymphoid lymphangion, it regulates as volume speed of lymph flow so composition of lymph. All intervalvar segments of LB have common structure: between entrance and outlet valves there is unvalvar part, but with different construction. The wall of lymphatic postcapillary consists of endothelium and (often) connective tissue. The wall of LV includes yet smooth myocytes, the wall of LN (internal wall of nodal sinus) – lymphoid tissue. The border valve belongs to both neighbouring intervalvar segments (wall of LB is uninterrupted). The cusps of closed valve divide lumen of neighbouring intervalvar segments on the autonomic compartments. Their dilatation by filling of lymph induces passive contract of intervalvar segment (pressure of surrounding tissues – external cuff of LB), and stretching of its walls – ac-

tive contract (muscular cuff of lymphangion). Segmentary principle of construction extends on network of lymphatic capillaries. Mobile intercellular contacts of endothelium are maken and function as minivalves [3] on entrance of lumen of lymphatic capillary: they level variable current of fluid between tissue channels and lymphatic capillary and thus regulate filtration of tissue fluid in lumen of lymphatic capillary (lymphization).

LSy may be present as chain of intervalvar segments. Their construction become complicated progressively in orthograd direction (Fig. 2): the endothelium of lymphatic capillary are supplemented by its folds (valves) and adventitia in the walls of lymphatic postcapillary, smooth myocytes – in the walls of LV, lymphoid tissue – in the walls of LN. This hierarchy in structure of definitive LSy recapitulates the main stages of development of LSy with connection with organogenesis (growth of functional loading on LB) in evolution and ontogenesis of vertebrates. Thus human thoracic duct:

1) has endothelial walls in embryos of 7-8 weeks, first valves with short cusps – in embryo of 8 week;

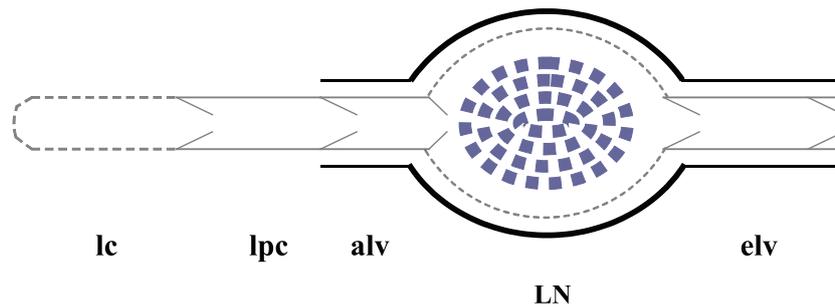


Fig. 2. Lymphatic system as chain of intervalvar segments with progressively complicated construction of their walls (scheme): lc – lymphatic capillary with endothelial wall, dotted line symbolizes mobile intercellular contacts, they function as minivalves on entrance into unmuscular intervalvar quasi-segment; lpc – lymphatic postcapillary, where typical, intraluminal valves appear (unmuscular intervalvar segment); alv, elv – afferent and efferent lymphatic vessels, thick black line symbolizes muscular layer in their walls (muscular intervalvar segments or lymphangions); LN – lymph node as nodal or lymphoid lymphangion, its walls contain lymphoid tissue

2) acquires thin adventitial coat and several valves with long cusps, which cut up the lumen during their closing in fetuses of 3 month;

3) become unpaired with beginning of division of its thickening wall on definitive layers including smooth myocytes from ending 3d – beginning 4th months [5].

LN is part of uninterrupted lymphatic tract: walls and lumen of afferent LV pass into capsule and sinuses of LN, which continue into walls and lumen of efferent LV. Their muscular layers interconnected too. LN is one of lymphangions in network of extraorganic LB. On structure and function capsule of LN is mus-

cular cuff of nodal lymphangion, in connective tissue of which lymphocytes instil [6]. As in evolution of vertebrates, so in ontogenesis of man and mammal animals LN form at last among all sections of LB, on the base of LV, but with participation of arteries and veins, which invaginate in lumen of LV. Then it is originated lymphoid parenchyma of LN as local transformation of the wall of maternal LV (Fig. 3): monocytes (→ macrophages) and lymphocytes pass from blood microvessels of the invagination (stromal anlage of LN) into its intervacular connective tissue which grow up as lymphoid tissue into lumen of the LV [5].

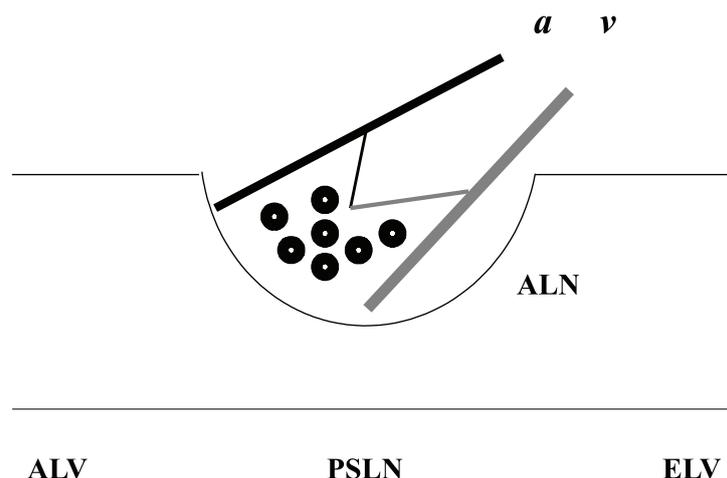


Fig. 3. Anlage of lymph node (ALN – scheme): a, v – artery and vein, they invaginate into lumen of lymphatic vessel, which divides on three segments, ALV, ELV and PSLN – afferent and efferent lymphatic vessels and primary marginal sinus of lymph node. PSLN is local narrowing of lumen of maternal lymphatic vessel in its part, where invagination of its wall with a, v (stromal ALN) grow up and transformate into ALN with lymphoid tissue

Classification of segments of LSy. Segmentary organization of all LB is defined as structure of its walls (valves), so its topography (branching artery). Therefore I divide all segments of LSy on two groups:

1) general (common for LB and blood bed) or systemic;

2) special, own or local.

I discern two types of general, periarterial segments of LSy:

1) central, paraaortic (lymphatic ducts and their parts and roots);

2) peripheral, subaortic, including

2a) regional or topographo-anatomical (usually about primary branches of aorta);

2b) organic, anatomical or subnodal (near the organ, in basin of its regional LN of I order);

2c) microorganic, microanatomical or paraarteriolar (in microdistricts of microcirculatory bed in organ – LV I order and their roots);

2d) root, primary or subarteriolar – lymphatic postcapillaries and their roots in modules and microdistricts of microcirculatory bed.

I divide special segments of LSy on unmuscular and muscular intervalvar segments, lymphangions – on vascular and nodular. Structure of own segments of LSy becomes complicated in orthograd direction:

1) at level of tissues in organs (in the places of lymphization) there are root general segments, they consist of unmuscular intervalvar segments;

2) on exit of organs and their coats (on withdrawal from vis a tergo) lymphangions appear;

3) at level of regional general segments lymphoid or nodal lymphangions supplement vascular lymphangions by means of including lymphoid tissue in the intima.

Integration of segments of LSy. The own segments of LSy unite with another components of general segments of LSy (and corresponding neuro-vascular segments of body at whole) by means of loose connective tissue, which may be transformates into lymphoid tissue in LN. In the walls of LB it may be distinguish own or segmentary apparatus (intervalvar segments) and oversegmentary apparatus of bipartite connections with surrounding tissues. The own apparatus includes inner layers of LB wall: in lymphatic capillaries and postcapillaries – endothelium, in LV and LN – intima (including lymphoid tissue in LN) and

media. The intervalvar segments of LV and LN are surrounded by common case of uninterrupted adventitia. Connective tissue fibers entwine in superficial layers of LB adventitia uniting wall of LB with surrounding tissues and organs – mechanic drives of external cuff of tissue (extralymphatic) pump.

Conclusion

Constitution or general construction LSy, which determines its reactions on all influences of surroundings including pushes of lymph flow, is in the segmentary construction of all parts and sections of LSy. Its organization includes folding structure of LB walls, causing by fluctuations of lymph flow [6], and quasi-segmentary connection of LB with arteries. Topographo-anatomical segmentation of LB arises in embryos [5] and reflects external connections LB with its surroundings – source of extravasal factors of lymph flow. Functional, intervalvar segmentation of LB arises in fetuses and corresponds to impulsed lymphization in organs and partial lymph flow out organs, that causing cyclic organization of vital activity of cells and tissues. In condition of deficit of own lymph flow energy LB intervalvar segments organize passive and supplementary active moving of lymph from organs to veins. Structure and regimen of function of LB intervalvar segments are determined by their topography: at each level of general segmentation, branching of the main artery of systemic segment LB is divided on intervalvar segments with different construction of their walls. It corresponds to fluctuations of functional activity of surroundings: the metabolic activity of draining organs (lymphization as piston of tissue pump) and mechanic pressure of adjacent organs (external cuff of tissue pump).

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EFFICIENCY OF BIOREGULATORS AGAINST POWDERY MILDEW DISEASE (*LEVEILLULIA TAURICA* (LEV.)G. ARNAUD.) SPREAD ON TOMATO PLANTS

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The given article presents the results of studying the way the bioregulators (Albit, Zircon and Epin-extra) influence powdery mildew disease, caused by pathogenic fungus *Leveillulia taurica* (anamorph *Oidiopsis sicula*) and spread on tomato. The adaptogenic activity has also been studied, including its influence on tomato resistance to water deficiency and higher temperature during vegetative stage. The plant growth bioregulators Albit, Zircon and Epin-extra have antistress and protection effect, therefore, the research shows that use of these bioregulators results in considerable reducing powdery mildew disease on tomato and in increasing resistance of plants to unfavorable environment conditions.

Keywords: tomato, powdery mildew, plant growth regulators, plant water conditions, photosynthetic potential, actual photosynthesis productivity

Bioregulators are natural, highly effective preparations stimulating plant growing and protecting plants from injurious influence of abiotic and biotic environment factors. Use of growth regulators in small doses helps to decrease harmful influence on living organisms. The rational application of bioregulators leads to considerable reduction of chemical weed and pest killers, and that is definitely improving environmental and ecological conditions and safety of the production. The purpose of the present research is to study the way and the efficiency the bioregulators influence powdery mildew disease, caused by pathogenic fungus *Leveillulia taurica* (anamorph *Oidiopsis sicula*) on tomato plants and their resistance to harmful environment conditions.

Material and methods of research

Bioregulators Albit, Zircon and Epin-extra have been tested on a tomato variety *Novitchok Rozoviy* cultivated with a recommended dose of fertilizers when planting out. These bioregulators have antistress and protection characteristics, they stimulate vital activity of tomato plants.

Concentrations of bioregulators solutions have been tested on vegetable crops according to the description enclosed. Solutions of Albit (2 ml per 1 litre of water), Zircon and Epin-extra (2 drops per 100 ml of water) have been applied to preplant processing of tomato seeds. Testing tomato seeds have been soaked in distilled water. The time of soaking of all kinds (has) made up 6 hours.

Plant spraying during vegetation period was carried out using solutions of Albid (1 ml/10 litres of water; during initial phase and during flowering), Zircon (0,1 ml/1 litre of water; after planting out and during 1st, 3^d and 4th cluster flowering, Epin-Extra (5-6 drops/0,5 l of water during initial phase and before panting; and 1 ml/5 litres of water when budding and at the beginning of flowering). Control plants were processed with distilled water. Field testing were carried out in 4 replications according to «Methods of carrying out tests and experiments». During research the following observations have been carried out: phonological observations

on growth and development phases of plants, biometric measuring; physiological observations: measurements of photosynthetic activity of crops and plant water conditions. Accounting of tomato disease spread and accounting of crop capacity have been made according to the methods of Russian Scientific Research Institute of Plant Growing. Statistic analysis of crop capacity data has been carried out by variants.

Results of research and their discussion

The symptoms of mildew powdery disease were observed on tomato variety *Novitchok Rozoviy* during flowering and fruiting period. Higher air temperature (27-30 °C) aggravated the disease. Plants had lower turgor, assimilatory leaf surface decreased due to powdery mildew, and that resulted in decreasing tomato crop to 30,7 t/h during control.

Study of powdery mildew progress showed that the disease reached its peak during fruiting period (Table 1).

Table 1
Influence of growth regulators on powdery mildew disease spread on tomato plants

Treatments	% damaged plants	Preparation biological efficiency %
I – Control	30,6	-
II – Albit	10,0	67
III – Zircon	14,1	54
IV – Epin-Extra	12,2	60

The test carried out with Albit processing indicated the least number of damaged plants and, therefore, the best result; bioregulator Albit strengthens plant immunity to diseases. Plants with powdery mildew disease made up 30,6% during control. Thus, use of bioregulator Albit made it possible to increase resist-

ance of plants to the disease, reducing the number of diseased plants to 20,6% in comparison with control. Biological efficiency of Albit made up 67%. Bioregulator Epin-extra – 60% with biofungicide properties showed high biological efficiency against mildew powdery disease on tomato variety *Novitchok Rozoviy*. The amount of damaged plants made up 12,2% – that is 18,4% less as compared with control. The application of immunomodulator Zircon on tomato plants has also proved to be effective, Zircon reduced the amount of diseased plants to 16,5% in comparison with control, as Zircon has powerful fungicide and antistress effect. Its biological efficiency made up 54%.

Disease spreading is mostly provoked by harmful environmental conditions in which plants grow and develop. Higher temperature in spring and summer period and water deficiency in the Astrakhan region are the main limiting factors of environmental conditions which have negative effect on agricultural crops planting and growing and their productivity. Therefore, plants are in harmful conditions during all vegetative stage, and this has a negative influence on their resistance to diseases, crop capacity and production quality. Therefore, we have studied the influence of bioregulators on plant water conditions and photosynthesis productivity of tomato crops during vegetative stage (Table 2). It is proved that the bioregulators applied are adaptogens increasing drought and heat resistance of plants and reducing water deficiency in tomato plants during vegetative stage in drought conditions (Table 2). The maximum indicator of tomato plant water deficiency was observed at midday during flowering and fruiting period.

Table 2

Influence of bioregulators on water conditions and photosynthesis productivity of tomato plants

Treatments	Water deficiency, %	Photosynthesis Productivity, mln m ² /hectares
I – Control	15,2-28,4	3,5
II – Albit	11,8-18,2	4,7
III – Zircon	13,3-20,1	4,0
IV – Epin-Extra	12,0-19,6	4,3

Growth regulator Albit helps to increase turgor and to strengthen water-retaining ability of plant leaves; due to this water deficiency during vegetative stage was 3,4–10,2% less compared with control plants, water amount in leaves also increased from flowering phase till absolute ripeness by 61,9–81,5 g per 100 g dry weight of leaves. Growth regulator Epin-Extra influences the synthesis of antistress proteins and helps to reduce water deficiency coefficient to 3,2–8,8% and, as a result, to increase water amount in leaves to 43,5–62,2 g per 100 g dry weight of leaves as compared with control. The application of Zircon helped to decrease water deficiency of tomato plants to 1,9–8,3% as compared with control and to increase water amount of leaf tissue to 42,7–53,3 per 100 g dry weight of leaves in comparison with control – and this confirms the ability of the regulator to reduce transpiration in conditions of higher temperature and water deficiency, increasing drought resistance. Photosynthetic activity of plants depends on water conditions. The bioregulators increase stress resistance of tomato plants in drought conditions, so, the bioregulators influence better absorption (use) of light energy by plants, increasing photosynthesis productivity of crops.

