

Medical sciences
Article

- EFFECTIVENESS OF SOME INHIBITORS OF ANGIOTENSIN-CONVERTING ENZYME
ON A STATE OF GASTRIC MUCOSAL BARRIER IN INDOMETACIN-INDUCED GASTROPATHY
Usmanova S.E., Khamraev A.A., Yakubov A.V. 4
- EFFECTS OF CELLULAR IMMUNITY IN CONDITIONS OF SURPLUS SUPPLY
OF STRONTIUM WITH CONSUMED WATER
Zaytseva N.V., Dianova D.G., Dolgykh O.V. 7

Materials of Conferences

- ANALYSING LIFE QUALITY OF PATIENTS WITH AN EXTENSIVE FORM OF LUNG
CANCER AFTER SPECIAL TYPES OF TREATMENT
Bukenov A.M., Gizbrecht E.V., Orazbayev B.A. 9
- EDUCATIONAL TECHNOLOGY OF TEACHING PHYSIOTHERAPY
AND SPORTS MEDICINE USING ANDRAGOGIC LEARNING MODEL
*Gilmutdinova L.T., Gizatullina N.S., Sakhabutdinova A.R., Nazarova E.M.,
Iseyeva D.R., Semyonova S.M., Atmagulova E.R.* 9
- HUMAN ENDOGENOUS RETROVIRUS HERV-E Λ 4-1 EXPRESSION IN COXAE
ARTHROPLASTIC
Goldina I.A., Pavlov V.V., Mitrofanov I.M., Gaidul K.V. 10
- BIOTECHNOLOGICAL INNOVATION OF UKRAINIAN SCIENTISTS – RECOMBINANT
PROBIOTIC SUBALIN
Karnaukh E.V., Olefir A.S. 15
- ACTION OF FAMILY ON EMERGENCE OF PSYCHOSOMATIC VIOLATIONS
OF CHILDREN
Zhakanova T.A., Alibaeva R.N., Ernazarova S.T. 15

Biological sciences
Article

- STRUCTURAL-FUNCTIONAL ORGANIZATION OF A LEAF OF KINDS
OF KIWI IN THE CONDITIONS OF HUMID SUBTROPICS OF RUSSIA
Tutberidze T.V., Belous O.G. 17

Materials of Conferences

- PATHOMORPHOLOGICAL CHANGES UNDER CONTUSION TRAUMA
OF SPINAL CORD IN RAT
Pavlovich E.R., Prosvirnin A.V., Smirnov V.A., Zvyagintseva M.A., Ryabov S.I. 21

Culturology
Article

- ARTISTIC CREATIVITY AND VISUAL THINKING
Zhukovsky V.I., Pivovarov D.V. 22

Economic sciences
Article

- SIMULATION MODELS OF MODERN LABOR EXCHANGES
Nevecherya A.P., Semenchin E.A. 26

Materials of Conferences

- HORIZONS OF PLANNING OF SOCIO-ECONOMIC TRANSFORMATIONS
AND INSTITUTIONAL TRAPS (THEORETICAL ASPECT)
Bersenev V.L. 29
- THE INNOVATIVE TYPE OF DEVELOPMENT OF ECONOMY OF RUSSIA
AS THE NECESSARY CONDITION OF ENSURING ITS COMPETITIVENESS
Borisova E. 31

| | |
|--|----|
| INNOVATION STRATEGY IN IT BUSINESS <i>Jumasseitova A.K., Zhumabayev A.K., Abilakimova A.A.</i> | 33 |
| INSTITUTIONAL AND STRUCTURAL CONSTRAINTS OF THE RUSSIAN ECONOMY <i>Shestakov R.B.</i> | 35 |
| <i>Pedagogical sciences</i> <i>Article</i> | |
| METHODOLOGICAL BASIS OF ETHNOPEDAGOGIC RESEARCH <i>Malsagova M.K., Lezina V.V.</i> | 37 |
| <i>Pharmaceutical sciences</i> <i>Article</i> | |
| THE STUDY OF THE CONSISTENT PROPERTIES OF GLYCEROGEL CONTAINING ST. JOHN'S WORT <i>Dehkanova M.A., Karieva E.S.</i> | 40 |
| <i>Philological sciences</i> <i>Article</i> | |
| A SURVEY OF THE PRACTICES OF CAMBRIDGE LANGUAGE ASSESSMENT <i>Tleshova Z.K.</i> | 43 |
| <i>Philosophy</i> <i>Article</i> | |
| MEDIEVAL ALCHEMY – THE PREDECESSOR OF EXPERIMENTAL SCIENCE OF NEW TIME <i>Chelyshev P.V.</i> | 48 |
| <i>Technical sciences</i> <i>Article</i> | |
| THE MEANS OF PRODUCTION OF POTASSIUM PERMANGANATE THROUGH CALCIUM PERMANGANATE <i>Abdrashitov Y.M., Mudrik T.P., Kurganova V.V., Shapovalova V.D., Shergeng N.A., Shapovalova E.V.</i> | 52 |
| CORRELATIVE ANALYSIS AND OPPOSITION VARIABLES <i>Tsvetkov V.Y.</i> | 56 |
| <i>Materials of Conferences</i> | |
| THE MATHEMATICAL MODELS, LIING IN BASE OF MODELING OF THE HOOKS FISHING SYSTEMS <i>Gabryuk V.I.</i> | 59 |
| THERMIC STRENGTHENING OF MOOVING CORNER PROFILES IN THE STREAM OF ROLLING MACHINE <i>Ibraev I.K., Bogomolov A.V.</i> | 63 |
| READING WITH COMPUTER INNOVATIVE TECHNOLOGIES AND E-BOOKS: COURSE AND INSTRUCTIONS <i>Kutabayev T.Z., Akhmetova G.M., Kintonova A.Z.</i> | 66 |
| <i>Chemical sciences</i> <i>Materials of Conferences</i> | |
| FORMATION OF OXIDE TUNGSTEN BRONZES ON W – SUBSTRATE BY ELECTROCHEMICAL SYNTHESIS FROM MOLTEN SALTS <i>Vakarin S.V., Semerikova O.L., Surat S.A., Kosov A.V., Pankratov A.A., Plaksin S.V., Zaikov Y.P.</i> | 70 |

Ecological technologies
Materials of Conferences

- THE INFLUENCE OF ENERGY EFFICIENCY ON ENERGY DEVELOPMENT BURYATIA
Dambiev T.T., Berbidaev G.N., Tyskineeva I.E. 72
- ECOLOGIZATION OF CONSCIOUSNESS
Maslennikova L.A. 73

Ecological and conservancy
Materials of Conferences

- VEGETATION OF SPECIALLY PROTECTED NATURAL TERRITORIES OF THE WESTERN REGION OF AZERBAIJAN (IN CASE OF THE NATIONAL PARK OF GOYGOL)
Bayramova A.A. 74

Historical sciences
Materials of Conferences

- HISTORICAL – ETHNOGRAHPICAL ANALYSIS OF NATIONAL CULTURE
Samuratova T.K., Smagul G. 76
- SOME ETHNOGRAPHICAL FEATURES OF THE FAMILY LIFE OF GANJABASAR REGION (XIX-BEGINNING OF XX CENTURY)
Veysalova V.R. 78

Physical and Mathematical sciences
Materials of Conferences

- MODEL AND ANALYSIS OF FACULTY STAFF AGE STRUCTURE DYNAMICS AT UNIVERSITIES
Dobrynina N.F. 80
- UNIVERSITY OPERATION MODEL
Dobrynina N.F. 80

Psychological sciences
Short Reports

- THE CONCEPT OF NEGATIVE MENTAL STATE
Gonina O.O. 82

EFFECTIVENESS OF SOME INHIBITORS OF ANGIOTENSIN-CONVERTING ENZYME ON A STATE OF GASTRIC MUCOSAL BARRIER IN INDOMETACIN-INDUCED GASTROPATHY

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How it is known on set of adverse drug effects is consequence of uncontrolled taking of non-steroid anti-inflammatory drugs (NSAID). The majority of unwanted side effects of these means are developing within the limits of GIT. It is believed that gastric or duodenal injuries by taking of NSAID are approximately developing in each fifth patient [1].

Keywords: inhibitors, angiotensin-converting enzyme, gastric

The most serious complications are hemorrhage and perforation that substantially determine lethality related with using of these preparations [2].