The application of Albit showed the best photosynthesis productivity and made up 1,2 mln m² days per hectare higher as compared with control. Bioregulators Zircon and Epin-Extra raised photosynthesis productivity of *Novitchok Rozoviy*, increasing surface of leaves and total biomass (Zircon) and increasing chlorophyll amount in leaves (Epin-Extra) as compared with control to 0,5 and 0,8 mln·m² days per hectare. Actual photosynthesis productivity raised with use of all treatments and correlated with photosynthesis potential ($r = 0,97$).

Conclusion

Plant growth regulators have antistress and protection effect, therefore, use of these regulators in tomato planting technology helps to reduce powdery mildew disease in considerably and also to increase resistance of tomato plants to harmful environment conditions. The applied bioregulators increased resistance of tomato plants to higher temperatures and water deficiency during vegetative stage. The presence of adaptogen and protection effects of bioregulators may be the base for development of promising and ecologically safe means of biological protection of tomato plants and reduction of stressful pressure on plants when forming rich crops with good quality of production.

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ANALYSIS OF DEVELOPING MAIN FORMS OF REGIONAL INDUSTRIAL-PRODUCTION COMPLEXES

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In the article there are considered various theoretical approaches to the concept and typology of industrial-production complexes. There are analyzed the main indicators, as well as similarities and differences of such production-industrial formations, as territorial-production complexes (TPC), industrial-production complexes (IPC), clusters, local complexes, etc.

Keywords: regional complexes, industrial-production, analysis

At the present stage of developing the world economy there takes place a significant reevaluation of the most important trends of the regional economic development. In this connection, alongside with the common for a separate state strategic aims and tasks, there are developed and solved the problems conditioned by the characteristic features of the regions development, and the regional and common state aims must naturally effect the growth of the region population wellbeing.

The process of forming regional industrial-production complexes which has begun in the economy of Kazakhstan requires a scientific theoretical-and-methodological substantiation of their forming expediency taking into consideration the priorities of the national economy development, the state economic interests and the functioning integrated structures.

The present day tendencies of the development of Kazakhstan pose new requirements to the organization of the national industry managing, dictate the necessity of its timely reforming and modernizing with the aim of achieving its competitiveness.

The most efficient from the economic point of view is such a form of production-territorial formations, as industrial-production complexes (IPC). The analysis of home and foreign literature on this issue allows to separate various definitions of industrial-production complexes. All these definitions can be divided into three groups in which there are considered enterprises, or branches, or separate kinds of activities as the forming elements.

The first group of definitions is based on every region provision with their own fuel-and-energy, metallurgical and machine building base, building materials, production of wood and food industries, as well as the presence of corresponding enterprises on its territory. So, under a territorial-production complex there is understood a totality of uniform, closely interconnected «elementary technical-economic units» (enterprises located on a compact territory) [1].

The other group consists of definitions in which an industrial complex is considered depending on the territory covering or as a

combination of industrial branches within the limits of economic regions [2], or as a totality of branches and productions in economic regions, in industrial junctions and centers [3], or an interaction between enterprises in economic regions of different levels [4]. A.Ye. Probst, starting from the efficiency of locating interconnected enterprises on the same territory, limits production complexes with cities or even with grounds in their boundaries and calls them «territorial-industrial complexes of the center» [5]. An original by its content definition of an industrial complex belonging to this group was given by N.N. Kolosovski: «Mutually conditioned combination of organically connected branches on a certain territory in accordance with its economic and natural resources features ensuring a needed economic result, i.e. obtaining a preset amount of production with minimal costs» [6].

One more position in understanding an industrial complex has been formulated by an American scientist, W. Isard. In his interpretation «an industrial complex is a totality of kinds of activities carried out in a certain place and combined in a certain group with close production, commerce and other relations» [7].

The main content of the abovementioned definitions comes to the following: in the first case an industrial-production complex is oriented to the region self-sufficiency, in the second case –to achieving an optimal economic effect, in the third one – to the interconnection. Nevertheless, by joining the main propositions of each definition we can achieve an optimal understanding of industrial complex organization. The main indicators characterizing an industrial-production complex as a complicated territorial formation serve the following [8]:

- unity and interaction of branches and individual enterprises;
- association of a group of enterprises forming a branch to a certain territory;
- common infrastructure;
- an industrial complex conformity with local economic and natural conditions;
- achieving a needed effect due to a rational structure of an industrial complex.

An industrial-production complex can be defined as an interconnected and mutually conditioned combination of organically connected enterprises (and productions) on a certain territory, in accordance with its economic and natural conditions and transport-geographical location, comprising a part of the economic complex of the whole country or some economic region and ensuring the achieving of maximum economic effect, i.e. obtaining a needed production amount with minimum costs.

The present day structure of Kazakhstan economy was formed in the conditions of the USSR mainly based on practical realization of the theory of territorial-production complexes (TPC) which were an instrument of centralized planning in regions. In the 20-s the term «TPC» was identified with an economic region: «an economic region is a territorial-production complex ensuring the most complete and rational use of natural and human resources of the region» [9].

As far as complicating the territorial-production structure of the USSR economy there appeared a necessity to divide the existing economic regions into subregions for the more accurate planning of the regions development. An economic subregion began to be defined as a primary TPC, i.e. there took place the transfer of the TPC concept to a lower taxonomic unit [10].

Methodology of the territorial-production complex theory developed by N.N. Kolosovski and other soviet scientists is similar to the methodology of cluster theory by M. Porter which has not been used for long in our country.

According to N.N. Kolosovski, the basis of regionalization is designing regional territorial-production complexes which were understood as organized in certain technical forms social human labor with its power and machine equipping, applied to a certain favorable for the given specialization combination of natural resources. These production-territorial complexes were considered to be the basis of regionalization [11].

The ideas of typification production processes initialized the development of a conception of territorial-production complexes (TPC) which later on were widely used both as a method of analyzing and a category of planning, and as a form of the production territorial organization. In spite of that TPC managing was carried out by planning-and-administrative methods, there was practically no competitiveness, and the efficiency was defined by minimizing the reduced costs and the term of capital investments recoupage, there was accumulated a positive experience to develop vertical and horizontal cooperation relations, complex use of raw materials, cultivating new territories.

Changes in the country economy structure which are mainly defined by the influence of political factors led to the corresponding modernized approaches in forming and managing territorial-production complexes. These changes connected with the differences in TPC management permit to state the following:

- principles of TPC managing in the conditions of planning-and-centralized economy differ cardinaly from the market principles;

- at present there is brewing an objective necessity to form a principally new system of the state, regional and in-company management instead of the obsolete system of centralized state regulation of TPC functioning. A modernized system of TPC regulating in the strategic period would ensure the planned effect of TPC agglomeration and finally the country dynamic development;

- in the centrally-planned economy a TPC was functioning as a single organism in which a part of its structural elements «were feeding» the other ones. And the common TPC efficiency was estimated on the whole complex. In connection with developing the market principles of economy there is observed a certain isolation of TPC structural units and relations between them. In this connection in the competitive economy the first place is taken by the principle of TPC units self-repayment, there takes place a certain economizing of its parts each of which can participate in the TPC on the organizational principles of business-processes.

Consequently, present day conditions of the regional economy dictate the necessity to revise and change the existing principles and methods of managing such complexes. TPC management must be oriented to forming and developing integration processes which permit to ensure the complexity of satisfying the growing demands of economic subjects of a region. The integration of enterprises must be based on the principles of economic motivation of enterprises which consist in that enterprises functioning within the limits of TPC allow them to extract a larger economic effect than their independent development.

Now we can analyze similarities and differences between industrial-production complexes and clusters, as at first sight we can come to the conclusion that the conception of clusters repeats the basis propositions of IPC and is its copy. However, on closer examination it becomes clear that such a conclusion is incorrect. The conception of clusters does not copy the conception of IPC, they do not contradict to each other but can exist in parallel. We can accept V.Yu. Malov's opinion that a cluster by the set of objects can correspond to a TPC, but it is characteristic of the period after TPC

forming, when on the given territory there will be no new large structural transformations that require studying material-substantial proportions [9, p. 11]. One of the differences is clusters and IPC location. Clusters usually form in old-assimilated densely populated regions and especially often in the limits of agglomerations. In one city there can form several clusters. The IPC models can be mainly used for the regions of new assimilation with low density of population and not simple natural conditions. Besides, the structure and specialization of clusters and TPC are different. A cluster is an aggregation of contacting with each other independent companies working in one industry or subindustry. In the cluster structure there are also state and often educational or/and research organizations, there is a controlling body. An IPC is an interbranch complex in which the main role is played by the branches of the basic group defining the IPC main specialization, as well as there develop complex-forming branches. Clusters and IPX specialization is the next parameter by which these conception differ. Clusters develop mainly in new highly technological industries, sphere of services or in the traditional industries oriented to the consumers. An IPC is characterized by the presence of mining, metallurgical, chemical industries and machine building oriented to the manufacturers [12].

In connection with various approaches to the terminology there arises a necessity to streamline them. With this aim all the forms of organizing regional complexes can be grouped in such a way:

– to the first group there are referred complexes which form independently due to the space manifestation of the market forces. In its structure there can be various forms of industrial regions, regional and local clusters. Starting from this, the methods of the state regulation are to be aimed to forming corresponding preconditions for their further efficient development;

– as to the other regional complexes, the criterion of grouping is their artificial forming based on scientific-applied studies organized by the local authorities. Here there are formed territorial-production and industrial-production complexes, scientific-technological parks, innovation-scientific centers, technology towns, and business-incubators.

The internal relations reflecting the local differences in economic and natural-climatic conditions, specificity of the industry structure, are used as one of the main economic-geographical aspects of any IPC. Alongside with this, studying IPC is incorrect without revealing the external relations assisting the substantiation of the production specialization

trend with the aim of defining the place taken by each of them in the total system of the regional labor division.

The relations inside the IPC, even if limited by the relations of just production character, are very diverse and differ by a wide branching. They appear under the influence of using raw materials, fuel, electric and heat power, various materials, machines and equipment, semi-finished products, ready products, they spread over the general servicing units (transport, power, communal and other facilities), over human resources, etc. Their highest expression serves such forms of industry organization, as combining and cooperating.

A complex of factors effecting the process of IPC forming can be combined in the following groups: natural-climatic (natural-resource potential of a territory, ecological conditions); social-demographic (employment specificity and level, provision with qualified personnel, the population wellbeing level, cultural-everyday traditions, etc.); technical-economic (material-, fund-, power- and labor intensity of production, transportability of raw materials, investment amounts, etc.).

Thus, the process of complex-forming can take place both within the limits of a large territory (economic-geographical region) and within the limits of a limited territory (administrative-territorial unit) – local complexes. Due to the mutually conditioned combination of productions there can be ensured the production economic efficiency by the way of reducing transport costs, more complete and complex using of the raw materials and auxiliary materials, rational use of local natural and social-economic conditions.

Industrial groups where enterprises are connected between each other by the common transport-geographical location and the common use of the same servicing units, under known circumstances serve a step which is transit to industrial complexes. In an IPC there can be included in some cases the productions which are left from the old time if they are organically connected with the common principles of the production-territorial combination, and those which have just appeared and haven't yet had time to merge organically with the other productions but have all the necessary preconditions for this.

Regional industrial-production complexes are exclusively diverse. The individual characteristics meaning, from the point of view of industrial complexes typology is different. Some of them are the main ones, the other play an auxiliary role.

The largest interest for typological aims there presents the analysis of specialization, structure, and territorial organization

of the production. They are the main aspects in the economic-geographical studying of any production-territorial combinations in industry.

Of the decisive importance among all the indicators which can be basic for the IPC typology there are, of course, characteristic features of the production specialization and structure. With their help it can be possible to define the functions performed by the given complex, its role in the common system of the labor territorial division inside the country, and the character of the mutually connected enterprises combination that occurred under the influence of such and such factors.

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THE BASIC ASPECTS OF THE INTERACTION MARKETING CONCEPT AND THE NETWORK THEORY

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The basic concept of interaction marketing is that the relations with buyers and other participants of the process of purchase and sale become the object of marketing theory. Unlike classical marketing interaction marketing considers communications with buyers and business partners as any long-term mutual relations of a firm with its partners promoting profits extractions and satisfaction of regular customers' requirements.

Keywords: interaction marketing, purchase, sale, network theory

Interaction marketing concept was widely adopted by industrial (business-to-business) markets having a number of differences from traditional (business-to-customer) markets of consumer goods. In business-to-business marketing a purchase and sale process is viewed as a long and continuous process of interaction between the organization-seller and the organizations-buyers. Clients in industrial markets can hardly be segmented equivocally with the accurately allocated borders, the majority of them require the individual approach. Therefore the concept of traditional marketing focused on a buyer becomes a non-effective tool.

The network theory is a logic continuation of the interaction marketing concept and for the last thirty years has become more and more popular. Earlier network organization researches were focused on studying the relations between a supplier and a consumer (distributor). For example, see P.R. Dickson's work. Later, the number of subjects was expanded and researches were directed to the analysis of communications and forms of interactions between all the subjects of a network. The advantages of network organizations are fully investigated in the work [6].

The advantages are:

- better adaptation to the information environment;
- quick reaction to market changes;
- decrease in investments into fixed capital and technologies;
- bigger orientation to clients and markets demands;
- information exchange improvement, susceptibility increase to the external environment.

In this case a network organization is viewed to be a coalition of interdependent specialized economic countries with their own goals. Such economic entities operate without any hierarchical control, however all of them are involved into the system with general aims through numerous horizontal links, interdependence and an open exchange.

Further the authors make a conclusion that the basic difference between the network theo-

ry and the economic theory of the organization is «involvement». Besides, the network theory contains to a larger degree – sociological aspects and a policy of coalitions and to a lesser degree – the neoclassical economic theory.

Apart from the mentioned advantages the concentration in developing of the key competences by all business-subjects should be noted. The network participants invest more to gain a higher level of competences instead of creation new ones, since non-profile functions are transferred to other participants of value creation. As a consequence of wide development of network outsourcing has become so popular and widely used.

The network concept actually contains the following:

- Market subjects develop relations and keep in touch with each other in order to get additional resources.
- A set of market subjects cooperating for a long period of time forms a network of the organizations with general goals (creation of value for a consumer).
- Development of horizontal links and formation of profit centers promote relation strengthening and improve steady position of each partner in a network.
- Network relations allow firms to reduce expenses for creation and realization of innovations.
- The information openness and interaction with the environment allow firms to response to demands and new possibilities of the market.
- The key competence of the network subjects develops.
- An essentially new business model directed to the effective service of consumers is formed.

The progressiveness of the concept has defined the main objective of business activity of a company – to coordinate all the aspects of mutual relations management.

When the clients base is quite big and a various one it is necessary and important to reveal and to consider a variety of mutual relations in order to maintain and support them with all the

types of consumers. A constant monitoring of the consumers or direct interactions with them allowing to consider their requirements and a necessity to transmit new data to them can help find out what new decision making is necessary.

Not less important factor is that close interactions with the clients allow the company to get information on their satisfaction with the products and changing values. The company goes away from the stereotype consumer perception, which has been developed for years, and this permits it to identify the structure of consumer value better. As a result there is a growth of satisfied clients.

In the network theory the main attention is paid to the formation of partners relations between all the business subjects in the process of creating consumer value and delivering it to a consumer. The system of values realized in goods is the key element and makes up the specificity of interdependence between the participants of a network. In the course of developing new goods and services and delivering them to consumers the contribution of each partner to the general strategy of the network is defined and considered.

While forming a network the partners define integrated long-term objectives. Each partner may have its own goal but general objectives are: trusted cooperation within the frame of development and maintenance of mutual relations to realize the primary activity of each of the partners. The compliance of all the objectives is based on the generality of interests and specificity of each partner's contribution.

Network partners are not only production manufacturers including accessories, half-finished products etc. but all the organizations providing business services: financial institutions, consulting firms, logistical providers etc. Because of wider understanding of the term «business partner» networks go far beyond the traditional understanding of the term «branch», and the character of the relations is defined by the general target orientation – creation of an effective business model.

Thus having defined the intrinsic aspects of the interaction marketing concept and the network theory it is possible to point out the following essential issues:

1. The mutual relations management concept assumes a durable character of mutual relations with a consumer unlike single transactions and, as a consequence, it makes an emphasis on holding of the old clients much more than on attracting new ones.

2. Mutual relations management proves economically the necessity of holding buyers, especially the most profitable clients. Thus if 20% of the firm's clients bring 80% of the

profit volume (a rule of Pareto) the largest part of expenses for interactions with clients should be directed to the development of relations with this group of buyers.

3. The concept of mutual relations management makes a greater emphasis on a communicative component in relations with consumers than it is usually made in the traditional concept of marketing.

The mutual relations management concept is based on the principles of active involving all the participants of a marketing system into the process of manufacturing distribution, realization and consumption of goods.

Such an approach to business communications changes the purpose and orientation of the business organization focusing management and all the participants in manufacturing and distributing on buyers' wants and final consumers' demands. It means that it is necessary to produce such goods and in such volumes which the market needs.

Consumer purchases and goods sale are predetermined with a high probability thanks to the preliminary marketing research, thorough studying and forecasting market dynamics and its environment intensive competitive struggle in many branches of market activity stimulates manufacturers to develop new methods for ensuring and maintaining a competitive advantage in the market environment. Competitive advantages are based on the ability of a company to create value to cater effectively to consumer demands. The key idea of the concept of business structures interactions is defined as maximum and at the same time effective satisfaction of business buyers' and business partners' requirements by creating necessary and sufficient conditions for functioning of all the business-system subjects.

The basic strategy of the interaction concept is developing long-term mutual advantageous interaction with the key-consumers and other participants of business processes based on social, technical, information and legal adaptation of the partners to each other. Thus a manufacturer gets an opportunity to create goods/services satisfying all those who consumes them or uses in their businesses (final consumers and business-subjects).

A long term interaction ensures transaction costs reduction and this raises the importance of such interaction. Thereupon a long term interaction acts as a competitive advantage.

A network and integration analysis acts as a necessary toolkit for formation of mutually advantageous cooperation. In the frameworks of the analysis it is supposed to investigate investments into relations; to analyze consumers and all the other participants of the market interaction; to work out a complex of market-

ing activities for each consumer separately; to explore the corporate culture of an enterprise structure and peculiarities of business service consumption. As the main purpose of the activity is the achievement of the maximum satisfaction of requirements of all the business process participants it is necessary to create such interaction network all the participants of which would be satisfied. It is achieved by the correct choice of participants, an establishment of mutually advantageous relations and the subsequent interaction management.

The concept of active interaction between the subjects of a business infrastructure grows out of the development of the theory of the organization and business infrastructure functioning based on modern lines in the field of business buyers' behaviour, business information technologies development, and the peculiarities of the evolution of market structures and enterprise activity as a whole.

The key directions in business-structures activity are innovations, social and technical adaptations, development and maintenance of relations between all the subjects of enterprise activity. Within the framework of the given approach it is necessary to point out the following basic principles:

1. A principle of competitive interaction in joint creation of value and its distribution between the participants of communications.

2. A principle of the coordination of interests of all the business participants in realization of the objectives.

3. A principle of priority of long-term interaction throughout the whole life span of buyers.

4. A principle of construction of an interaction chain not only with the business process participants but between the elements of the internal environment of the enterprise as well.

5. A principle of real time in the interaction chain organization.

Development and further improving of toolkit for formation of strategy of effective interaction of the business infrastructure subjects allows to reduce costs considerably in search of new trade channels, information on the market environment, business partners thereby allowing the companies to concentrate their efforts

on improving the quality of goods and services in order to ensure the competitive advantage in the market. Concentration of efforts on efforts on the primary activity of the company requires attracting experts for performing additional production functions. The mentioned tendency has received the greatest activity in connection with the complication of production cycles, increase in consumers' requirements to the quality of goods and services, and also with information streams increase which has demanded working out of specialized approaches for the analysis and processing of information resources. The specialized companies are engaged to perform these specific functions in order to maintain the efficiency of business-structures.

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FORMATION OF THE VALUABLE RELATION OF TEENAGERS TO THE NATURE IN ESTABLISHMENTS OF ADDITIONAL EDUCATION

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In article the essence «the valuable relation of teenagers to the nature», and also structural and substantial characteristics of this concept is opened. Pedagogical conditions of successful formation of the valuable relation of teenagers to the nature, considering features of the organization of teaching and educational process in establishments of additional education are described.

Keywords: ecological education, ecological consciousness, valuable relation to the nature, establishments of additional education, ekologosozidatelnny activity

The present stage of development of society, reorganization of all system of the public relations, sharpness of ecological situations demand the statement in public consciousness of a new paradigm according to which ecological education, as well as as a whole, education, should take the central place in activity of the educational institutions which conditions meet necessary requirements for development of an ekologo-world outlook and acquisition of experience of ekologosobrazny activity.

At different stages of formation of ecological education and education their essence and the purposes were transformed depending on different approaches to these categories. Now the purposes of ecological education and education is formation of ecological consciousness, formation of ecological culture of the personality which integral line is the valuable relation to the nature.

Still in literature there is no unequivocal approach to category definition «the valuable relation to the nature» which we consider as the integrated quality of the personality including development of system of world outlook views, experience of ekologosozidatelnny activity, system of the valuable ekokulturny and moral orientations causing formation of an ecological orientation of the personality, its relation to the sotsioprirodny environment.

The most sensitive period for formation of the valuable relation to the nature is the teenage age. Because that level of development of the valuable relation of the personality is connected with this period ontogeneza to the nature which allows it to function as the special system, making defining impact on an orientation of the personality, its active social position.

Intrinsic and substantial characteristics of the valuable relation of teenagers to the nature, it is represented to us to the important structural making being formed identity of teenagers. The valuable relation of teenagers to the nature includes cognitive, emotional потребностный and deyatelnostny components which reflect development of system of world outlook views, experience of ekologosozidatelnny activity, sys-

tem of the valuable ekokulturny and moral orientations causing formation of an ecological orientation of the identity of the teenager, his relation to the sotsioprirodny environment.

The pedagogical capacity of institutions of additional education in the course of formation of the valuable relation of teenagers to the nature is defined by their specifics, i.e. those features and conditions which are created for the organization of teaching and educational process.

A variety of types of establishments of additional education belongs to specific features of additional education. Here join as stationary establishments, as creativity Palaces, clubs and stations юннатов, gymnasiums and lyceums, the cultural and educational centers, and created on a certain interval of time summer improving camp, including the city.

Core of system of additional education is the circle as a result of which activity systematically, step by step, taking into account age features of teenagers process of formation of the valuable relation to the nature can be carried out. Feature of kruzhkovy work that teenagers choose activity in which are engaged in circles, teachers who are interesting to them, etc. Thus, establishments of additional education direct teenagers on harmony of relationship with the nature, the person, taking into account their interests, requirements, abilities.

Other important condition causing specifics of formation of the valuable relation of teenagers to the nature in establishments of additional education, the organization of purposeful communication with the nature is. Practical experience testifies that interaction with the nature amplifies if modern methods of education, such as are used: a method of projects and especially a method of educational bringing-up situations which promotes accumulation of personal experience of behavior and activity in the nature. For example, where and as, it is possible to plant a fire how to behave in extreme situations as it occurs directly in the nature. The educational effect amplifies at the sight of the littered sites, the destroyed ant hills, and on the

contrary at the sight of well-planned platforms for the rest, the cleared reservoirs etc. Using similar situations in the educational purposes, teenagers have a conviction in expediency and need to live under other laws.

Other feature connected with purposeful formation of the valuable relation to the nature, is that all necessary conditions for acquisition of experience of adoption of ecologically competent decisions on the basis of the received knowledge and the developed abilities and according to the created valuable approaches and orientations are created.

One of the most important pedagogical conditions of efficiency of formation of the valuable relation of teenagers in establishments of additional education, is that the system of additional education offers invaluable advantages in achievement of the purposes of ecological education of that it represents to the tutor – to the teacher possibility to carry out an individual approach.

Preconditions are for this purpose put in principles of the organization of additional education. In circles, sections of an ecological orientation, come teenagers voluntary on own interest. But pupils are various on age, readi-

ness, depth of interests to a subject, and also of the purposes which they thus put before themselves. A task of the tutor is development of interest of the teenager, satisfaction of his requirements for understanding of the nature, as unique value, living conditions on Earth.

Educational activity of establishments of additional education *многопланова* also is multipurpose, each of them has the specifics, but it always exists as interrelation of two subjects of teaching and educational process – the teacher and the teenager. Education process in additional education is unique that cooperation, coauthorship of the teenager and the teacher, their partnership gives rise to absolutely new relations, values which focus each teenager on formation of own ideas of and world around.

Therefore activity of teachers – tutors should be directed on disclosure of the updated potential of spiritual and moral values. Formation of the valuable relation to the nature in establishments of additional education assumes that the teenager has a frame of reference, principles, psychological installations at level of the imperatives creating a basis of awareness of need and the importance of *ekologosobrazny* activity of the person.

*Materials of Conferences***TECHNOLOGY OF DEVELOPMENT
OF CRITICAL THINKING
IN MEDICAL COLLEGE**

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This educational technology is aimed to develop the way of a student's thought through reading and writing. Its main features are criticality, flexibility, openness, reflectivity. The purpose of using this technology within educational process is to develop intellectual abilities of a student, thus allowing him to study independently. The technology is a multiplicity of methods, aimed to interest a student, stimulate him for activity, create conditions to generalize information, provide for development of his critical thinking, skills of self-analysis, reflection. In foundations of the development of critical thinking through writing (DCTTW) lays the model that consist of three stages: challenge, comprehension, reflection.

Challenge. Revelation of initial ideas of a student according the discussion, activation of cognitive activity among students, actualization of one's own experience takes place within this stage. It stimulates them to recall what they already know on the topic, put this knowledge into a definite system, and also share their knowledge. Besides, students are tuned into the class topic, their interest is developed, it serves as a special motivational moment. In the end of a challenge a systematization of all information that arose during the discussion must take place.

The used methods are: brainstorm, cluster, cognition cards, mixed logic chains.

Within the realization of a challenge stage

1. Students can express their points of view on the studied topic, and do it freely, regardless of possibility to make a mistake or be corrected by their tutor.

2. It is important that all expressions are registered, as any of them will be important for the further work. Besides, there are no «correct» of «wrong» expressions within this stage.

3. Individual and group work can be combined. Sharing points of view can provide for an emergence of new ideas that are often unexpected and productive. Sharing thoughts can help students find new interesting problems, solution of which will make them study new material. Besides, some students are often afraid to express their point of view to their tutor or in a big audience. Working in several groups allows such students to feel more freely.

The tutor's part is to stimulate students to recall what they already know on the topic, provide for a conflict-free share of points of view in groups,

fixing and systematization of information, obtained from students, not to criticize their answers, even if they are inaccurate or wrong.

Comprehension. Here new information is compared to one that students had received before. A quick temper of providing new material in regime of listening and writing almost makes such comprehension impossible. At the stage students work independently. A tutor's goal here is to support students' activity that was achieved during the challenge stage.

Used methods: studying text or its separate parts, watching video films, listening to a tutor's lectures, listening to audio records. It can be a story, a lecture, individual, pair, or group reading or watching video material. Anyway, it will be an individual acceptance and tracking of information. Authors of pedagogic technology of development of critical thinking point out that during the realization of the sense stage the main purpose is to support students' activity, their interest and motion that was created during the challenge stage.

During the comprehension stage students: experience a contact with new information, try to compare the information with their knowledge and experience, accent their attention on searching answers for their questions and problems, point out unclearness, thus putting new questions, try to track the very process of learning new information, outline what exactly draws their attention, what aspects are more interesting to them and why, prepare to analyze and discuss the new information.

During this stage a tutor: can be a direct source of new information. In this case his goal is to provide information clearly and attractively. If students work with a text, their tutor watches the work activeness, attentiveness. To organize work with a text a tutor suggests different methods serious reading and thinking. It is necessary to emit a sufficient time to realize sense stage. If students work with a text, it would be reasonable to emit time for a second reading.

Reflection. The purpose of reflection is to fix the obtained knowledge, master new information, form one's own new knowledge, include new ideas into the system of knowledge, and also set new problems and search answers for them, that can serve as foundations of a challenge stage for a new lesson. Used methods: construction of scheme, table, discussion, short composition, cluster, cognition cards, development of mini-project, questioning and control, drawing, etc.

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ON QUESTION OF EDUCATION TECHNOLOGY IN PROFESSIONAL EDUCATION

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Nowadays education is considered as a kind of service that inevitably makes higher educational institutions correspond to the demands of competitiveness of the provided educational services, and it requires alterations in content and forms of educational process. Besides, change in paradigms of education from traditional to innovative requires improvements in a specialist's training from a higher school.

At the modern development stage of our society social demand for non-standard thinking and creative people increased dramatically. A demand for creative activity of a specialist and his developed technical thinking, for his skill to construct, evaluate, rationalize technics and technology grows quickly. A solution to these problems much depends on content and technology of training future specialists.

Technology is the science of technics. Technic is an art, knowledge, skills, methods of work and their appliance.

Technology. Some claim that it is a synonym to the older term «methodic». Others think that technology (unlike methodic) consist only of reproducing actions, but does not contain description of a pedagogue's personality that is always unique, while methodic, apart from action algorithm, includes characteristics of its author's personality, and without that a methodic cannot provide the desired result.

Some other people say that everything is about time: in previous century the term "methodic" was firmly linked to an academic subject. Now, in XXI century, it is used as "technology" in a wider, more general meaning (not methodic, but technology of training, upbringing, management development, etc).

As an education technology we imply a definite method of training, where a means of education carries out the main load of a function realization under a man's control. In education technology the main part belongs to means of training: a tutor does not train students, but carries out the function of stimulating and coordinating their activity, and also the function of controlling the education means. Pedagogic skill of a tutor is his ability to select the necessary content, implement optimal methods and means of training according to the programme and his pedagogic objectives.

New demands of society for level of education and a person's development lead to the necessity to alter education technologies. Today technologies that allow to organize educational process considering professional direction of education and also a student's personality, his passions and abilities, prove to productive.

One of the most important problems of didactic is the problem of education methods, and it remains urgent in both theoretical and practical sense. The very educational process, activity of a tutor and students, and, therefore, an education results depend on its solution.