Taking into consideration foregoing a problem of NSAID-gastropathy in the last decade takes an important place in treatment of rheumatoid patients. It is searched new mechanisms of formation of NSAID-gastropathy and elaboration of novel therapeutic preparations for treatment and prevention taking into account the data received [3].

It is known that inhibitors of angiotensin-converting enzyme (I-ACE) have a stimulating effect on synthesis of prostaglandins (PG-E₂) in kidneys, vessels, brain. It is supposed that they also cause an analogous effect in gastrointestinal tract. Studies of O.M. Mikheyeva et al. [4] that established ulcer-healing effect of enalapril in patients with hypertension and concomitant ulcer disease may serve as corroboration.

Nafeeza Mohd Ismail et al. [5] established on a model of aspirin-induced gastropathy in rats comparatively studying effectiveness of captopril and ranitidine that captopril unlike ranitidine increased activity of glutathione reductase, composition of prostaglandin E₂ and reliably decreased content of malon dialdehyde (MDA). Circumstances expounded served grounds to conduct this study.

The purpose of the research

Goal of research was to study effect of some I-ACE on a state of gastric mucosal barrier in indometacin gastropathy in animals with experimental rheumatoid arthritis.

Materials and methods of research

Experimental studies were carried out on 36 male rats of mixed population weighting 160–200 g that received usual ration of vivarium. Studies were performed in the following groups: 1st group – intact, 2nd group – animals with experimental rheumatoid arthritis and indometacin gastropathy (GERA), 3rd group – GERA + H₂O (without treatment), 4th group – GERA + enalapril, 5th group – GERA + lisinopril, 6th group – GERA + captopril. Every group consisted of 6 animals.

Experimental model of rheumatoid arthritis was challenged by a single administration of 0,2 ml of Freund' adjuvant into posterior right leg [6]. NSAID-gastropathy was challenged by administration of indometacin per os at a dose 2,5 mg/kg during 5 days [7]. After modeling the preparations studying were administered as water suspension per os during 10 days in the following doses: enalapril 10 mg/kg [8], lisinopril 8 mg/kg [9], captopril 7,5 mg/kg [10], omeprazole 50 mg/kg [11], cytotek 0,2 mg/kg [12].

To conduct biochemical investigation all the animals were decapitated by a single-stage etherization, the stomach was extracted. The stomach was cleaned, washed by a cold physiological salt solution, proventriculus was removed. Mucosal layer was then scarified, weighed and slurried in distilled water in the porcelain mortar at a rate 30 mg/ml [13]. State of mucosal barrier was calculated by determination of compositions of carbohydrate and protein components of insoluble glycoproteins (IGP). Sialic acids were determined by a method of L.I. Linevik [14]. To determine fucose was used a method proposed by P.D. Rabinovich et al. [15]. Content of protein was estimated by a method of O.N. Lowry et al. [16].

Results of research and their discussion

Results of studying effect of some I-ACE on content of insoluble glycoproteins in gastric mucosa in indometacin gastropathy in animals are presented in a Table.

How it is shown from the data presented content of IGP in gastric mucosa was considerably decreased in GERA. Composition of sialic acids was decreased 3,4 times, fucose – almost 2,5 times, and protein – 2 times from control values. These changes in a group without treatment (H₂O) remained the same.

An increase in content of sialic acids 60,8%, fucose – 34,5% and protein – 29,7% from indicator in a group without treatment noted to be in a group treated with enalapril. Almost analogous results were also observed in a group treated with lisinopril.

Application of captopril was found the most effective in treatment of GERA. In this group composition of sialic acids was increasing 136,2%, fucose – 69,7% and protein – 37,4%. But despite of substantial increase in fractions' composition in this group the results obtained remained lower compared with values in control (intact) group.

Effect of some I-ACE omeprazole and cytotek on content of fractions of insoluble glycoproteins in gastric mucosa in indometacin gastropathy in animals with experimental rheumatoid arthritis.

| Number | Groups of animals | Sialic acids mkg in ml of suspension | Fucose mg in ml of suspension | Whole protein mg in ml of suspension |
|--------|-------------------------|--------------------------------------|-------------------------------|--------------------------------------|
| 1 | Control | 4,12 ± 0,158 | 6,73 ± 0,125 | 15,22 ± 0,655 |
| 2 | GERA | 1,22 ± 0,067 | 2,78 ± 0,100 | 7,65 ± 0,257 |
| 3 | GERA + H ₂ O | 1,38 ± 0,072 | 2,85 ± 0,121 | 8,55 ± 0,352 |
| 4 | GERA + enalapril | 2,22 ± 0,047* | 3,82 ± 0,089* | 9,92 ± 0,400 |
| 5 | GERA + lysinopril | 2,47 ± 0,085* | 4,12 ± 0,051* | 10,12 ± 0,397* |
| 6 | GERA + captopril | 3,27 ± 0,041* | 4,82 ± 0,106* | 11,75 ± 0,546* |

Note. * – p < 0,05 from indicator of GERA group without treatment (GERA + H₂O).

It was established that sialic acids and fucose play special role in IPG functioning of full value. These carbohydrate components provide elasticity and viscosity of mucosal barrier [17, 18]. Results received in a group with GERA allow assert that injury of mucosal barrier of stomach was caused by decrease of IPG synthesis and its functional insufficiency characterized by changes of its rheological features. Negative effect of indometacin on mucosal barrier in the literature available is accounted for inhibition of COX enzymes, suppression of prostaglandins' production with the future damage of microcirculation. It is assumed that this mechanism is not the only one.

Convincing data are available in the literature confirming ulcer-healing effect of enalapril [19, 20]. The authors relate it with stimulation of prostaglandins' synthesis. We suppose that it is one of the mechanisms of positive effect of drug that is also a cause of correcting action of preparation on other mechanisms of pathogenesis. Nikonov E.L. [21] investigated an effect of captopril and lysinopril on a state of gastric mucosal membrane in patients with arterial hypertension and osteoarthritis over a long period of time taken NSAID. It was established by author that I-ACE have positive effect not only on cardiovascular system but also improve morpho-functional indices of gastric mucosal membrane. S.A. Alexeyenko et al. [19] affirm that mechanisms of positive effect of preparations of I-ACE group on gastric mucosal membrane need the further investigation.

Conclusions

1. Synthesis of insoluble glycoproteins in gastric mucosal barrier is considerably sup-

pressed in indometacin gastropathy in animals with experimental rheumatoid arthritis.

2. I-ACE enalapril, lysinopril and captopril stimulating glycoproteins' synthesis in gastric mucosa have cytoprotective effect. Captopril is the most effective in treatment of NSAID-induced gastropathy.

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EFFECTS OF CELLULAR IMMUNITY IN CONDITIONS OF SURPLUS SUPPLY OF STRONTIUM WITH CONSUMED WATER

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Anthropogenic pollution of environment leads to emergence of immune system malfunction among children. Using the method of flowing cytometry and immune-ferment analysis, we have studied alterations in indexes of immune system among children who consume water with increased contents of strontium. It has been established that expression of early (CD25⁺) and late (CD95⁺) activation antigens on immune cells has been decreased, and expression of anti-inflammatory cytokine IL17 has been increased in statistically-significant values ($p < 0,05$) among the studied children. Intake of chemical polluting substances (strontium) defines development of immune disturbances that can cause heavy pathological processes in an organism.

Keywords: cellular immunity, strontium, water

An impact of anthropogenic chemical factors of various degree of expression create conditions for emergence of stable premises for formation of immune system malfunction among children that can display in disturbance of cellular regulation [2].

The objective of this work is to define special features of immune status among children who consume water with increased contents of strontium.

Materials and methods of research

The research has been carried out at the example of children population throughout various environmental conditions. Biomedical diagnostic studies among children have been carried out according to necessary following of ethical principles of medical-biological researches, described in Helsinki declaration of 1975 and its addendums of 1983. The research has been approved by Ethical committee of Federal scientific center of medical-prevention technologies of managing risks to health of population. Criteria of inclusion into the study are: children from 4 to 7 years of age, residence of the studied territory. Criteria of exclusion are: impossibility or refusal to provide informational approval for participation in the research by parents, participation of the studied children in a different research. All parents (guardians) have signed informational approval for participation in the research and usage of personal data. The observation group was formed of 113 children (an average of $7,20 \pm 0,14$ of age, 50 boys (44,2%) and 63 girls (61%) among them) who constantly live on a territory where waters of low quality according to sanitary-chemical indexes are provided as sources of household-consumable water supply (territory of observation). The control group was formed of 100 children (an average of $6,58 \pm 0,13$ years of age, 39 boys (39%) and 61 girl (61%) among them) who live at the territory of relative sanitary-hygienic wellbeing, where underground soil waters are used as a source of household-consumable water supply (control territory). Groups of observation and control were comparable in their age and gender composition. Selection of the studied has been sufficient for reliable definition of intergroup differences.

In order to define impacts of environment chemical factors upon health condition, we have carried out natural researches of prior polluting substances' (strontium) contents in water of household-consumable purpose at territories of research. Study of bioenvironments (blood) for metal contents (strontium) has been carried out upon

atomic-absorption spectrophotometer of produced by «Perkin Elmer 3110» (USA) with implementation of acetylene-air composition as an oxidant and detection in regime of flame atomization as well as state standard specimen solutions of the studied metals in accordance with methodical guidances [3].

Definition of lymphocytes' populations (CD25⁺, CD95⁺) has been carried out via method of membrane immunofluorescence with implementation of panel of marked monoclonal antibodies to membrane CD-receptors «Becton Dickinson» («BD», USA), besides, no more than total of 10000 events have been registered simultaneously. In order to identify membrane markers of apoptosis, we have used suspension of mononuclear cells of peripheral blood, singled out by centrifugation in gradient of ficoll-voidigen density («Pharmacia Fine Chemicals», Sweden) [5]. Cytokines (IL7) have been defined by immune-ferment analysis (tests-systems, produced by «Vector-Best», Novosibirsk, Russia) at analyser «Elx808IU» (Biotek, USA).

To select criterions of evaluating significance of intergroup differences of averages, we have tested correspondence of forms of selective distributions to normal, using criterion χ^2 , and also controlled equality of general dispersions with F-criterion of Fisher. In case of inclination from normal distribution non-parametric U-criterion of Mann-Whitney has been used to compare the data. In case of correspondence between the received data and this normal distribution t-criterion of Student has been used. The research results are provided as an average value (M) and average error (m) of the studied indexes. The achieved level of significance (p) has been calculated in all procedures of statistical analysis, besides, critical level of significance in this research has been set as 0,05 [1, 4].

Results of research and their discussion

Increases in utmost acceptable concentrations of strontium have been registered in water samples, taken at observation territory during evaluation of household-consumable water supply quality (Table 1). The part of non-standard samples according to strontium contents equaled 16,7%. Strontium contents in water supply of the control territory do not exceed maximum permissible concentration according to SanPiN 2.1.4.1074-01 «Consumable water. Hygienic requirements towards water quality of centralized systems of consumable water supply. Quality control».

Table 1

Results of chemical analysis of consumable water of observation territory (exposition to strontium) and control area ($M \pm m$)

| Territory | Place of water probing | Strontium, PDC = 7,0 mg/l | |
|-------------|------------------------|---------------------------|-------------|
| | | Concentration, mg/l | Part of PDC |
| Control | Water from faucet | 0,71 ± 0,06 | 0,10 |
| Observation | Water from faucet | 7,8 ± 0,62 | 1,11 |

According to results of chemical-analytic research, we have established that strontium contents in blood samples of observation group children have been increased by 2,9 ($p < 0,05$) in relation to average-group contents of the analysed component in bioenvironments of control group children (Table 2).

Evaluation of immune state of all studied children has shown that number of early

CD25⁺-lymphocytes and late CD95⁺-lymphocytes has been decreased ($p < 0,05$) in comparison to results, received from children who live on territories of relative sanitary-hygienic wellness. Analysis of cytokine status has shown that expression of IL17 is increased ($p < 0,05$) among children of observation group in comparison to the similar index of control group children.

Table 2

Exposition markers and markers of immune system effect among studied children who live in different conditions of sanitary-hygienic wellness of environment ($M \pm m$)

| Indexes | Control group ($n = 100$) | Observation group ($n = 113$) |
|---|--------------------------------|------------------------------------|
| Strontium, mg/dm ³ | 0,0442 ± 0,00424 | 0,11055 ± 0,01111 ^p |
| CD25 ⁺ , % | 6,29 ± 0,30 | 4,70 ± 0,53 ^p |
| CD25 ⁺ , 10 ⁹ / dm ³ | 0,16 ± 0,01 | 0,15 ± 0,02 ^p |
| CD95 ⁺ , % | 27,13 ± 1,05 | 15,82 ± 1,60 ^p |
| CD95 ⁺ , 10 ⁹ / dm ³ | 0,67 ± 0,03 | 0,52 ± 0,08 ^p |
| IL17, pg/cm ³ | 0,54 ± 0,07 | 1,68 ± 1,73 ^p |

Note. ^p is a difference between groups of observation and control according to average values $p < 0,05$.

Thus, alteration of activation and regulatory markers of cellular immunity is registered among children who live in conditions of environmental impact of strontium, and this phenomenon can be one of pathogenic mechanisms of immune system malfunction development. It has been established that reliable ($p < 0,05$) alteration in immune response among children, exposed to impact of strontium is related to decrease in expression of early (CD25⁺) and late (CD95⁺) activation antigens on immunocytes and increase in expression of anti-inflammatory cytokine (statistically-reliable ($p < 0,05$) increase in IL17).

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*Materials of Conferences***ANALYSING LIFE QUALITY OF PATIENTS WITH AN EXTENSIVE FORM OF LUNG CANCER AFTER SPECIAL TYPES OF TREATMENT**

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Results of treating 241 patients with diagnosis «lung cancer of stage III^{a-b}» have been analysed. During the initial examination, an extensive form of lung cancer has been established among 97,1% (234) of patients, and remote metastasis have been revealed among 38,6% (93) of patients. Metastasis into regional lymph nodes have been revealed among 81,3% (196) patients. Among those: N₁ – among 28,6% (56), N₂ – among 69,9% (137), bronchopulmonary, N₃ – among 1,5% (3), paratracheal and periesophageal.

After verifying diagnosis of patients considering extent of disease and prediction factors, four variants of treatment have been undertaken: beam therapy – 37,7% (91), surgery – 22% (53), combined approach (beam therapy or neoadjuvant chemical therapy + surgery) – 16,2% (39) and complex therapy – 0,8% (2).

Treatment efficiency has been estimated according to remote results. Five-year rate of survival equaled $22,2 \pm 10,1\%$ per 35 radical surgeries. Survival rate in dependence on surgery volume has been reliably higher ($p < 0,05$) after pneumectomy than after lobectomy. One-year rate of survival equaled $85,7 \pm 9,7\%$ and $57,1 \pm 11,1\%$ correspondingly, three-year – $57,1 \pm 13,7\%$ and $38,1 \pm 10,8\%$ correspondingly. Five-year survival rate was insignificantly higher after pneumectomy than after lobectomy, $28,6 \pm 26,1\%$ and $19 \pm 8,7\%$ correspondingly, the difference is statistically-insignificant.

Analysis of life quality of patients in long time period (from 1 to 5 years) has shown that relapse of bronchus stump cancer emerges among 40% of patients (among 14 of 35 radically-operated), and among 70,5% of patients (170 of 241 treated persons) emerges progression of tumour process with metastasis into the organ department.

Among causes of regress and decrease in life quality of patients with lung cancer in long time periods we can outline the basic ones: relapse of the disease and its further progression for 87,5% (211) of cases, emergence of new metastasis for 86,7% (209) of cases, and for 12,8% (31) of cases adjunction and exacerbation of a competitive pathology can be a cause of regress in a patient's condition. Thus, analysis of life quality has shown that adequate treatment of patient with extensive

form of lung cancer is successful and prolongs life expectancy.

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EDUCATIONAL TECHNOLOGY OF TEACHING PHYSIOTHERAPY AND SPORTS MEDICINE USING ANDRAGOGIC LEARNING MODEL

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As a result of learning using andragogic learning model, in the Bashkir State Medical University at the Department of Medical Rehabilitation, Physiotherapy and Health Resort of the Institute of Postgraduate Education, people who have successfully mastered the educational program, acquire professional competence, knowledge, abilities, skills on physiotherapy and sports medicine speciality.

At present physiotherapy and sports medicine speciality has integrated into many sections of medicine and outlined a wide range of activities, ranging from preserving the health of healthy people, prevention of diseases to medical rehabilitation at all its stages. Sports medicine plays an important role in training of athletes, maintaining their health, in achieving the highest sports results. Nowadays the experts of physical therapy and sports medicine are demanded in all areas of medical practice.