Method is a way to come closer to a truth. An education success mainly depends on direction and inner activity of the studied, type of their activity. Independence degree, expression of creative abilities must serve as an important criterion of a method selection. I.Y. Lerner and M.N. Snatkin suggested outlining methods of training:

1. Descriptive-illustrative method.
2. Reproductive method.
3. Method of problem description.
4. Partially-searching, or heuristic method.
5. Research method.

Initiative, independence, creative search are expressed in research activity most completely. Methods of training directly grow into methods of scientific research. Y.K. Babanskiy outlined 7 steps of the algorithm «optimal selection of education methods».

1. Decision if a material will be studied independently or under the guidance of a pedagogue; if a student can master a material independently without excessive efforts and time costs, then a pedagogue's help is superfluous. In any other case such help is necessary.

2. Defining correlation between reproductive and productive methods. If there are conditions, productive methods should be chosen.

3. Defining correlation between inductive and deductive logics, analytic and synthetic way of mastering. If empiric foundations for deduction and analysis are prepared, deductive and synthetic methods are completely affordable for a grown man. They are, of course, preferable as stricter, more economical, and closer to scientific description.

4. Measures and means of combining oral, illustrative, practical methods.

5. Decision if it is possible to introduce a method of students' activity stimulation.

6. Definition of «points», intervals, methods of control and self-control.

7. Thinking of reserve variants in case of real inclination of real training process from the planned one.

Whatever methods are used to increase efficiency of professional education, it is important to create such psychological-pedagogic conditions, where a student can take an active personal position and express himself completely as a subject of educational activity. Didactic principle of a person activity in education and professional self-definition conditions the system of demands to a student's training activity and a tutor's pedagogic activity in a single educational process. This system includes inner and outer factors, needs and motives. Correlation of these characteristics defines the selection of upbringing content, specific forms and methods

of education, terms of organization of the whole process of forming an active and creative person. Recently we always read and hear: «It is necessary to use active and remove passive methods of education». A method can't be active or passive itself, its implementer makes it such.

Everything depends on how a tutor uses one or another method.

There are no universally-effective or uneffective methods.

All education methods have their strong and weak points, and, therefore, depending on goals, conditions, available time, they need to be combined optimally. Therefore, it is correct to say: «An education process can be effective (when a student participates as a subject of his own training) or passive (when a student only serves as an object of someone's influence). Education quality is made of training quality and upbringing quality. Training quality can only be achieved as the result of providing efficiency of each training step. In other words, the whole training process is built by the scheme: apprehend – comprehend – remember – implement – inspect. To achieve a training quality it is necessary to pass all steps of cognitive activity consequently. Using of different forms and methods during the training process provides for an increase in training quality».

Main forms and methods of training that provide for its quality increase are: role-playing games, business games, seminars, reproductive-generalizing lessons, conferences, disputes, dialogues, problem study, independent work, essay defence, individual work, creative composition, reports, lectures, testing, programmed control, research, etc. All mentioned technologies of training provide for the solution of the problem of education quality.

It is known that it is impossible to give a material for independent mastering right away in groups where students, unprepared for independent training prevail. If it is inevitable, a tutor must carefully develop a task, considering his group, its preparation level, formulate questions clearly, compose methodical recommendations, point out literature. And here one cannot neglect two principles of didactics: availability and training on a high level, difficulty.

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KONSTANTIN OLESHKEVICH (1873–1935): OUTSTANDING LIFE OF A KAZAN PEDAGOGUE

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Activity of some pedagogues was significant and fruitful for the development of Kazan industrial college (KIC). Among such people, we think, professor Konstantin Savvinovich Oleshkevich occupies an important place. K.S. Oleshkevich was born in noble family in the city of Vilnius, graduated from Vilenskoe real college and Institute of civil engineers in Sankt-Peterburg in 1897. Then he was defined to serve in the Ministry of inner affairs, stood as a grant holder of the Ministry of national enlightenment from the 1st of January till the 1st of July 1899, and, at the same time, being on a foreign business trip, studied organization of training process in secondary professional educational institutions. On his return, by an order of the governor of Kazan educational district, he was assigned as a tutor of building science and manager of training part of lower building-technical college that was a part of Kazan Pedagogic University, and from the 28th of August 1900 he was transferred to the position of tutor of building science and drawing of a secondary chemical-technical college, remaining the manager of educational part of lower building-technical college (he occupied the position till 1904) [5, l. 3]. Before K.S. Oleshkevich, as before all other pedagogues of the college, a difficult problem of organizing educational process arose, and it was complicated by the lack of training books and programmes. In order to overcome these difficulties, he developed a programme of the main course «Construction works and materials», and, with help of the tutor of the mechanical college Andreyev, he prepared programmes on drawing, norms of productive practice, etc., staying the only tutor of building specialties in the college. He also had to develop a registry of necessary subjects. Konstantin Oleshkevich lived in a government flat by the industrial college, regardless of the fact that in 1900-1903 he was the city architect of Kazan, and in 1901-1903 he was the architect of Kazan principle land board. The architect obtained his own house (now on 33 Mushtari st.) only in 1915, by the time when he had already built much in the city, and during soviet times the house was confiscated, and a children's home was allocated there [3, p. 42].

Konstantin Savvinovich was quite noticeable and interesting man; local press frequently called his name regarding some scandals and curious situations [2, 6, 7]. The most scandalous event took place in 1906 when he performed an execution for the future classic of soviet literature A.N. Tolstoy (1882(3) – 1945) [1, p. 364]. In the end of 1905 Alexey Nikolayevich, undergraduate of Petersburg technological institute came to Kazan with his young

wife and son to his relatives. Families of Tolstoy and Oleshkevich became close and often spent time together. Alexey Nikolayevich, obviously, offended Konstantin Savvinovich somehow (as angry tongues say: «cherche la femme»). K.S. Oleshkevich invited A.N. Tolstoy to his place and, pointing a revolver at him, struck the future author of world-known masterpieces with a whip. Tolstoy paid the debt and on the next day he caught K.S. Oleshkevich when he was going to work in a carriage and gave him a lashing with a whip as well. However, being aware of a violent temper of his enemy and afraid of further mutual beatings, future academician of SA USSR hastily left Kazan without even taking his wife and child.

From the 7th of November 1906 and till 1917 he returned to managing training part of the building college. The second stage of his social-pedagogic activity started. At the same time in 1910-1911 he was a temporary Kazan city architect, in 1911-1913 he was a temporary technician of Kazan city board, in 1917 he was an the architect of powder plant. Besides, in 1909-1912 he was the speaker of Kazan city дума, and from the 1st of August 1911 he was the trustee of arbitrators of Kazan arbitrage [3, p. 42]. After events of October 1917 K.S. Oleshkevich replaced V.I. Nechkin in his position, becoming the head of Presidium of Kazan industrial, economic, and artistic technical college [4, l.68]. In 1920-ies he trained in Kazan politechnical institute, from 1922 he was the dean of architectural faculty. In 1931 Oleshkevich was defines as a regional architect of Kazan. According to his projects, besides the building of industrial college (1899), house of S.A. Chukasheva (1908), Shamovskaya hospital (1910), and others were built. He worked in modern direction. Such is a short biography of an outstanding man, talented architect, successful official, scientist Konstantin Oleshkevich, whose lifeline was closely entwined with the history of Kazan professional school.

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METHODOLOGY OF THE FORMATION OF PEDAGOGICAL CULTURE OF TEACHERS

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The teacher's pedagogical culture provides the possession of the necessary set of knowledge and skills, which determine the formation of his teaching activity, teacher communication, teacher's personality, as the bearer of certain values, ideals and the pedagogical consciousness. The pedagogical culture has its own specific features: attitude to the children, teaching activity, to himself as to the value; the transference of social-cultural experience to students through the guidance of cultural norms in educational activity; the use of innovative forms, methods, technologies of training and students' education; a critical attitude to them and the creative transformation of educational activity [1-3].

The analysis of scientific literature has shown that pedagogical culture is seen as part of human culture (E.V. Bondarevskaya); the integral quality of the teacher's personality, which projects his common culture to the profession, the synthesis of high professionalism and the internal properties of the teacher's personality, the possession of the teaching's methods and the presence of the cultural-creative skills (N.E. Vorobjev); a certain range of the value relations to education and child, which objectively and practically is implemented in the educational process (N.B. Krylova); a set of intellectual, moral, aesthetic, emotional and verbal cultures, which basis is the teacher's common culture (V.A. Sukhomlinsky).

Synthesizing these definitions we consider the teacher's pedagogical culture as the integrative professional and personal quality that combines the valuable attitude to the children, the teaching activity, to him- or herself, the support in the educational activity and behavior on the common cultural norms, an aspiration to the innovations and creativity.

We have identified the following components of the pedagogical culture of high school students – future teachers:

– The motivational and valuable component, which defines cultural aspirations, the system of internal principles and persuasions in the necessity of mastering of the pedagogical culture as a professional and meaningful quality. This component is characterized by formation of the valuable notions, the presence of an integral «I-concept». The content of this component is presented in a professional-pedagogical orientation of the future teacher, which integrates the system of personal meanings, values, motivations and needs. They regulate the professional behavior of teacher in educational activity, and also reflect the psychological purpose of the development as a personal need, so the internal accepted persuasion.

– The cognitive component presupposes the existence of general cultural knowledge, the integral pedagogical knowledge, which is directed at

the valuable attitude to the students and the future professional pedagogical activity. The content of this component is characterized by the fact that a key element of the pedagogical culture is a cognitive competence. The cognitive competence synthesizes the system of knowledge and practical actions and determines the results of activity. It assumes the formation of knowledge, experience, that allows a successful decision of the professional tasks.

– The activity component involves the stability of the basic plans of attitude to himself, to the world and their expression in behavior in appropriate pedagogical situations. The component characterizes the built image «I – a professional», the personal experience of the future teacher, which integrates knowledge, values, motives and needs. The content of this component determines the acquisition of experience, knowledge of pedagogical reality and the progress of skills, due to the professional activity develops.

– The reflexive component is the ability to enter into a reflective stance in relation to the image «I» in the pedagogical culture. It is the ability to build and analyze models of the pedagogical culture in the communication with students. The content of this component is that due to the presence of the reflection the future teacher is able to implement his inward position to the teaching, to manage his activity, to achieve purpose.

All components of pedagogical culture of future teachers are interrelated and interdependent. Each of them carries the certain functions. The exception of one of them results in a violation of the structure's integrity of the pedagogical culture of the future teacher.

The formation of pedagogical culture of high school's students – the future teachers is a complex process, understanding of which should be carried out from different positions. From the position of the system approach, this process involves the revelation of its components, the establishment of systemic factors and the relationships between components and the definition of the system's functions as a whole. To the external systemic factors of pedagogical culture of high school's students – the future teachers, as a teaching system, we related: the purpose – the achievement of the ability and the willingness to realize the educational activity which is based on the rules and regulations and on the content of pedagogical culture; the management of cognitive activity in a particular type of the educational tasks. To the internal structural relations, we classified the relationships between the structural elements of the pedagogical culture, between the stages of the culture's formation and the functional connections between the components of the pedagogical culture. The structural contexts of the pedagogical culture's formation of the high school students – future teachers are represented as a system of the structural elements: social-cultural, professional and educational. The functional connections are established between the components of pedagogical culture.

The integrative-activity approach favours the orientation of the pedagogical culture's formation of high school students – future teachers to the prin-

ciples of the integration of the psycho-pedagogical disciplines' content, excluding discrete and duplication of their content, disclosure of the integrity of the pedagogical culture in the structure of pedagogical that contribute to formation of a holistic perception of teaching activity, the individual in this process and reduce them to the theoretical picture.

The cultural approach assumes the consideration of the basic functions of the culture, which determine the definition of the process as a cultural and educational process through the transfer, actualization and the mastering of the pedagogical culture's values, the forms' creation of the self-determination, self-development and the self-actualization of students, the support of the efficiency of educational activity. This effectiveness provides the demonstration of pedagogical culture, the definition of the cultural status by the formation of pedagogical culture of high school students – future teachers (the cultural values, the cultural norms, the cultural interest, the cultural self-determination and development the cultural environment and the cultural situation).

The environmental approach provides an indirect control of the process of the formation of pedagogical culture and is a system of subject's (student's) actions of the control with an innovative educational environment, which is directed on transformation it into a means of designing and producing the result. The actions by formation of the environment are focused on the bringing of the features of the innovative educational environment in line with the objectives by the formation of pedagogical culture of high school students – future teachers.

The person-centered approach serves as a theoretical-methodological strategy and tactic for the formation of pedagogical culture of high school students – future teachers, which suggests the identification of the practical aspects of solving the problem that is based on the range of scientific experience. The result of the person-centered approach is the development of the self-realization, the aspiration to the enrichment and updating of knowledge, the comprehension of the need by the mastering of the components of teaching culture in the future teaching activity.

The system of formation of pedagogical culture of high school students – future teachers serves as a pedagogical system, a system-forming factor, an element of the system, a system's component, and includes the main components of the pedagogical culture – the motivation-evaluative, the cognitive, the activity and the reflective and also describes specifically organized, purposeful interaction between the teachers and the future teachers, which is directed on the decision of the tasks.

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A SEMIBRIDGETHYRISTOR INVERTER FOR A WIDE RANGE OF LOADINGS

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The new scheme of a semibridgethyristor inverter operating in a wide range of voltages is presented.

Keywords: semibridgethyristor, inverter

Nowadays semibrige inverters a widely applied in various secondary power supplies ranging from 3 up to hundreds kw, for example in electrowelding devices for arc welding, plasmotrones and other devices requiring stabilization of capacity in loading.

To provide a steady operation at small loadings an additional switching choke is included into an inverter circuit.

The lacks of this circuits are parameters of a switching choke and a limited range of loadings of which the inverter is efficient. To minimize them two switching capacitors with free outputs connected with the direct current

diagonal of inverter 1 are included into the circuit. It has allowed to make a switching choke saturate quickly and operate only at switching currents. As a result the volume of employed materials (copper, iron) and the choke parameters as a whole have been reduced sharply and the working capacity of a semibridgethyristor inverter has been provided in all the loadings range (from the idle mode up to maximal loads).

The operation of a semibridgethyristor inverter is illustrated by Fig. 1, where the scheme of a modernized inverter is presented and by Fig. 2 (the voltage diagrams).