The main educational program of postgraduate professional education on physiotherapy and sports medicine speciality is the regulatory guidance document, which regulates the content and form of organizational and methodological training of this speciality in postgraduate education of doctors.

Since 2000 in the Bashkir State Medical University physicians have been training on the program of professional education training, general and thematic improvement at the Department of Medical Rehabilitation, Physiotherapy and Health Resort of the Institute of Postgraduate Education in the cycle of «Physiotherapy and sports medicine», «Urgent issues of gymnastics and sports physiotherapy», «Medical rehabilitation». Clinical bases of the department are Republican medical sports clinic, sanatorium «Zelyonaya Roscha» («Green Grove») in Ufa.

Educational and professional activities aimed at building competencies that determine overall professionalism of the doctors.

Modernization of education in institutions offering vocational education and training at the moment, is connected with the implementation of the competence-based approach. Competence-based approach is focused on a such result of the formation where the determining factor is a combination of knowledge, skills and ability to apply the knowledge in professional practice.

The objectives of the improvement program include the improvement of the knowledge, acquisition of skills, new competencies in this specialty.

The retraining of the specialist begins with methodologically consistent studying of the theoretical foundations of physiotherapy, clinical and physiological justification for the use of methods, systematization of the exercises, drawing physiotherapy techniques, biomechanics of movement, biochemistry of muscle activity and their clinical implementation. The doctors are taught on training medical monitoring methods in sport, rehabilitation, training athletes for the competitions. Lectures cover topical issues of using the new technologies, information and training programs in the rehabilitation process for the acquisition of professional competences.

In the pedagogical process, as a visual material, we use multimedia equipment, electronic control training tests, online resources, methodical textbooks, simulators, training videos, movies, working in the simulation center. At the practical classes, students work out on functional samples in order to obtain the most complete and comprehensive information about the physical development, health assessment, indicators of its physical performance. Then, their learned techniques are put into practice of treating patients at various stages of their rehabilitation.

Based on the theoretical and practical knowledge specialist can provide qualified preventive and rehabilitative care to maintain the health of healthy people and the patients with reduced functional reserves of the body.

The important task is to develop the best methods of independent work. It is carried out in the process of developing and testing the methods of physiotherapy, writing term papers, essays, speeches at physiotherapists, balneologists, physical therapists and sports medicine doctors' Association, devoted the introduction of new technologies into practice; new techniques of using the equipment.

After the familiarization of each section of the program, some kind of control is carried out: a set-off test or a test of practical skills in the specialty.

Thus, as a result of learning, using andragogic learning model, people who have successfully mastered the educational program, acquire professional competence, knowledge, abilities, skills. Students are motivated to achieve the goal of learning and formation of common cultural and professional competence and readiness to work in modern conditions.

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HUMAN ENDOGENOUS RETROVIRUS HERV-E λ 4-1 EXPRESSION IN COXAE ARTHROPLASTIC

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Considering the ability of some retroviruses to activate in result of stress impact and produce proteins that possess immunotrophic characteristics, the objective of this research is to study the possibility of activating human endogenic retrovirus *HERV-E λ 4-1* as a result of surgery with massive damage of tissue at the example of total replacement of coxae with endoprosthesis, and also study its part in emergence of post-surgical infectious complications among patients with coxae arthrosis during early post-surgical period of coxae endoprosthesis care. As a result of the study, an increase in expression frequency of *HERV-E λ 4-1* has been revealed during the following 21 days after surgery in mononuclear blood cells among patients with complicated flow of post-surgical period depending on expression of system inflammatory reaction. Correlation dependence between development of infectious post-surgical complications and expression of *HERV-E λ 4-1* during post-surgical period.

Introduction. An increase in number of patients with pathologies of coxae (CP) is an urgent problem of modern medicine that is defines by an increase in part of aged population [22]. Arthroplasty of CP is an efficient method of treating this pathology that provides an improvement in life quality of patients, so, decrease in number of post-surgical complications after arthroplasty is important for efficient reproduction of the joint function.

Prosthetics of CP is a major surgery that goes along with local and system alterations in immunologic state in early post-surgical period, specifically

increase in production of IL-1 β , IL-6, IL-8, TNF- α , C3a component of compliment, decrease in production of LI-10 [6, 17]. Infectious complications are one of major causes of a prosthesis' incompleteness, according to our data [21], they emerge in 1–3% of all cases of total coxae replacement surgery, therefore, prevention and early diagnosis of them are significant factors of restoring the function of joint. In order to predict possibility of emergence of infectious complications, level of C-reactive protein and erythrocytes' sedimentation speed are used as well as study of anamnesis, physical and roentgenologic inspection, study of joint liquid, and a number of serological tests are used nowadays [24]. However, these indexes are not specific enough, and they correspond to reference values in case of presence of paraprosthesis infection in 3% of cases. On the other hand, increased level of C-reactive protein and erythrocyte sedimentation speed correlates with presence paraprosthesis infection only in 87% of cases [11]. Therefore, development of minimally-invasive, informative, and specific method of predicting risk post-surgical infectious complications is an urgent problem of arthroplasty.

Endogenous retroviruses (ER) emerged in genome of the spinal as a result of infecting embryonic cells at early stages of development with exogenous retroviruses, and they represent their provirus form that is always present in genome [2, 15]. ER inherit according to laws of Mendel, and form about 8% of human genome [12]. Expression of ER is regulated at different levels – at the level of various stress signals (damage of tissue, superinfection, factors of the environment, hormonal alterations), epigenetic state of genome, intracellular factors of transcription, splicing mechanism [4, 14, 16]. Regular elements, localized in U3 region of 5'LTR, carry out key part in control of ER expression [7]. Intracellular factors of transcription are modulated by stress factors that cause ER expression and, sometimes, synthesis of virus proteins that possess immunomodulating characteristics [9, 14, 20].

According to bibliographic data and also the received results, human ER of class I *HERV-E* λ 4-1 associates with a number of autoimmune diseases – system butterfly disease, expand sclerosis, rheumatoid arthritis, and frequency and level of its expression in mononuclear blood cells of patients correlates with a disease activity [8, 10, 20, 25]. This ER is replicably-competent and able to produce proteins, its amino-acid sequence (8,8 kb) contains open frames of read in regions *gag* and *env*. Antibodies to *HERV-E* λ 4-1 in blood serum of healthy individuals are not located [23].

Considering the ability of certain ER to activate in result of stress impacts, and also produce proteins that possess immunotrophic characteristics, the objective of this research is to study the possibility of activating ER λ 4-1 as a result of stress impact, represented by surgery with a massive damage of tissue at the example of total replacement of coxae

with endoprosthesis [6], and also the part of ER λ 4-1 in emergence of infectious complications among patients with coxae arthrosis in early post-surgical period of coxae endoprosthetics.

Materials and methods of research. *Donors and patients:* The study included patients with diagnosis «coxae arthrosis», 3 – of displastic genesis, 3 – post-traumatic, and 26 – idiopathic, 16 men and 16 women in age of 34 to 74 years old, all patients of clinic «Federal state budget institution Novosibirsk scientific-research institute of traumatology and orthopedy of J.L. Tsivian». All patients were delivered to the clinic to carry out surgery of initial endoprosthetic of coxae. Peripheral venous blood of dependently-healthy persons of the number of staff donors (20 men and 12 women in age of 34–56 years old) has been provided by the department of blood transition of the institution. According to modern diagnosis criterions, all patients had initially low level of post-surgical complications' risk [18]. Retrospectively, according to indicator of presence or absence of infectious paraprosthesis complications, patients have been divided into 2 groups: patients with non-complicated flow of post-surgical period, 9 men and 9 women, formed control group; patients, whose post-surgical period was complicated by infectious paraprosthesis maturation, 7 men and 7 women, formed the experimental group. Protocol of research corresponded to ethical standards and was regulated by ethical committee of Federal state budget institution Scientific-research institute of traumatology and orthopedy of J.L. Tsivian in accordance with Helsinki Declaration of Universal association «Ethical principles of carrying out scientific medical researches with participation of human» and its addendums of 2000 and «Ethical principles of carrying out scientific medical researches with participation of human» according to the order of Ministry of healthcare of Russian Federation № 266 (Rules of clinical practice in Russian Federation) dd. 19/06/2003.

Definition of body temperature. Body temperature of the patients has been evaluated in axillary cavity twice a day, at 7 a.m. and 4 p.m. during the whole period of research.

Expression of env gene of human ER HERV-E λ 4-1 has been defined 48 hours before carrying out the surgery and also after day 1, 7, 14, 21 of post-surgical period.

Introduction of mononuclear cells. MNC have been discharged by centrifugation of heparinized venous blood on gradient of ficoll of 1,078 g/cm³ (Lymphocyte separation medium, MP Biomedicals, LLC, Eschwege, Germany).

Revelation of RNA has been carried out via method of phenol extraction [5] with facilitation of test-system VectorsRNA – extraction (Vector-best, Novosibirsk).

Amplification of the received DNA has been carried out on programmed amplifier «Tercik» (DNA – technologies, Moscow) with facilitation of couples

of oligonuclear primers to gene *env ER λ 4-1* [23]. The received cDNA fragments have been analyzed in 2% gel of agarose with addition of 0,00001% of bromide etidium (VectoDNA-EF, Vector-Best, Novosibirsk). Samples with presence of cDNA line in gel that corresponded to the expected size of the amplicon have been considered positive. Products of amplification have been standardized according to β-actine and visualized on densitometer Pharmacia-LKB.

Research design: diagnostic, retrospective, prospective.

Statistical procession of the received data has been carried out with facilitation of application pack STATISTICA v.10.0 (StatSoft Inc, USA). The results are provided as Me (25%; 75%). To estimate statistical significance of differences between qualitative variables, we have used two-side variant of accurate criterion of Fisher, and U-criterion of Mann-Whitney has been used to estimate qualitative variables. Analysis between researches in different terms of post-surgical period has been carried out with facilitation of non-parametrical type of criterion of Newman Keuls for qualitative values, and

Q-criterion of Cochran for qualitative. Differences have been considered reliable if $p < 0,05$.

Results of research and their discussion. Clinically, indicators of deforming arthrosis of coxae have been revealed among patients, included into the research. They displayed in an expressed pain syndrome, limited mobility, limping, shortening of limbs.

Roentgenologically, among all patients we have registered signs of hyperplasia of coxae bone tissue with para-articular ossificates and central wedge-shaped osteophyte that led to external shift of femoral bone head. During the surgery signs of inflammatory alterations such as synovitis, injection of vessels, hyperplasia of joint capsule, synovia, bone tissue. No growth of pathogenic microorganisms has been revealed under bacteriological study of material, taken from the area of surgical wound.

According to the received data of general-clinic laboratory research, no signs of local or system inflammatory process have been revealed among patients by the beginning of the study among all patients (Table 1).

Table 1

Parameters of general-clinic laboratory signs during pre-surgical period (Me(25;75))

| Studied parameter | Reference indexes | Control group | Experimental group |
|----------------------------------|---|-------------------|----------------------|
| Erythrocytes | male 4,5 – 5,0·10 ¹² /l, female 3,9 – 4,7·10 ¹² /l | 4,3(4,0; 4,7) | 3,9(3,7;4,2) |
| Hemoglobin | male 130–160 g/l, female 120–140 g/l | 139(125; 150) | 124,5(118,0;133,0) |
| Thrombocytes | 180–320·10 ⁹ /l | 234 (201; 296) | 230,0 (196,0; 288,0) |
| Leukocytes | 4,0–9,0·10 ⁹ /l | 5,8 (4,8; 6,8) | 5,4 (4,6; 7,1) |
| Stab neutrophils | 1–6% | 4,5 (3,0; 7,0) | 3,0 (2,0; 5,0) |
| Segmented neutrophils | 47–72% | 57,5 (52,0; 62,0) | 56,0 (45,0; 64,0) |
| Eosinophils | 0,5–5% | 3,0 (1,0; 5,0) | 3,0 (2,0; 6,0) |
| Lymphocytes | 19–37% | 30,0 (28,0; 37,0) | 29,5 (18,0; 34,0) |
| Monocytes | 3–11% | 2,0 (2,0; 4,0) | 5,5 (3,0; 6,0) |
| ESR | male 2–10 mm/hr, female 2–15 mm/hr | 13,0 (9,0; 21,0) | 19,0 (14; 22,0) |
| Fibrinogen | 2–4 g/l | 3,1 (2,6; 3,6) | 3,25 (2,9; 4,0) |
| Leucosytic index of intoxication | 0,3–1,5 | 0,97 (0,35; 1,5) | 0,39 (0,3; 0,54) |

Note. * – $p < 0,05$, Mann-Whitney U-test for two independent groups; control group $n = 18$; experimental group $n = 14$.

In the group of patients with complicated flow of post-surgical period early complications such as infection of haematoma have been registered among 3 patients on days 4–7. Early deep paraprothestic infectious complications emerged among 11 patients after 14 days of research. Average period of hospitalization for patients with complicated flow of post-surgical period equaled (23 (17; 40) days) and exceeded the corresponding index of the control group (17 (15; 21) days), $p < 0,05$.

Results of studying dynamics of blood temperature in armpit of patients during pre-surgical and post-surgical period are presented in Table 2.

It has been established that patients of the studied groups did not differ according to body temperature. During day 1 of post-surgical period an increase in body temperature took place in control group of patients, and it decreased by the seventh day of the observation and normalized completely by day 14. Among group of patients, whose post-

surgical period was complicated by infectious paraprosthetic aftereffects, increase in body temperature also took place on day 1 after the surgery, and it did not exceed the corresponding value of the control group, but by day 7–14 body temperature of these patients exceeded that of the control group. An increased body temperature preserved up to 21 day of the observation in a number of cases. The

received data of body temperature dynamics as a marker of non-specific system inflammation during post-surgical period correspond to opinions of authors [1, 13] that prove the presence of hyperthermia ($> 38,5^{\circ}\text{C}$) is observed among 15 % of patients during early post-surgical period (day 1–3) of total replacement of coxae and is not linked with emergence of local or system infectious complications.

Table 2

Values of body temperature in armpit, $^{\circ}\text{C}$, Me (25; 75)

| Observation period, days | Control group | Experimental group |
|--------------------------|---------------------|------------------------|
| Before surgery | 36,6 (36,6; 36,7) | 36,6 (36,5; 36,6) |
| 1 | 37,4 (37,4; 37,8)** | 37,8 (37,5; 38,0)*, ** |
| 7 | 36,7 (36,6; 37,3)** | 37,2 (37,1; 37,9)*, ** |
| 14 | 36,6 (36,6; 36,7) | 37,4 (37,1; 38,0)*, ** |
| 21 | – | 37,4 (36,7; 37,9)*, ** |

Note. * – $p < 0,05$, Mann-Whitney U-test for two independent groups; ** – $p < 0,05$, non-parametrical variant of Newman-Keuls Range test; control group $n = 18$; experimental group $n = 14$.

During evaluation of *env ER λ 4-1* expression of the group of conditionally-healthy donors, frequency of this parameter equaled 1/32 (3,1%). The receive data corresponds to results [19] that also testify for revelation of gene *gag ER λ 4-1* in

MNC of donors in certain cases. It is possible that this phenomenon is linked to presence of persistent forms of infections among them. The following data has been received during revelation of *env ER λ 4-1* expression among patients (Table 3):

Table 3

Expression of *env ER λ 4-1* MNC of patients with coxae arhrosis (n , %)

| Observation period, days | Control group | Experimental group |
|--------------------------|---------------|--------------------|
| До операции | 1 (6%) | 0 (0%) |
| 1 | 7 (41%)*, ** | 14 (100%)*, ** |
| 7 | 2 (12%)*, ** | 3 (21%)** |
| 14 | 0 (0%) | 7 (50%)*, ** |
| 21 | – | 5 (45%)*, ** |

Note. * – n (%), comparison of groups – Fisher exact test, two-tailed; ** – dynamics – Cochran Q Test; control group $n = 18$; experimental group $n = 14$.

In has been revealed that expression of *env ER λ 4-1* equals 1/32 (3,1%) before the surgery, and it corresponds to frequency of this value among donors ($p > 0,05$); an increase in frequency of *env ER λ 4-1* expression takes place in control and experimental group of patients during day 1 of post-surgical period. This parameter decreased with a high degree of reliability by the seventh day of research in control group. For the group of patients with high complicated flow of post-surgical period expression of *env ER λ 4-1* exceeds the similar parameter of patients of the control group; by day 7 expression frequency decreases, but then it raises

again by day 14 and preserves up to the 21st day of observation. While estimating dependence between *env ER λ 4-1* and body temperature, we have established a direct correlation between these parameters on day 1 ($R = 0,52$; $p \leq 0,002$), 7 ($R = 0,56$; $p < 0,001$), and 14 ($R = 0,73$; $p < 0,001$ of observation).