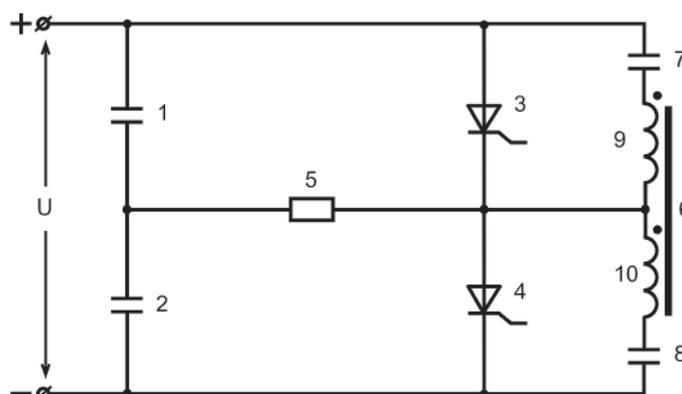


Fig. 1. The scheme of a modernized inverter

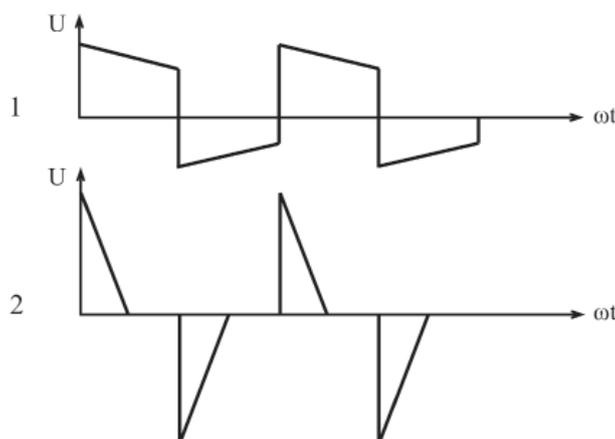


Fig. 2. The voltage diagram

The inverter functions as follows. When the supply voltage is on switching capacitors 7, 8 are charged (each up to half of supply voltage U). Let the unlocking impulse from a typical control system arrives at thyristor 3. Thyristor 3 is unlocked and capacitor 1 charges into loading 5 and a simultaneous discharge of switching capacitor 7 via unlocked thyristor 3 and semiwinding 9 of switching choke 6. Capacities of switching capacitors 7 and 8 are chosen according to the locking time of thyristors 3 and 4. These capacities are less than capacities of capacitors 1 and 2, therefore the discharge occurs quickly. After the discharge of switching capacitor 7 switching capacitor 8 is charged up to the charge U of the power supply. If the loading current is small, capacitor 1 discharges slowly (Fig. 2, diagram 1) and the voltage at thyristor 4 has no time to decrease up to zero before the next impulse. When thyristor 4 is unlocked the discharge of switching capacitor 8 occurs via half winding 10 of switching choke 6 and thyristor 4 and in the process the voltage equals to the halfwinding 10 voltage (U) is induced in halfwinding 9 of switching choke 6. This voltage has the sign of plus at the thyristor 3 cathode and thyristor 3 is locked. Then the process of switching

repeats. When the loading current is increased up to a certain value, which, depending on the inverter parameters makes usually (0,4-0,5) of the rated loading current capacitors 1 or 2 have time 2 to discharge completely during a half cycle of the inverter voltage (Fig. 2, diagram 2) and the current via thyristor 3, 4 falls down up to zero in a natural way. Switching elements (switching choke 6 and switching capacitors 7, 8) do not influence the switching process in this mode.

As halfwindings 9 and 10 in switching choke 6 pass only short-term current impulses, dimensions of switching choke 6 are insignificant in comparison with the dimensions of the analogues known.

The positive feature of the scheme is that compulsory switching is necessary only at small loadings and it reduces the locking time of thyristor 3, 4 and the dimensions of the switching unit considerably.

A semibridgethystor inverter can be used in a wide power range especially if the power supply is a three-phase rectifier.

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PROTECTION OF A BRIDGE TRANSISTOR INVERTER FROM RESONANCE OVERTENSIONS

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The article describes an innovative way of transistor inverter protection which enables to easily and efficiently suppress resonance overvoltage in single-phase bridge inverters with condensers in a circuit of primary transformer winding.

Keywords: overvoltage, resonance, transistor inverter

Transistor inverters can be used in various secondary power supplies in the power range from hundreds watts to tens kilowatts, e.g. electrowelding devices of an inverter type, single-phase plasmotrones, electronic voltage stabilizers etc.

We know transistor single-phase bridge inverters containing a transistors bridge shunted by an inverse diode bridge and connected to a network rectifier via a direct current diagonal and to loading [1, 2] via an alternating current diagonal in a power circuit.

To eliminate a constant component in the diagonal loading a condenser is built in series with the loading. However, in most cases a secondary winding of a transformer is the loading of a transistor bridge, that is the loading is of an active-inductive character and it may result in a voltage resonance in a series L-C circuit. A unipolar transistor key has been applied to

eliminate resonance overvoltage. The principle of the device is illustrated in Fig. 1, where the scheme of a single-phase transistor inverter is shown and in Fig. 2 which represents a unipolar transistors key.

Unipolar transistors key 13 (Fig. 2) contains phototransistor 22, a collection circuit of which is built in into diode bridge direct current diagonal 23, 24, 25, 26 and is connected to common anodes of a diode bridge via an emitter, and to common cathodes via a collector. The alternating current diagonal of diode bridge 23, 24, 25, 26 is built in between the condenser 11 connecting point with primary winding 9 of transformer (Fig. 1 and 2) and the common point of additional inverse diode 19, 20. A photodiode of phototransistor 22, connected with an optoelectronic pair and with a minus of a network rectifier via a cathode is an controlling input of unipolar key.

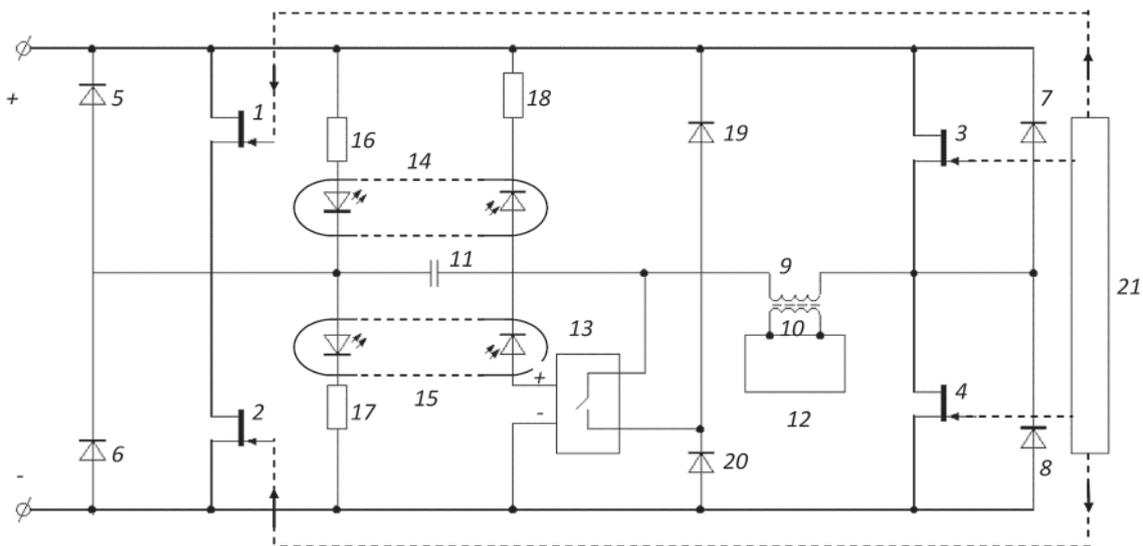


Fig. 1

The device operates as follows. The diagonal pairs of inverter transistors 1-4 and 2-3 are switched on in turn and the duration of their on and off state, i.e. pulse-width modulation is set

by control system 21. When one diagonal pair is on (e.g. 1-4), transistor 1 shunts the circuit of optopair photodiode 14, and the latter does not conduct the current. Accordingly, the sig-

nal at the controlling input of transistor key 13 is zero and the transistor represented in Fig.1 as a contact is locked (the contact is open). The complete scheme of a unipolar transistor key 13 is presented in Fig. 2. It is clearly seen that if a photodiode of optoelectronic pair 14 does not conduct the current, photodiode 22 of a phototransistor of the same name and a phototransistor is locked. Accordingly diode bridge 23, 24, 25, 26 is also locked. The current between the connecting point of condenser 11 with primary winding 9 of a transformer (see Fig. 1 and 2) and the common point of additional inverse diodes 19, 20 can flow in no direction. A similar situation arises when another transistor diagonal pair 2-3 is built in: a photodiode of optoelectronic pair 15 is shunted by transistor 2, a photodiode of the same name conduct no current, a photodiode of phototransistor 22 is not lit, diode bridge 23, 24, 25, 26, is locked. Only during the pause when tran-

sistor diagonal pairs 1-4 and 2-3 are switched over, transistors 1 and 2 of different diagonal pairs are locked, accordingly, two photodiodes of optoelectronic pairs 14 and 15 «are lit» – the photodiodes of both optoelectronic pairs conduct the current, photodiodes 22 of the phototransistor of the same name is lit, diode bridge 23, 24, 25, 26, is unlocked, the circuit between the connection point of condenser 11 with transformer winding 9 and the common point of additional inverse diodes 19, 20. If the voltage at condenser facing or at transformer primary winding 9 outputs exceeds the inverter supply voltage, i. e. the network rectifier voltage, a discharge of condenser 11 up to the value of a network rectifier voltage or a discharge of excessive electromagnetic energy of a transformer primary winding takes place or these processes occur simultaneously, and unipolarity of transistors key 22-26 (Fig. 2) provides the flow of a discharge current in two directions.

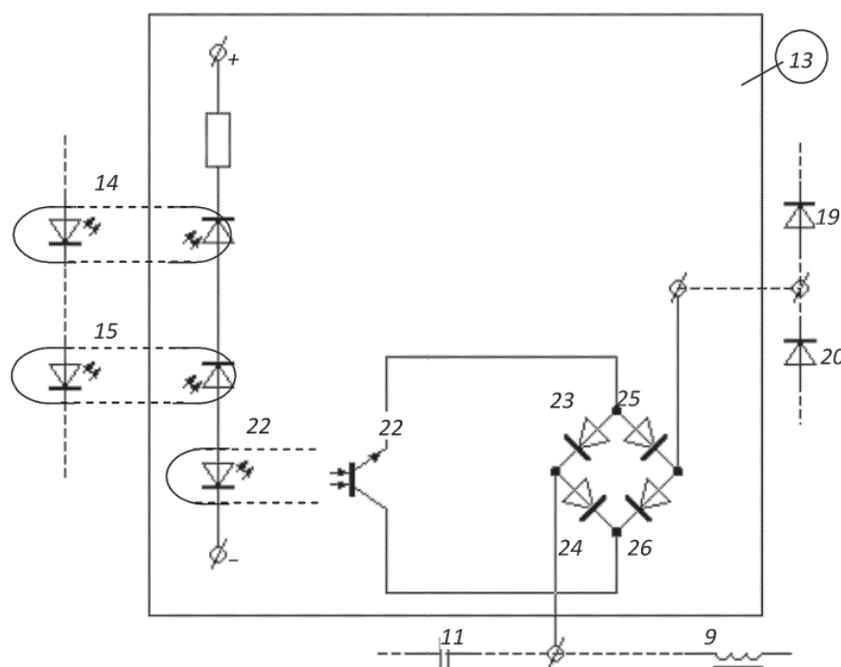


Fig. 2

It is necessary to note that the scheme in Fig. 2 represents a special case of unipolar transistor key realization, i.e. one of the possible variants.

A unipolar key, for example can be implemented in two back-to-parallel connected transistors.

Thus, the proposed device allows us to remove resonance overvoltages in single-phase bridge inverters with a condenser in the transformer primary winding circuit simply and effectively and, simultaneously, get rid of an ad-

ditional winding complicating the construction of a transformer.

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PROSPECTS OF INDUSTRIAL WASTE PROCESSING

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The science and engineering of the beginning of the third millennium develop at rates of a geometrical progression, the industry isn't an exception and it is as one of the most large-scale fields of a man's activity. This kind of tendency extended the worldwide. Due to the technological processes the industry influences negatively on the environment, the industrial wastes as a component of this influence. Annually around the world and in our country billion tons of a hard, paste like, liquid, gaseous wastes are exuded in the biosphere. They cause irreparable damage both to the living nature, and the lifeless nature. Despite of prescription and a large

number of researches in the field of non-polluting production, the problem of utilization and processing of industrial wastes remain still actually

The purpose of this work is to consider the structure and perspective ways of industrial waste processing of copper production of Kazakhstan.

Industrial wastes of copper production differ with the content of valuable metals, as osmium and rhenium. Rare metals have no own raw sources, and they are taken from the industrial wastes of production of non-ferrous metals. The main sources of receiving rhenium in Kazakhstan are sulphidic copper ores. In pyrometallurgical processes rhenium and osmium, generally changes into metallurgical gases. At dry and wet purification of gases they are distributed between dust, washing sulfuric acid and lead slime of copper production.

In the table, the chemical compound of the slime and dust, formed in copper production are presented.

The chemical compound industrial wastes of copper production

The wastes	The mass fraction of elements, %								
	Pb	Cu	Zn	Ag	As	Hg	Cd	Os	Re
Slime	61,4	0,47	0,04	0,006	0,10	0,43	0,06	0,005	0,08
Dust	45,1	2,1	9,1	-	0,8	-	0,2	0,0004	0,008

You can see that this two technogenic wastes of copper production generally consists of compounds of lead.

The dust has much more zinc, than the slime. The dust respectively contains 4 and 200 g/t valuable metals, osmium and rhenium, and the slime contains much more and 50 and 800 g/t. Including these materials contain toxic elements as mercury and arsenic. If the dust contains up to 1% of cadmium and arsenic, the slime contains also about 1%. These data testify requisite development of complex technology of copper waste processing of technogenic production with extraction of valuable components and utilization of toxic metals with less toxic connections. Such decision is important in the point of ecological and economic view.

In the dust the lead is in the basic oxide form. Metallurgical dust and slime were earlier processed at the Chimkent lead plant for receiving lead and rhenium, zinc, cadmium and indium. Thus there wasn't considered extraction of the most valuable metal of osmium. However, the rhenium extraction in sulphate solutions didn't exceed 15% from the contents of the initial dust. Such low extraction is caused that rhenium in a sulphidic product substantially is at a type of connections with the lowest ex-

tents of oxidation (II, III) which in the lixiviation remain with insoluble connections. Besides, in the course of sulphatizing burning significant amount of rhenium turned into a gas phase caught with the solutions of washing towers. So the gas of sulphatizing burning was an extra source of rhenium. Therefore it is necessary development of technology considering complex processing dusts with passing extraction of osmium and rhenium.

The results of X-ray phase showed that lead slime represents a monophase of lead sulfate for 80-85%. In a small amount lead is presented in sulphidic and oxide forms. It is difficult to find form of rhenium and osmium in the slime because of their small concentration. Phase structure of the slime are the following%: 86,8-96,7 PbSO₄; 0,08-0,4 PbS; 2,4-13,8 PbO.

We develop technology of reception of an osmium concentrate from sulphuric acid lead slime, including low-temperature sintering and hydrometallurgical processing.

Realization preliminary low-temperature sintering is based on physical and chemical properties of osmium and rhenium, and also nonferrous metals and can be considered as one of the variants, allowing to separate one group of sulfides of metals from another.

For lead slime processing were carried out the sintering with a sodium carbonate and sulfate and coke, with the subsequent lixiviation of the received products.

At tests of these options the temperature of burning changed 750–900 °C. The addition a sodium carbonate and sodium sulfate into the charge contained 20-35%, coke of 5-15% from quantity used slime. Duration was 1-3 hours.

The results of experiments proved that the extractions of valuable content from the lead slime were rather higher in sulphidizing sintering.

The best results was the addition of 30% sodium sulfate, 10% coke into the charge in the 800 °C temperature and the duration was 2 hours.

The thermogravimetric analysis of $\text{Na}_2\text{SO}_4\text{-C}$ slime system proved that in sulphidizing (800 °C) eutectic mixture formed with the $\text{Na}_2\text{S-Na}_2\text{SO}_4$ and $\text{Na}_2\text{S-MeS}$ which intensify the formation of sulphide and resumption of osmium.

Making of sulphidizing sintering is one of options allowing to separate one group of sulphides metals from another, and was based on physical chemical properties of sulfides and tiosoly non-ferrous, rare metals. And in our opinion it will allow to reduce considerably volume of processed solutions at the subsequent vatting [3].

Received cake further is exposed two-phasic to hydrometallurgical processing:

- at water vatting leaves water-soluble connections of sodium. Thus in a solution passes 90-95% sodium and 95-98% arsenic.

- at acid vatting leaves connections of lead, thus osmium and rhenium remain in the firm rest and concentrates.

The received concentrate is enriched on osmium 100-120, and rhenium 60-100 times. The output

of a concentrate from initial slime makes 0,8-1,5%; the maintenance of osmium in a concentrate makes 0,40-0,59%, and rhenium 5,0-8,16%.

The result of electron-micrograph analysis it is revealed, that osmium forms metal and dioxide forms, and rhenium is in the form of disulfide, which are established by element structure of a phase and on density of distribution in it of elements [4].

Thus, the technology of processing lead slime with reception the osmium-, rheniumconsis concentrate in which 100-120 and 60-100 multiple enrichment of osmium and rhenium is reached is developed. The sulphidizing sintering of lead materials with the further lixiviation allows to divide heavy non-ferrous, rare and precious metals into separate quite easily processed concentrates and solutions.

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*Materials of Conferences***SCIENTIFIC SUBSTANTIATION
OF THE THEORY
OF TOWN DEVELOPMENT**

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Today, the city became the main place of human habitation. In general, Russia's cities and towns have approximately 70% of country population. Urban system is a complex system of semi-structured socio-economic system with lots of forward and backward non-linear relations. City, a particular spatial environment, emerging in the development of society, and is one of the highest manifestations of human civilization. Urban settlement, which arose originally as a specific kind of environment opposed to the environment, embodies the enduring values and the unique experience of human culture. It is characterized by high compactness, density of development, communication, and a saturation concentration of resources, which allows to co-exist and cooperate effectively to a large number of people.

In modern conditions, social and economic development of cities is an important strategic component of the municipal government, along with administrative and legal regulation and fiscal policy. The main functions of the socio-economic forecasting and analysis are integrated urban development, the formation of a consolidated development plan with the preparation of long-term and short-term plans for the development of territories. Establishing the strategy for socio-economic development, decision-making at the level of municipal government, requires information and analytical support in the form of an information system of decision-making, the central component of which is system modeling of urban areas.

It is important to perform analysis and modeling of urban systems according to their characteristics, as the city is:

- semistructured complex system with many interactions;
- a social system with dominating natural and psychological factors;
- a dynamic system;
- self-regulating system that seeks to maintain economic equilibrium and balance of resources;
- conflict object between the targets of long-term planning and short-term solutions;
- targeted and multi-purpose system with a heterogeneous internal and external purposes;
- non-linear system.

Methodological basis for modeling the socio-economic development of cities is a system anal-

ysis with central point to build a single model of development of territories, which reflects the critical factors and interrelations of the real system [1]. In practice, means the creation of complex models with strong dynamic links and information between models at all levels. It must be remembered that the city as an object model is characterized by: the weakness of theoretical knowledge (lack of a unified theory of the city) the qualitative characteristics of knowledge about the system (the control problem are semi-structured), a high level of uncertainty of initial information.

The theory of the city as an abstract conceptual tool whose main purpose is to explain the processes and phenomena should be based on three rules of conformity models, elements and their relationships [2]:

- how the organization of urban settlements to match the way the description;
- modeling tool should be based on theoretical concepts;
- theory must be true.

The problem of urban development has always interested researchers, in particular, J. Forrester in the early 70's built a simulation model of the evolution of a typical American city. His followers consider the model of urban-based optimization approach. However, the scope of such models is limited to the solution of particular problems of urban areas.

The technological approach to the construction of models of urban systems based on the representation of models of resource types. With this approach, the state of the urban economic system is described by variables. External influences and management decisions that determine the dynamics of the simulated system, are constants. The main target in this task is to establish a balance of resource use in the system. These models are «hard» and as optimization models, describe only the special cases of urban development.

As a method for simulation of urban areas it is advisable to use a model of system dynamics, since it allows to simulate the dynamic processes at the highest level, in terms of the functioning of a dynamic system as a combination of cash, product, human and other streams. Therefore, subject to the following three types of compliance:

- 1) the dynamic equilibrium of urban settlements with elements of self-organization and the content model;
- 2) environmental-economic model based on space-time method and the concept of «sustainable development»;
- 3) predict the development of scenario-based simulation with the condition that the objectives of short-term and long-term planning.

Lack of tools for analysis of urban areas, in particular, no single technology integrated envi-

ronmental assessment, leads to a number of geo-ecological problems. In the long process of the formation of towns natural environment undergoes constant changes under the influence of anthropogenic factors, the main ones are:

- construction of various engineering facilities, which entails a violation of natural groundwater and hydrogeological conditions;
- installation of underground utilities, construction and operation of the reservoirs;
- High density and number of floors of building housing estates.

Occurring in the early stages of development in the main agricultural areas, lead to changes in soil structure and water balance, to the weakening of fixation of soils that are already fraught with gully erosion. With the expansion of the area of human impact disrupted the natural drainage. When moving large amounts of soil compaction and subsidence occur, and the surface deformation with the formation of gaps, cracks and craters. When routing communication there are conditions for the development of subsidence and

suffusion processes. During the construction of linear structures (roads and railways), a change in the structure of watersheds. During the construction of reservoirs, hydro-geological environment is undergoing fundamental changes: flooding of the former rock vadose zone, the formation of new and increased capacity of existing aquifers, development of the backwater, which leads to the development of a bypass filtration, which, in turn, causes an increase in water level and flooding of the area developments.

Consequently, the urban ecosystem, as a long-term, should be designed and developed taking into account the integrated environmental assessment. Such an assessment is needed as a basis for the harmonious development of regions, without environmental degradation.

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*Materials of Conferences***FEATURES OF PLACING AND TYPOLOGY OF ETHNOCONTACT ZONES OF THE NORTH CAUCASUS**

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Northern Caucasus is a special, complicatedly-organized space that is populated by multiple and various in ethnic-cultural, religious, and civilization aspects nations, and history of their introduction into Russian civilization is extremely complex and contradictious. As a result, an importance of developing research of spacial-temporal peculiarities of ethnic-cultural relations within the region is great.

In this case revelation and typology of ethnocontact zones (ECZ) becomes significant. Outlining ECZ of the Northern Caucasus is possible with usage of the index of ethnic mosaic (Eckel, 1976) that shows their «complication» degree. Index of ethnic mosaic is calculated at the level of administrative regions and capital centers of administrative-political subjects of the Northern Caucasus considering all ethnic groups that has been living on their territory in 1926 and 2002 with a share of more than 0,15 of the total population. It allows us to reveal general ECZ of the Northern Caucasus and their dynamics.

At the foundations of empiric searches, A.G. Manakov (2002) has established two classes of ECZ: faintly-expressed (index of ethnic mosaic from 0,2 to 0,4) and highly-expressed (index of ethnic mosaic more than 0,4). In Northern Caucasus, in accordance to utmost indications of the index of ethnic mosaic, according to the data of All-Russian population census of 2002, a bigger part is represented by ECZ, and almost half of them are highly-expressed.

In a sub-latitude direction a mirror symmetry is registered in alterations of the index of ethnic mosaic. In flat regions of Pre-Caucasus a growth in the index of ethnic mosaic goes from west to east, and in mountainous area it goes from east to west. A limited number of nations remains relatively homogenous in their ethnics. In flat areas they include administrative districts of Krasnodar region within Azov-Kuban plain, and also laying by western territories of Stavropol region. The second aerial of relatively homogenous in ethnic aspect regions is registered in mountainous territories of North-Caucasus republics, including Inner Dagestan, Chechnya republic, Republic of North Ossetia – Alania, and, in a slighter degree, eastern regions of Karachaevo-Cherkessia (Karachaevskiy and Malokarachayeviskiy districts) and western territories of Kabardino-Balkaria (Zolsk and Baksansk districts).

Stationed highly-expressed ECZ that preserve their state from the beginning of the XX century formed at coasts of Black and Kaspian seas. The widest line of ECZ has sub-latitude spread, it has stretched along pre-mountainous plains from Taman peninsula to Primorsk lowland of Kaspian sea. Also, two curves of ECZ of sub-meridian direction. The basis of the first of them, the most powerful one, are Ingushetiya and Prigorniy district of North Osetiya, it continues to the middle flow of Terek, on Tersko-Kumskaya lowland, further it stretches and gradually fades in North-West direction, along the axis of Kumo-Manychskaya hollow. In the basis of the second curve lay western territories of Karachayevo-Cherkessiya, south-eastern territories of Krasnodar region and Adygeya republic. Most of districts of Stavropol region within Stavropol hight and separate lacunes in the grid of highly-expressed ECZ (for example, Nogayskiy region of Republic of Dagestan of Labinsk district of Krasnodar region).

Complex picture of ECZ has a long development history and reflects peculiarities of ethnic structure of a region and its dynamics. Specificity of their formation and peculiarities of their structure can be described on foundations of typological analysis (table). Two types and sub-types of ECZ are outlined in North Caucasus according to a degree of ethnic-cultural closeness of elements: (1a) strictly complimentary and (1b) relatively complimentary; (2a) strictly contrast and (2b) relatively contrast. ECZ of the first type are formed on foundations of confessionally- and historically-close ethnoses and sub-ethnoses, and the first sub-type (1a) is represented by ECZ that consist of close-relative ethnoses, for example, the Slavian and the Adyg, and the second one consists of confessionally-, historically- close ethnoses, for example, Slavian nations and the Osetian, or unnative christian nations (the Germans, the Greek, the Amenian, etc).

Strictly contrast ECZs from during the process of interaction between ethnoses and polar civilization and ethnic-cultural systems that aren't related in territory or history (for example, Tersk cossacks and the Kabardian). The contrast degree of an ECZ is also affected by a character of development of ethnic-cultural interaction (good neighbourly or conflicting).

According to dynamic peculiarities and evolution direction of ECZ we can outline three types of them – stationed, dynamic, and historical. Stationed ECZ are characterized by a significant existence duration and do not suffer great structural alterations. Depending on structure stability degree and functioning of stationed ECZ two sub-types are outlined: stable and unstable. Dynamical ECZ, depending on

their development direction, can be divided into divergent and convergent, in other words, evolving either towards the strengthening of expression, or its decrease. Historical ECZ are ethnic-cultural formations that proved their development as ECZ

during the development of Russian civilization in Northern Caucasus. It is important to point out that, during its development, an ECZ can transfer from one typological group into another under the impact of a complex of inner and outer factors.

Typology of ECZ of North Caucasus

		Complimentary		Contrast	
		Strictly	Relatively	Strictly	Relatively
Stationed	Stable		Mineralovodskaya	Prikubanskaya Kumo-Manychskaya	Tersko-Sunzhenskiy district
	Unstable		Low-Kuban	Prielbrusskaya Tersko-Kumskaya	Prikaspiyskiy, Tersko-Sulakskaya
Dynamic	Convergent		Middle-Kuban		
	Divergent	Pyatirechnaya	Prikumsk, Stavropol	Prichernomorskaya	Eastern-Kuban
Historical		Azov-Kuban			Sunzhenskaya

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Materials of Conferences

**ON STUDIES OF NON-LINEAR
OSCILLATIONS IN THE SYSTEM
OF SECOND ORDER DIFFERENTIAL
EQUATIONS WITH SLOWLY
FLUCTUATING COEFFICIENTS**

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In this work conditions of solutions' existence that are described by a significantly non-linear system of the second order of the following type with slowly altering coefficients:

$$\begin{aligned} f_1(x, y, \tau, \mu) &= X_1^{(m_1)}(x, y, \tau) + \mu X_2^{(m_2)}(x, y, \tau) + \dots + \mu^{k-1} X_k^{(m_k)}(x, y, \tau); \\ f_2(x, y, \tau, \mu) &= Y_1^{(m_1)}(x, y, \tau) + \mu Y_2^{(m_2)}(x, y, \tau) + \dots + \mu^{k-1} Y_k^{(m_k)}(x, y, \tau), \end{aligned} \quad (2)$$

$X_k^{(m_k)}(x, y, \tau)$, $Y_k^{(m_k)}(x, y, \tau)$ – are multinomials relative to x , y of any final degree of m_k and they do not contain terms of lower than m – order with coefficients that are limited functions on τ and with the first derivatives, limited on τ , μ is unlimitedly small parameter, $\tau = \mu t$ is slow time.

Let us imply that right parts of the system (1) equal zero only in the point $x = y = 0$.

The problem study goes with the function of Lyapunov, via method, introduced by G.V. Kamenkov [1].

First of all, let us show a topological study of so-called «shortened» system. Shortened system that corresponds to initial equations (1) has the following type:

$$\begin{aligned} \dot{x} &= \frac{dx}{dt} = X_o^{(m)}(x, y); \\ \dot{y} &= \frac{dy}{dt} = Y_o^{(m)}(x, y). \end{aligned} \quad (3)$$

Questions of qualitative theory of stability of differential equations according to Lyapunov were studied by G.V. Kamenkov in 1935.

G.V. Kamenkov showed [1] that behavior of integral curves around the coordinates beginning of two functions:

$$\begin{aligned} R_o^{(m+1)}(\theta) &= \bar{X}_o^{(m)}(\cos \theta, \sin \theta) \cos \theta + \bar{Y}_o^{(m)}(\cos \theta, \sin \theta) \sin \theta; \\ F_o^{(m+1)}(\theta) &= -\bar{X}_o^{(m)}(\cos \theta, \sin \theta) \sin \theta + \bar{Y}_o^{(m)}(\cos \theta, \sin \theta) \cos \theta. \end{aligned} \quad (6)$$

The solution of the system (5) looks as:

$$r = r_o \exp \int_0^\theta \frac{R_o^{(m+1)}(\theta)}{F_o^{(m+1)}(\theta)} d\theta. \quad (7)$$

Thus, in formula (7) under-integral expression is a periodical function of θ , then (7) it can be described as:

$$\dot{x} = X_o^{(m)}(x, y) + \mu f_1(x, y, \tau, \mu); \quad (1)$$

$$\dot{y} = Y_o^{(m)}(x, y) + \mu f_2(x, y, \tau, \mu),$$

where

$$\begin{aligned} X_o^{(m)}(x, y) &= A_o x^m + A_1 x^{m-1} y + \\ &+ \dots + A_{m-1} x y^{m-1} + A_m y^m, \end{aligned}$$

$$\begin{aligned} Y_o^{(m)}(x, y) &= B_o x^m + B_1 x^{m-1} y + \dots + B_{m-1} x y^{m-1} + B_m y^m, \\ A_i, B_i \quad (i=1, 2, \dots, m) \end{aligned}$$

– are constant coefficients, and

$$\begin{aligned} x Y_o^{(m)}(x, y) - y X_o^{(m)}(x, y) &= F(x, y); \\ x X_o^{(m)}(x, y) + y Y_o^{(m)}(x, y) &= R(x, y) \end{aligned} \quad (4)$$

depending on structure of these functions can be described in a number of ways. Let us say that equation $F(x, y) = 0$ has substantial roots (each substantial root of this equation defines a curve that, together with axis OX , forms an angle, tangent of which equals k) $k = \frac{y}{x}$, and form $R(x, y)$, while

$F(x, y) = 0$ preserves constant sense for any k . This event is characterized by a knot. Besides, if $R(x, y) > 0$, this knot is unstable, and if $R(x, y) < 0$ it is stable. If equation $F(x, y) = 0$ has substantial roots, and form $R(x, y)$ on one of the beams equals more than zero, and on other beams is less, then such event is characterized as a «saddle».