During evaluation of dependence of *env ER λ 4-1* expression and emergence of infectious post-surgical complications via correlative analysis using coefficient of ranging correlation of Spearman, relation between these two parameters has been established on the 14th day of observation ($R_s = 0,58$; $p = 0,001$).

Thus, *env ER λ 4-1* expresses among all patients with coxae arthritis who have been exposed to surgery of coxae endoprosthetics on day 1 of post-surgical period; this parameter returns to normal by the 14th day of observation among patients with non-complicated flow of post-surgical period; body temperature and frequency of *env ER λ 4-1* expression of patients with complicated flow of post-surgical period exceed these indicators of patients with non-complicated flow of post-surgical period; expression of *env ER λ 4-1* preserves after day 14 of observation and correlates with frequency of development of post-surgical infectious complications.

It is known that surgical intrusion is followed by system inflammatory reaction with increase in production of pro-inflammatory cytokines – IL-1 α , IL-1 β , IL-12, IL-2, γ -IFN [3], and this process is described by an increase in body temperature. We suppose that this reaction, one of components of which is hyperproduction of cytokines, activates expression of *env ER λ 4-1* that, in its turn, is followed by production of virus proteins that possess immune-modelling features and thus provide for formation of post-surgical infectious complications. The received results correspond to the data [16] that revealed stimulation of ER expression in lymphocytes in case of extreme burn among mice. The revealed activation of *ER λ 4-1* during post-surgical period requires further investigation of its possible mechanisms.

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BIOTECHNOLOGICAL INNOVATION OF UKRAINIAN SCIENTISTS – RECOMBINANT PROBIOTIC SUBALIN

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In the pharmaceutical market of Ukraine presented the resulting genetically engineered newest recombinant probiotic Subalin for the dysbiotic violations correction and normal flora of the intestine restore with subsequent normalization of digestion, intestinal motility and detoxification in the complex treatment of patients with the syndrome of intestinal infections endotoxemia, acute and chronic viral hepatitis A and hepatitis B and patients carrying HBsAg, patients with bacterial and viral and bacterial meningencephalitis, for the adult and pediatric patients with contraindications to the antibiotics therapy.

This biological product is created by Ukrainian scientists (V.V. Smirnov, S.R. Reznik, I.B. Sorokulova et al., Institute of Microbiology and Virology of Ukrainian Academy of Sciences, Research and Design Technological Institute of Biologically Active Substances, Research and Production Association «Vector») on the basis of the strain *Bifidobacterium subtilis* VKPM B-4759, containing the recombinant plasmid with the gene of human $\alpha 2$ -interferon.

Subalin shows polytropic antibacterial, anti-diarrheal, immunomodulatory, antiviral, antitumor therapeutic and preventive action in the combined therapy of the adults and children, characterized by a high antagonistic activity against a broad spectrum of pathogenic and opportunistic microorganisms (*Salmonella*, *Staphylococcus*, *Pseudomonas aeruginosa*, *Proteus*, *Klebsiella*, *Candida*), antiviral activity (due to synthesis of $\alpha 2$ - and U-interferon and the ability of when administered orally to induce the synthesis of g-interferon).

This microbial strain was deposited in the Collection of Industrial Microorganisms, adapted to the long-term persistence in the human intestine and adapted to the human population living in Ukraine. Russian Patent RU2035185. Subalin has no analogues in the world of medical practice. Subalin® (Ukraine, Kiev, Biopharma Company) is available as a dry powder in vials number 10 for the preparation of oral suspension (1 dose contains $1 \cdot 10^9$ live microbial cells *Bacillus subtilis* UKMV-5020) at an average retail price of around 88–95 UAH (8-9 EUR) per pack.

Polytropic probiotic action, low toxicity, clinically proven efficacy and pharmaco-economic availability make Subalin as popular and promising modern probiotics drug. These properties of the Subalin increase the clinicians empowers individualized approach to the treatment of dysbiosis in adult and pediatric practice with the most rational use of recombinant preparations of microbial origin.

The work is submitted to the International Scientific Conference «Homeostasis and infectious process», Israel (tel Aviv), February, 20–27, 2014, came to the editorial office on 03.02.2014.

ACTION OF FAMILY ON EMERGENCE OF PSYCHOSOMATIC VIOLATIONS OF CHILDREN

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The medicine science proved for a long time that diseases in a human body is not accident or not infections, not intoxication, and not an infectious disease. That is became known that under each illness there are mental, psychovulnerable factors. Unsatisfied need of the person, in the period of big difficulties and experience as it proved that mentality and a body is closely connected among themselves, also became the proof that harms to weak bodies of an organism. That is the mentality and a body of the person do not live separately therefore many the case which irritated, gave a look an organism, created certain diseases. This case happens not only an adults, these diseases meet and on small children.

In many families not found enough time for children and kindness is not shown. Even there are parents who consider that food and clothes are enough for education. There are parents who consider correct to grow children without paying attention to their inner world why it sad, roughly talking, forbidding and take in a high security. That is different a case in a family, continuous quarrel of parents not to turn enough time to them, not to notice their desire, not to do or establish too confidential service, to cause that children could not make, set freely the unattainable purposes, won't praise for awards, not to notice, punish for inutile mistakes, that is because of psychological compulsions of children, children always feel a dissatisfaction, uncertainty, chagrin, even fear. Infinite proceeding the concern of the fear, unsatisfied requiring, harms to an organism of children and creates different diseases.

In education in a family there are pleasant and unpleasant obstacles for character styles for development of children. This is general good breeding relation, negative and emotional relations of family members, obstacles or not emotional proximity etc.

In general, it is possible to distribute three types of education in family: destructive, constructive and type which contains both types-mixed type. Destructive part of family. The family relations differ that there is no politeness and patience. In a family often quarrels. In such family parents generally show to children negative emotions, and the type of parents in education differs that there is no decency.

Constructive type of education in family. In general, this type is full opposite previous. Parents try to keep the pleasant, sure atmosphere. And quarrels are usually turned into a joke. Adults in a family, they hold the strong feelings, especially, teach children that they are good, that they love them and that they necessary for them. And still, in empirical

studying of J. Baldwin, education of parents divide into two types: democratic and observing.

Democratic style is defined by the following parameters: high relations between parents and children, participation of children in solutions of family problems, the parental help in due time to look with trust at actions of the child, limited subjective thoughts in studying of the child.

Observing style is a lot of restrictions on behavior of the child. Each action, aspiration, desire of the child is under strict supervision and is estimated by seniors, about the reasons of restrictions for child won't tell nothing clearly.

The mixed style of education is peculiar to children emotional sensitivity and trust. In their thoughts the universality and reflections are not noticed.

Let's look at communication between parental education and features of the child.

Too controllable (hyper patronage). The child is under supervision of parents and other people. They pay attention to maximum on satisfaction of need of the child. This type of education can be described as excessive care of parents. Such parents are not allowed to disturb nobody on the relations between children.

Prevailed hyper patronage. The child has no rights to choice. The child is passive, dependent, with difficulty gets used to environment. After these in children will appear psychogenic diseases.

Poorly controllable (giperprotection). Actions of the child are not supervised. And on the hand parents try to limit children from adults, teachers, from organizations of education of children. In that case in family the physical needs of the child are not satisfied in the necessary level. Child has no toys, books, his own study. Spiritual needs are not noticed in any way. Nobody helps to do homework. Parents do not interested their child, with whom he spends time, what is he doing. Most of all such relations will result in negative character.

Prevailed hypopatronage. Interest to education is poorly noticeable, but parents do not demand any rules of good breeding. Children feel it. Such type is described like in the purpose not to show a shortcoming of parents, the child renders the help to people around. In such artificial removal of time the child does not feel heat of soul. From it at the child there will be psychological wounds.

High moral responsibility. Approach low attention to needs of the child and high insistence. Here, because of certain reasons the child demands

from his own children that things which his parents did not reach. In many cases the care of others is provided to the child to look after and feed, that is to help younger and needing the help. The child for some time already will understand big responsibility in himself. And still, the child psychologically cannot take out such responsibility, despite age. To look for the younger brother, to help the grandmother, every day to return with five at school, because of these requirements at the child can be psychogenic violations, and can ache with phobia diseases.