Let us imply now that $F(x, y)$ is defined in sense. Let us write down (4) in polar coordinates:

$$\begin{aligned} \dot{r} &= \frac{dr}{dt} = r^m R_o^{(m+1)}(\theta); \\ \dot{\theta} &= \frac{d\theta}{dt} = r^{m-1} F_o^{(m+1)}(\theta), \end{aligned} \quad (5)$$

where

$$r = r_o \exp \left(\frac{a_0}{2} + \sum_{n=1}^{\infty} \frac{a_n}{n} \sin n\theta - \frac{b_n}{n} \cos n\theta \right), \quad (8)$$

where a_o , b_o , a_n , b_n are coefficients of degradation of functions $R_o^{(m+1)}(\theta)/F_o^{(m+1)}(\theta)$ into the line of Fourier.

It is clear that (8) is an equation of spirals. If $a_o > 0$, they are unstable. If $a_o = 0$, phase trajectories form locked curves, and the beginning of coor-

dinates is the center. Periodic solution of the system (3) corresponds to the letter event.

Thus, conditions of existence of periodic solutions for system (3) comes to the fulfillment of two requirements:

a) Function $F(x, y)$ must be defined in sense;

$$b) a_o = \frac{1}{\pi} \int_0^{2\pi} \frac{R_o^{(m+1)}(\theta)}{F_o^{(m+1)}(\theta)} d\theta = 0.$$

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$$s_k = \frac{k}{a} + \frac{d_{1k}}{ak} + \frac{d_{2k}}{ak^2} + O\left(\frac{1}{k^3}\right),$$

$$k = 1, 2, 3, \dots$$

and for this

$$d_{1k} = \frac{1}{2\pi} \cdot \left[\int_0^\pi q(t) dt + \int_0^\pi q(t) \cos(2kt) dt - 2(a_{11} - a_{22} + a_{12} - a_{21}) \right],$$

$$d_{2k} = -\frac{d_{1k}}{2\pi} \cdot \int_0^\pi (2t - \pi) q(t) \cdot \sin(2kt) dt + \frac{a_{11} - a_{22}}{2\pi} \cdot \int_0^\pi q(t) \sin(2kt) dt -$$

$$-\frac{1}{4\pi} \cdot \int_0^\pi q(t) \cdot \left(\int_0^t q(\zeta) \cdot [\sin(2k\zeta) - \sin(2kt) - \sin(2k(\zeta - t))] \cdot d\zeta \right) dt, \dots$$

The theorem is proved by methods of the chapter 5 of the monograph [2].

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ABOUT A BOUNDARY-VALUE PROBLEM OF STURM-LIOUVILLE WITH NOT SEPARABLE BOUNDARY CONDITIONS OF THE FIRST TYPE

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Let's consider differential operator Sturm-Liouville of the second order:

$$-y''(x) + q(x) \cdot y(x) = \lambda \cdot a^2 \cdot y(x),$$

$$0 \leq x \leq \pi, \quad a > 0,$$

with not separable boundary conditions of the first type (see [1]):

$$\begin{cases} y'(0) + a_{11} \cdot y(0) + a_{12} \cdot y(\pi) = 0, \\ y'(\pi) + a_{21} \cdot y(0) + a_{22} \cdot y(\pi) = 0, \end{cases}$$

where $a_{km} \in C$ ($k, m = 1; 2$), and it is supposed that potential $q(x)$ – summable function on the segment $[0; \pi]$:

$$q(x) \in L_1[0; \pi] (=) \left(\int_0^x q(t) dt \right)' = q(x) \quad (3)$$

almost everywhere on $[0; \pi]$.

Theorem. Asymptotics of the eigenvalues of the differential operator (1)–(2) with a condition (3) has the following kind:

THE MATERIAL WORLDS HIERARCHY EMPIRICAL MODELS

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As, now, it was known, on the basis of all those natural science models, having described in the author's papers [1, 2] etc, having taking into account the physicists' empirical conclusions, the findings, and the experimental results after Albert Einstein, the STEREOCHRONODYNAMICS objective reasons had been noted – the physical theory, that could be created the time – space mathematical model, which should to be had the quite necessary and the sufficient flexibility in the time – space all the properties description, including the modern physical

phenomena vast fields, that is, in accordance with our conclusion on the physical theories axiomatics completeness for our four – dimensional world, we have assumed, as the basis the FIVE fundamental axioms, the main among which our essentially new PARADIGM for the attributively – substantive NATURE of our world is.

Now, we are needed each of all these FIVE above – mentioned axioms to be subjected by the empirical or the experimental verification, in order to fill this STEREOCHRONODYNAMICAL AXIOMATICS by the specific physical content. So, by following the numbering order of the axioms mentioned [2], we recall the FIRST of the:

All the material objects of our world, in the form of the fields or the material bodies, are presented themselves the general continuous medium – the physical ether, in which all the material objects have been located (e.g. the bodies, the fields), having interacted with each other, according to the established laws. For all this, for the world dimension we have the right to take the number of the independent properties of this world, that is, its attributes number, inherent its in the definition. It should be remembered, that the deformed medium neighborhood is the DEFONOM around the LOCAL DEFORMATION at the O point with the indicated components of the normal σ , and the tangential τ_{ik} strains. It is quite clear, that the substance in the deformation world has the physical properties, which are similar to the physical vacuum properties, the exemplary representations of which we have on the instrumental studies results of the near space: the temperature is close to the absolute zero, the viscosity is corresponded to the superfluidity at the very low temperatures, etc.

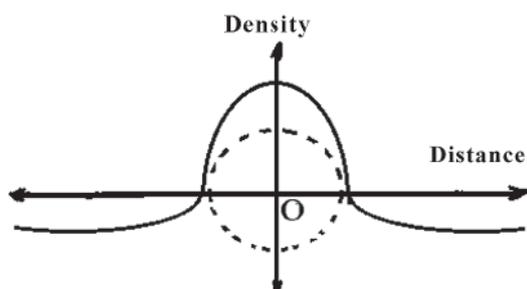


Fig. 1

For all this, from the known deformation compatibility property in the geometry, it is quite clear, that the ρ_q substance density in such DEFONE compression is greater, than the ρ_p substance density in its neighborhood, that we have graphically presented some dependency

$$\rho = f(r), \quad (1)$$

where r – distance from the O point, as it has been shown in Fig. 1.

So, it is quite known, that the DIRECTION notion in the GEOMETRY is determined by the ANGLE – value quantity, which is appeared only in the two – dimensional worlds – surfaces (e.g. radian), and in the three – dimensional worlds (e.g. steradian). For all this, if for the plane ANGLE value uniqueness should be its sign indication (the right one – clockwise, the left one – counterclockwise, relative to the given REFERENCE – line), then the space ANGLE value uniqueness yet it is necessary the indication, and its orientation, relative to the surface.

To be illustrated the marked circumstance, let us use the vector fields topological studies results on the surfaces [3] and the others. Let us imagine to ourselves the simple such spheroid DEFON compression in the neighborhood of the O point, as in Fig. 2, whereas in Fig. 3, we will obtain the σ_i normal vector fields image (e.g. Fig. 3, a) and the τ_{ik} tangential (e.g. Fig. 3, b) stress components in the adjacent neighborhood with the spheroid, which by the definition are the orthogonal ones to each other.

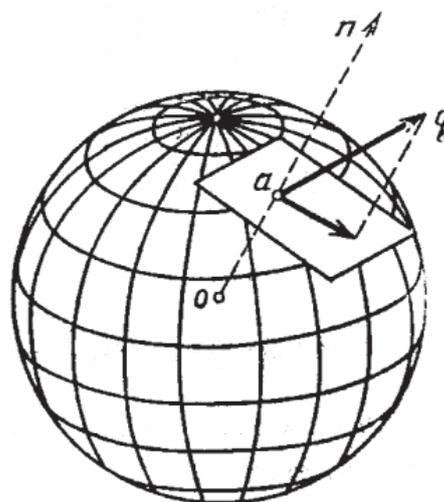


Fig. 2 (fig. 88 by [3])

At the same time, the two similar DEFONES, having located closed to each other, will be appeared on the opposite sides of any surface, which will be always able to be presented in closed indefinitely for the improper lines around any of the DEFONES, as it has been graphically shown in the Fig. 4, in which l – is the trace of the boundary surface between the A and B DEFONES neighborhoods, having had the m and m' characteristics, correspondingly.

As we have already noted earlier [1], this surface curvature radius l for the A and B DEFONES will be had the opposite signs. So, from the above – mentioned circumstances, it is followed immediately the need convergence of the two neighboring such DEFONES – SPHEROIDS compression, which is equivalent to the attraction, as it has been shown in the Fig. 4.

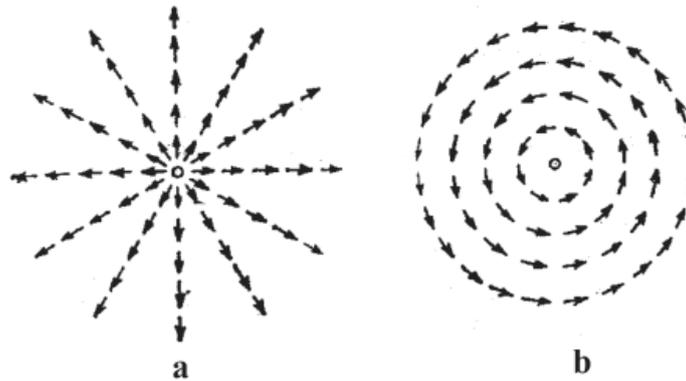


Fig. 3 (fig. 89-a) and b) by [3])

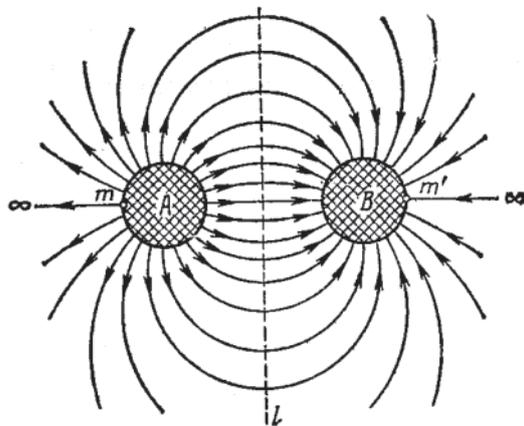


Fig. 4

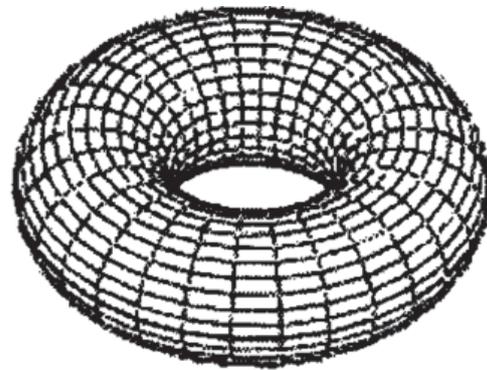


Fig. 6

As we have already determined previously [1], such surface can be accepted one from the shown in the Fig. 5 (e.g. the sphere), in the Fig. 6 (e.g. the torus), and in the Fig. 7 (e.g. the twisted torus) forms:

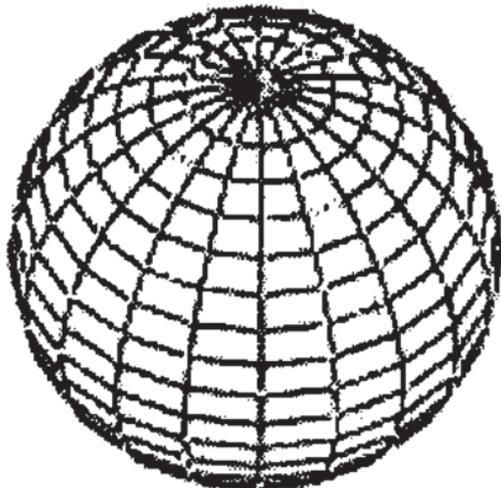


Fig. 5

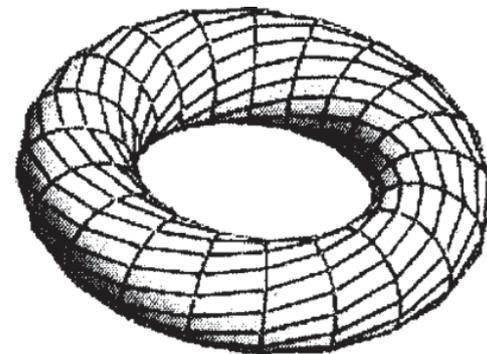


Fig. 7

From one of the fact, that in contrast to the simply connected spheroid, the toroid (see, Fig. 6) is the biconnected one [1], it is immediately led to the conclusion, that there is no vector field central symmetry of the normal σ_i component of the stress, inherent to the spheroid, having got in the polar plane, the toroid orthogonal to the equatorial plane, the axial symmetry, having allowed the change to be provided the vector field of the normal σ_i stress component, having omitted the mathematical transformations, having done by the author earlier [4], as it has been shown in the Fig. 8, in which the n и $-n$

limits levels values of the vector field of the normal σ_i component are indicated by the dashed lines.

From the circumstances, mentioned again, the conclusion is followed, the convergence necessity between the two neighboring such DEFONES – TOROIDS compression, which is equivalent to the attraction, like DEFONES – SPHEROIDS attraction in the Fig. 13, but the DEFONES – TOROIDS gravitation magnitude is dependent not only on the distance between them, but on the relative spatial orientation to each other: their interaction in the equatorial planes is subjected to the central symmetry, like the DEFONES – SPHEROIDS interaction (see, the Fig. 4), and the DEFONES – TOROIDS compression interaction is subjected to the axial symmetry in the polar plane, also here it is leaving until the challenge of this attraction magnitude is opened.

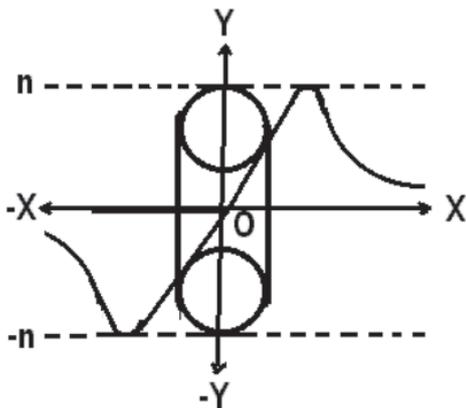


Fig. 8. Component of the stress

For all this, here it is significant to be noted the distinguished feature action of the DEFONES – TOROIDS interaction, unlike the DEFONES – SPHEROIDS interaction only, as it is quite clear from the graphical dependence, which has been shown in the Fig. 8, at the distances between the DEFONES – TOROIDS, comparable to their own dimensions. Moreover, we know [1], that the deformed environment neighborhood around the LOCAL DEFORMATION at the O point with the indicated components of the normal σ_i and the tangential τ_{ik} stresses, having bounded by the surface, is formed the DEFONES – SPHEROIDS and the DEFONES – TOROIDS, which, in their turn, are formed the asymmetric BRACKETS, in the vicinity of which accompanying deformations are also co-created the asymmetrical regions, within which the values and the directions of the normal σ_i and the tangential τ_{ik} stress component are shown this surrounding areas asymmetry from the various sides, regarding the TWISTED DEFONE – TOROID BRACKETS.

Also, having taken into consideration the circumstance, that the DIRECTIONS notion in the

GEOMETRY is determined by the ANGLE sign and the magnitude, it is necessary to be recognized the decisive influence upon the magnitude and the interaction direction, and also as well as the TWISTED DEFONES – TOROIDS TWISTING DIRECTIONS, which can be two: the right one and the left one. In fact, the DEFONE – TWISTED TOROID formation can be presented, as the circumference moving process around some point of the deformable medium by the external axis – that is the close trajectory at this circle rotation, with respect to the center moving trajectory of this circle up to the closure of the path – which is the TOROID axis.

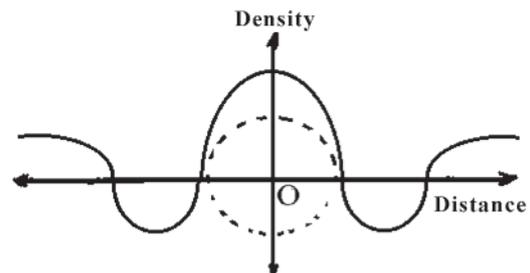


Fig. 9

As we have seen earlier [1], the torsion deformations are accompanied by all the other types of the deformation: as the compression, well as the tensile, as the shear, well as bending. Therefore, the special practical interest for us is presented that dependence $\rho = f(r)$ (1) density from the distance within the DEFONE – TWISTED TOROID itself and in its neighborhoods, as we have been found for the DEFONE – SPHEROID (see, Fig. 1), and also the vector field dependence of the normal σ_i stress components in its neighborhood, as we have already found above for the DEFONE – TOROID.

In accordance with the distinguished «DEFORMATIONS COMPATIBILITY CONDITIONS» after Saint – Venant [1], it is perfectly clear, that at the DEFONE – TOROID torsion, its surficial layer is tested the tension, which, if necessary, can be calculated even, having compared the helix lengths with the toroid corresponding equator length. This circumstance is led to the necessity of the tensile strain in the nearest TORSIONED DEFONE – TOROID neighborhood, as in the Fig. 9.

The other substance organization five levels

As it is turned out, the briefly – described above information from [1] on the deformation worlds is able to be interpreted, on the basis of the empirically established regulations. So, for example, it is quite known from the CTO, that:

$$m = \frac{m_o}{\sqrt{1 - \frac{v^2}{c^2}}} = m_o \left(1 - \frac{v^2}{c^2}\right)^{-1/2}. \quad (2)$$

Then followed by A. Einstein [5], having expanded the Newton binomial theorem into the Taylor series, we will get:

$$m_o \left(1 - \frac{v^2}{c^2}\right)^{\frac{-1}{2}} = m_o \left(1 + \frac{1}{2} \frac{v^2}{c^2} + \frac{3v^4}{4c^4} + \dots\right) \quad (3)$$

And having assumed along with A. Einstein

$$\frac{3}{4} \frac{v^4}{c^4} \ll 1 \rightarrow 0 \quad (4)$$

we will get:

$$(a+b)^n = a^n + na^{n-1} \cdot b^1 + \frac{n(n-1)}{1 \cdot 2} \cdot a^{n-2} \cdot b^2 + \frac{n(n-1)(n-2)}{1 \cdot 2 \cdot 3} a^{n-3} b^3 + \dots \quad (8)$$

that, in our case, it is required to be rewritten the expression (3), in the form completely, as it is already subsequent to the fifth member after the fraction comma has

$$M = m_o \left(1 - \frac{v^2}{c^2}\right)^{\frac{-1}{2}} ;$$

$$m_o \left(1 - \frac{v^2}{c^2}\right)^{\frac{-1}{2}} = m_o \left(1 - \frac{1}{2} \frac{v^2}{c^2} + \frac{3}{4} \frac{v^4}{c^4} - \frac{5}{16} \frac{v^6}{c^6} + \frac{35}{128} \frac{v^8}{c^8} + \dots\right) \quad (9)$$

Indeed, after getting rid of the common denominator the FIFTH term on the right c^o is obtained,

$$M \cdot 128c^8 = 128m_o c^8 - 64m_o v^2 c^6 + 96m_o v^4 c^4 - 40m_o v^6 c^2 + 35m_o v^8 c^o. \quad (10)$$

In another way, the expression (10) can be rewritten in the form, as (11):

$$M = m_o - \frac{m_o}{2} \left(\frac{v}{c}\right)^2 + \frac{3m_o}{4} \left(\frac{v}{c}\right)^4 - \left(\frac{40m_o}{128}\right) \left(\frac{v}{c}\right)^6 + \left(\frac{35m_o}{128}\right) \left(\frac{v}{c}\right)^8, \quad (11)$$

from which the conclusion is unequivocally followed on the WORLDS DEFORMATIONS SUBSTANCE QUINTUPLE HIERARCHY, that is, the worlds, having contained the DEFONES.

So, the received expression (11) is reminded us from the base storage [1] the TOPOLOGY CATEGORIES QUINTUPLE HIERARCHY, the WORLDS HIERARCHY FIVE LEVELS, etc. are prompting us, here, to be formulated the similar conclusion, by the analogy, on the ETHER SUBSTANCE ORGANIZATION FIVE LEVELS: the SUBSTANCES QUANTITY IN THE GIVEN NEIGHBORING AROUND THE WORLD OF THE DEFORMATIONS IS MET THE DEFONES MOTION VELOCITY IN THE DEGREES 0, 2, 4, 6 and 8. In other worlds, this value M in (11) can be presented by the FIVE – MEMBERED TERM:

$$M = M_1 + M_2 + M_3 + M_4 + M_5, \quad (12)$$

where

$$M_1 = m_o; \quad (13)$$

$$m = m_o \left(1 + \frac{v^2}{c^2}\right)^{\frac{-1}{2}} = m_o \left(1 + \frac{1}{2} \frac{v^2}{c^2}\right). \quad (5)$$

Then

$$E = mc^2 = m_o c^2 + \frac{1}{2} m_o v^2 + (\dots) \quad (6)$$

that is and followed by A. Einstein, at $v = 0$, we get the well – known expression

$$E_o = m_o c^2. \quad (7)$$

At the same time, here, it is necessary to be remembered, that the full expression of the Newton binomial [6]:

become into the constant term, which is independent of c^n the constant value, if this expression (9) is led to the common denominator, that is to divide the value of

that is, it is converted into the UNIT, that do not affect this term meaning:

$$M_2 = -\frac{m_o}{2} \left(\frac{v}{c}\right)^2; \quad (14)$$

$$M_3 = \frac{3m_o}{4} \left(\frac{v}{c}\right)^4; \quad (15)$$

$$M_4 = -\left(\frac{40m_o}{128}\right) \left(\frac{v}{c}\right)^6; \quad (16)$$

$$M_5 = \left(\frac{35m_o}{128}\right) \left(\frac{v}{c}\right)^8. \quad (17)$$

The defone – spheroid with the defones – toroids and the defones – toroids between each other coupling geometry

Without wishing to be anticipated here yet the empirically established names:

- 1) the elementary parts;
- 2) the clusters;
- 3) the atomic nuclei;

4) the chemical elements atoms;
 5) the chemical compounds molecules,
 now, we imagine ourselves these DEFONES various configurations on the basis of our paradigm on the ATTRIBUTIVELY – SUBSTANTIVE EXPANDING DEFONES WORLD, in accordance with the established types of the INTERACTION SYMMETRY [1].

Indeed, as previously [1], we have already spread the very general topological principle of the continuity and for the dimension of the topology those categories, for which this principle is the fundamental one on the basis of the multiple processes geometry fractality, then it is appropriate and our conclusion, that

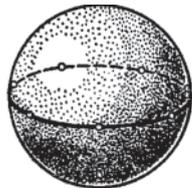
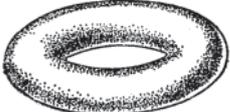
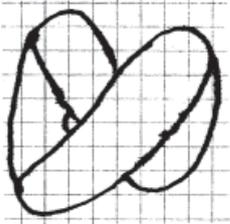
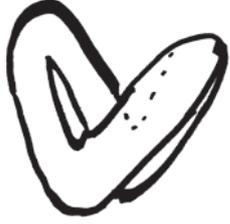
$$M = \int_{n_1}^{n_2} dM_n = \int_{n_1}^{n_2} m^n \ln m dn. \quad (18)$$

Thus, having considered the n PARTICLES dimension, depending on the specific physical properties of the DEFONES, CLUSTERS, NUCLEI, ATOMS, AND MOLECULES WORLD, that is, as the DIMENSION of the corresponding DEFONES COUPLING WORLDS:

- n_1 – размерность – DEFONE – SPHEROID,
- n_2 – размерность – DEFONE – TOROID,
- n_3 – размерность – RIGHT – TWISTED DEFONE – TOROID,
- n_4 – размерность – LEFT – TWISTED DEFONE – TOROID and so on, it is quite possible to be imagined oneself the DEFONES WORLDS, in the form of the illustrative tables, having used, for example, the appropriate symbolic notations:

Table 1

The elementary (the simplest) defones

Number	n	Visual representation	Simplified representation	Simbol	Name
1	n_1				DEFONE – SPHEROID
2	n_2				DEFONE – TOROID
3	n_3				RIGHT – TWISTED DEFONE-TOROID
4	n_4				LEFT – TWISTED DEFONE-TOROID

Still, having left aside outside our attention, as more than triple, well as the multiple COUPLINGS,

it is quite possible to be used our reasonable conclusion from [1], on the basis of the given table, that

$$M = \ln m \int_{n_1}^{n_2} m^n dn = \ln m \frac{m^n}{\ln m} = m^n = m^{n_2} - m^{n_1} \quad (19)$$

to the dimension determinations of the corresponding COUPLINGS:

Table 2

The simplest defones – spheroids with the defones – toroids pair couplings

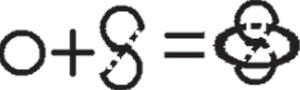
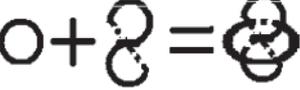
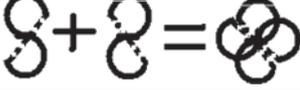
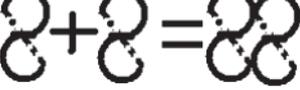
Number	n	Simplified representation	Symbol	Name
1	n_5			SPHEROID WITH TOROID COUPLING
2	n_6			SPHEROID WITH RIGHT TOROID COUPLING
3	n_7			SPHEROID WITH LEFT TOROID COUPLING

Thus, as have repeatedly pointed out previously [1, 7, 8], that the quantitative increase of the additional directions and the areas (e.g. the properties, the abilities, the possibilities...) is led to the appearance of the new qualitative features, values, and parameters. In other words, the system is usually gained or lost some of its properties (e.g. at the

dimension increasing – the properties number is increased, and at the dimension decreasing – their number is decreased, respectively) in the process of the dimension changing, that it is graphically illustrated to us the above – listed DEFONES COUPLINGS, having had their dimensions: $n_1, n_2, n_3, n_4, n_5, n_6, n_7, n_8, n_9, n_{10}, n_{11}, n_{12}, n_{13}$, etc.

Table 3

The simplest defones – toroids between each other pair couplings

Number	n	Simplified representation	Symbol	Name
1	n_8			TOROID WITH TOROID COUPLING
2	n_9			TOROID WITH RIGHT TOROID COUPLING
3	n_{10}			TOROID WITH LEFT TOROID COUPLING
4	n_{11}			RIGHT TOROID WITH RIGHT TOROID COUPLING
5	n_{12}			RIGHT TOROID WITH LEFT TOROID COUPLING
6	n_{13}			LEFT TOROID WITH LEFT TOROID COUPLING

The SPHEROID WITH THE TOROID  and the TOROID WITH THE TOROID COUPLINGS  geometry is paid the special atten-

tion to itself, which are easily explained by the dependence nature (1) $\rho = f(r)$ in the Fig. 1, the Fig. 8, and the Fig. 9, having reproduced, here again, in the comparative scales:

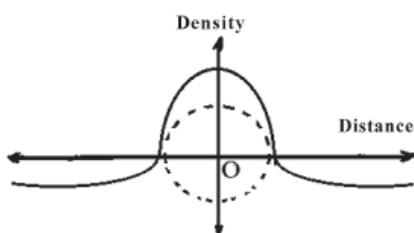


Fig. 1

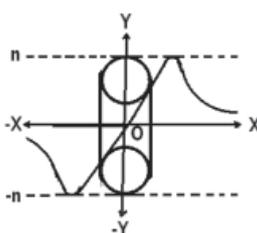


Fig. 8

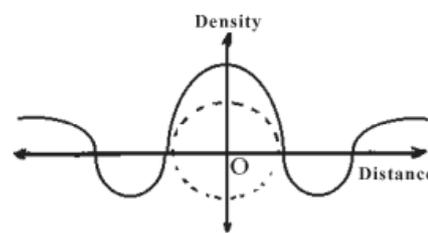


Fig. 9

Indeed, in contrast to the Figure 1, the dependence (1) $\rho = f(r)$, which is defined only the central symmetry of the gravity interaction of the Fig. 4, this dependence (1) $\rho = f(r)$ for the Fig. 8, and the Fig. 9 is determined and the interactions axial centrally symmetry, which is the special case of the stable position of one from the DEFONES inside another one, in the so called the potential well [8].

Conclusions

1. The interpretation on the basis of empirically established dependencies of the STEREOCHRONODYNAMICS guideline, that all the material objects of our world, in the form of the fields or the real bodies are presented themselves the common continuous medium – the physical ether, in which all the material objects (e.g. the bodies and the fields) have been localized, having interacted between each other, according the established laws, unambiguously is led us to the conclusion on the WORLDS DEFORMATIONS SUBSTANCE QUINTUPLE HIERARCHY, that is, the worlds, having contained the DEFONES:

$$M = M_1 + M_2 + M_3 + M_4 + M_5. \quad (12)$$

2. Having considered the n Particles dimension, depending on the specific physical properties of the DEFONES, the CLUSTERS, the NUCLEI, ATOMS, AND the MOLECULES WORLD that is, as the DIMENSIONS of the corresponding DEFONES COUPLINGS WORLDS, one can imagine oneself the DEFONES WORLDS, in the form of the empirically established ideas on:

- 1) the elementary particles;
- 2) the clusters;
- 3) the atomic nuclei;

- 4) the chemical elements atoms;
- 5) the chemical compounds molecules.

3. The pair couplings feature of the DEFONES BETWEEN EACH OTHER is the SPHEROID WITH THE TOROID and the TOROIDS BETWEEN EACH OTHER COUPLINGS, because of the DEFONES interactions axis centrally symmetry, which is the special case of the stable position of one from the DEFONES inside another one, in the so called the potential well.

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