Emotional discharges. Brought up in such look children won't brag for its good actions. Parents often punish them, beat the child. Won't satisfy them with the necessary things. First of all there is an emotional discharge.

Opposite education. Belong to the child differently for example having told «it badly to steal, only bad children do like this», so sometimes parents, it is not known from where taken a beautiful toy or money without having asked «where took?», tell to the child who asks back «it bought ourselves, this is our toy». That is personal mental difficulties of family members bring to that there are different types of education of the child. In this case for the child will appear unpleasant psychological case, as an opposite direction and conditions which complicate to get used, to establish neurotic qualities.

Violations of internal family relation, especially, between children and mother, lead to psychological diseases in the future.

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STRUCTURAL-FUNCTIONAL ORGANIZATION OF A LEAF OF KINDS OF KIWI IN THE CONDITIONS OF HUMID SUBTROPICS OF RUSSIA

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The content of green pigments in leaves of studied grades of a kiwi is defined. The greatest contents of a chlorophyll *a* and *b* in leaves of grades of Tomuri and Bruno are revealed. On the basis of it the grades which were potentially more adapted for conditions of the minimum lighting are established. The bigger accumulations of dry matters are happens in leaves of a grade of Tomuri. Dependence between the area of a sheet plate and specific density of sheet (UPPL) that is a diagnostic indicator at the ecological characteristic of a grade is revealed. The variation of biometric characteristics is connected with climatic factors of year. On the biological potential all studied grades of a kiwi are divided into three clusters.

Keywords: kiwi, chlorophyll, the leaf area, the specific density of the leaf, adaptation

As it is known [1, 5], studying of sheet parameters of culture allows to reveal mechanisms of adaptation of plants to action of abiotic factors of the environment, to use these indicators for identification of the anatomy-morphological indicators characterizing biological features of a grade, and, on the basis of it, to allocate the most perspective on efficiency and plasticity of a grade.

Materials and methods of research

The following grades of a kiwi participated in studying: the female grades – Bruno, Kivaldi, Monty, Hayward K-8, Hayward K-12, Hayward K-10, Hayward K-16, and man's grades of Matua and Tomuri; as control – the grade Hayward.

Laboratory researches are conducting on the basis of research and production department of subtropical and southern fruit crops and laboratory of biotechnology, physiology and biochemistry of plants at the All-Russian Scientific and Research Institute of Floriculture and Subtropical Crops.

For the purpose of identification of the perspective and adapted grades of a kiwi were defined: the area of a sheet plate (planimetric), the specific area density of a leaf (UPPL) [6], the content of a chlorophyll *a* and *b* at extract of green leaves [8].

Results of research and their discussion

One of the most important indicators of adaptive potential of plants in limiting conditions is the overall performance of the photosynthesis, including, and features of the pigments system. Only having studied pigment system of a kiwi it is possible to reveal completely biological and adaptive possibilities of culture. The chlorophyll *a* is a main photosynthesis pigment at the plant. The content of chlorophyll *b* testifies to level of fitness of plants to low illumination as it enters into a structural complex chloroplast, responsible for collecting quanta of light. In spite of the fact that the quantity of chlorophyll directly doesn't correlate with intensity of photosynthesis, their contents and a ratio are closely connected with a functional condition of plants [3, 4].

By us it is defined that the bigger content of a chlorophyll is revealed in leaves of man's grades, among female grades on limit of importance there is Bruno's grade; is noted excess respectively by 1,00–1,33 times at Hayward's (Table. 1).

Table 1
The content of green pigments and parameters of a leaf of studied grades of a kiwi

| The grades | Chlorophyll «a», mg/g | Chlorophyll «b», mg/g | a/b | Area of a leaf plate, cm ² | UPPL mg/cm ² |
|--|-----------------------|-----------------------|------|---------------------------------------|-------------------------|
| Matua | 1,35 ± 0,14 | 0,70 ± 0,05 | 1,93 | 430,3 | 3,93 |
| Tomuri | 1,44 ± 0,15 | 0,87 ± 0,10 | 1,67 | 215,4 | 17,27 |
| Hayward | 1,19 ± 0,17 | 0,73 ± 0,21 | 1,64 | 314,5 | 4,52 |
| Hayward K-8 | 1,00 ± 0,11 | 0,58 ± 0,05 | 1,71 | 260,7 | 8,71 |
| Hayward K-12 | 1,14 ± 0,13 | 0,55 ± 0,09 | 2,05 | 306,1 | 4,81 |
| Bruno | 1,33 ± 0,20 | 0,77 ± 0,19 | 1,73 | 249,0 | 7,26 |
| Kivaldi | 1,18 ± 0,14 | 0,69 ± 0,17 | 1,70 | 330,1 | 6,51 |
| Monty | 1,24 ± 0,09 | 0,72 ± 0,14 | 1,74 | 200,9 | 10,38 |
| Hayward K-10 | 1,24 ± 0,18 | 0,70 ± 0,12 | 1,78 | 264,4 | 3,27 |
| Hayward K-16 | 1,22 ± 0,23 | 0,68 ± 0,16 | 1,80 | 364,8 | 6,24 |
| importance of distinctions ₀₅ | 0,15 | 0,13 | – | 57,5 | – |

The smallest quantity of green pigments is noted in leaves of grades Hayward K-8, grades Hayward and K-12 similar on content of chlorophyll of *b*. However grade Hayward K-12 surpasses other grades at the ratio of a chlorophyll *a* and *b*, including control Hayward. It is known that important is not only the content of pigment, but also their ratio, because on the ratio a/b it is possible to do the conclusion about prevalence in a plant of I or the II photosystems. At the same time, this indicator characterizes the structural organization chloroplasts and the adaptation of a plant to changes of environment [7].

In this regard, grades with lower ratio of a chlorophyll and in, in our case is Hayward and man's grade Tomuri are potentially more adapted for conditions of the minimum lighting.

The area of a sheet surface is not less important diagnostic sign connected with photo-

synthetic activity of plants (Table. 1). By us it is revealed that the grade of Matua has the greatest area of a leaf and while significantly smaller area of a leaf surface – at grades Monty, Bruno and Tomuri (Table. 1). Besides the leaf area, a diagnostic indicator at the description of biological features of a grade is variability of a leaf depending on climatic conditions of vegetation that characterizes morphological variability. As a rule, plants with wide ecological plasticity (i.e. with high variability of the area of a leaf) have opportunity better to adapting in changing conditions and are more perspective at cultivation in limiting climatic conditions. Comparing the data within one year with average data, it is possible to conclude that the variation of biometric characteristics is connected with climatic factors of year. And, the bigger variation is noted at grade of Matua (Fig. 1).

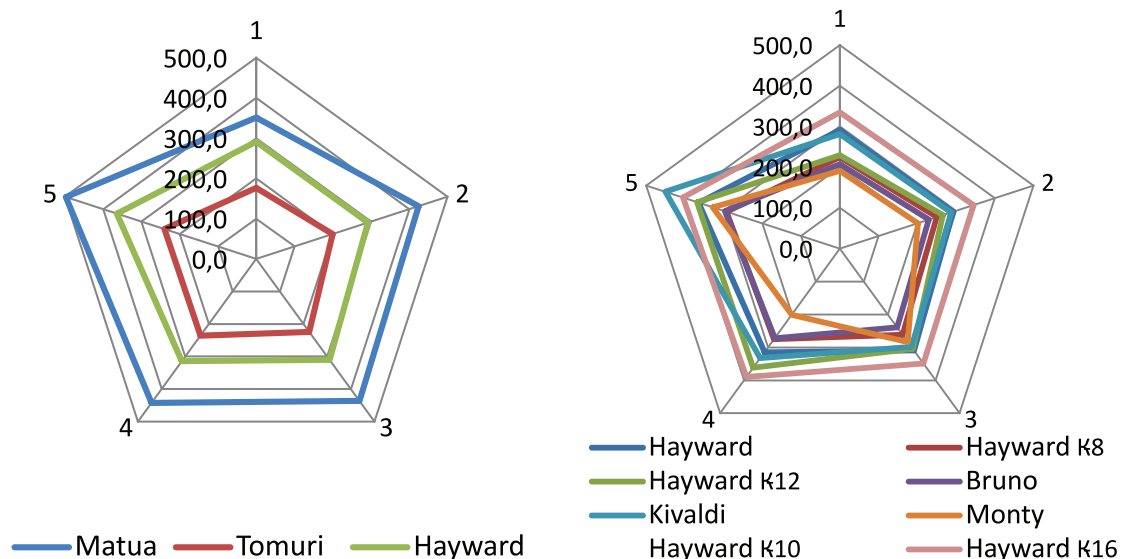


Fig. 1. Coefficient of variability of the leaf area of studied grades of a kiwi

The variation of a leaf at female grades differs not significantly, but on the general background are allocated Kivaldi and Hayward of K-16 (Fig. 1).

The individual variability expressed by coefficient of a variation, showed that variability of leaf grades fluctuates within 5,2–7,0% that below, than at listed above.

Intensity of the main process of assimilation-photosynthesis – depends on the area of a sheet plate which directly influences efficiency of cultures (Briggs, 1999; Ahmad, 1999; Lin, 2000). Indirect indicator of efficiency is UPPL. It is known that specific area density of a leaf connects growth and photosynthesis processes because reflects solid accumulation by sur-

face unit. If the UPPL is higher, the processes of photosynthesis which are counting on unit of a surface of a leaf are synthesizing the big biomass more effectively (Kuzmin, Kuzmin, 2001). The studied grades of a kiwi significantly differed on this indicator (Fig. 2).

So, grade Tomuri have the highest UPPL (17,27 mg/cm²), K-8 (8,71 mg/cm²) Monty (10,38 mg/cm²) and Bruno (7,26 mg/cm²) are exceeding a control grade on this indicator in 2,3, 1,9 and 1,6 times. The established fact testifies that grades are characterized by high photosynthetic potential. There are opinions that between the area of a leaf and UPPL have an inverse relationship [7]. Our researches confirm it, as it is visible from Fig. 2 data, and, the

coefficient of correlation is higher than an average ($r = -0,79$).

It was noted above that the specific area density of a leaf characterizes accumula-

tion of dry matter and in this connection; we carried out the analysis of data on amount of dry matter in leaves of studied grades of a kiwi (Fig. 3).

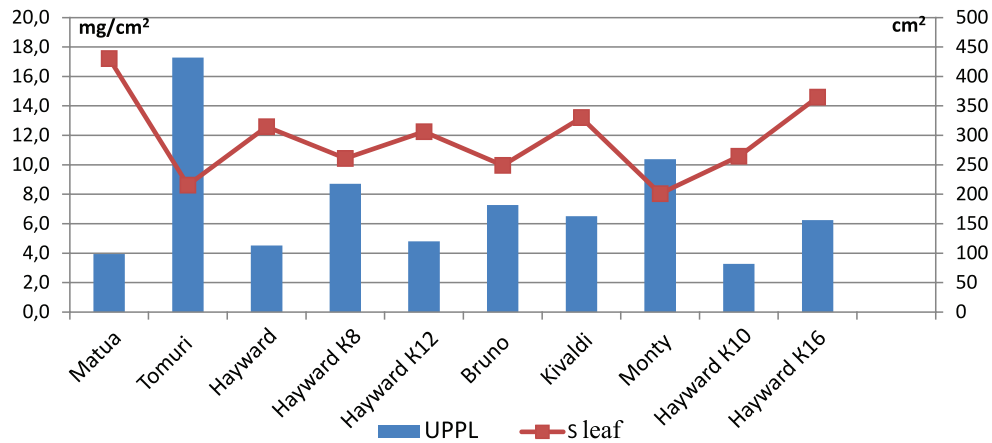


Fig. 2. Interrelation of the area of a leaf surface and specific area density of a leaf of studied grades of a kiwi

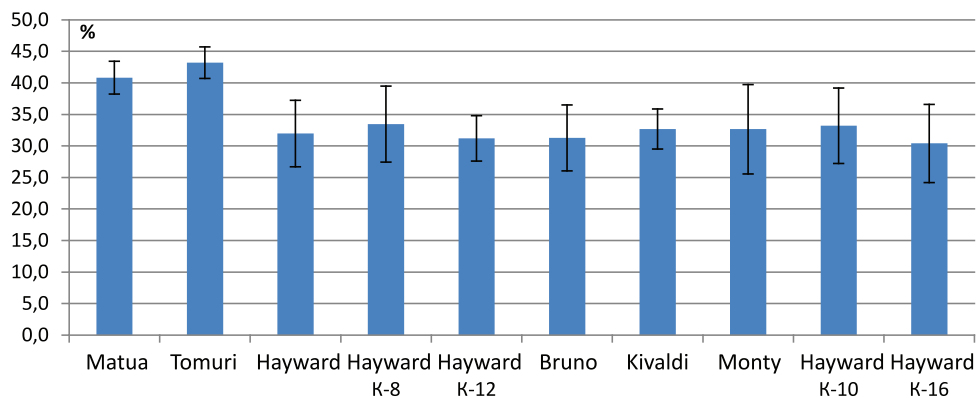


Fig. 3. The content of dry matter in leaves of studied grades of a kiwi

Was revealed that bigger accumulation of dry matter happens in man's grades and that is quite expected as there is no expenditure of assimilation substances on the processes connected with formation of fruits. Female grades differ on this indicator slightly, at the same time, can note a little bigger excess of control at grades Hayward

K-8 and Monty. We carried out the correlation analysis which has shown existence of direct dependence of accumulation of dry matter not only with an area of a leaf, but also with UPPL (Table. 2). Besides, we revealed direct correlation between morphological parameters of a leaf and the contents in them green pigments.

Table 2

Coefficients of correlation (r) between studied indicators

| Parameters | Dry matter, g | Sum of chlorophylls, mg/g |
|---------------------------------|---------------|---------------------------|
| Area of a leaf, cm ² | 0,66 | 0,63 |
| UPPL, mg/cm ² | 0,75 | – |
| Sum of chlorophylls, mg/g | 0,46 | – |

The cluster analysis which carried out of the results of three years of researches, gave the chance to distribute grades on the groups. The groups are different such physiology-morphological parameters, as the area of a leaf, UPPL, quantity of green pigments and accumulation of dry matter (Fig. 4). As a result, it is possible to see that all grades were divided into three clusters: separately are standing Matua and Tomuri, which are different the studied indicators and this is justified as it is man's grades. But the grade Matua on biological potential is closer to other grades, because it is a uniform subcluster.

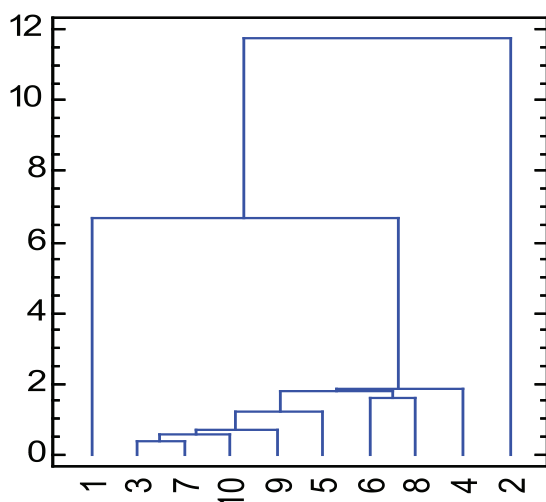


Fig. 4. Dendrogramm of the physiology-morphological parameters of leaves of a kiwi[^] where 1 – Matua; 2 – Tomuri; 3 – Hayward; 4 – Hayward K-8; 5 – Hayward K-12; 6 – Bruno; 7 – Kivaldi; 8 – Monty; 9 – Hayward K-10; 10 – Hayward K-16

There are in closer group such grades, as Hayward, Kivaldi, Hayward K-16, Hayward K-10 and Hayward K-12; and a separate sub-cluster are including the grades Hayward K-8, Bruno and Monty.

Conclusion

As a result of the conducted researches by us is established that the greatest contents of a chlorophyll *a* and *b* in leaves of grade of Tomuri and Bruno's grade. Grades with lower ratio of a chlorophyll *a* and *b* (Hayward and Tomuri) are more adapted for conditions of the minimum lighting. The biggest area of a leaf is noted on the grade of Matua and Hayward K-16, and grade of Matua have a big variation of a leaf in reply to change of climatic conditions. The variation of leaves at the grades are

differs not significantly, but grades Kivaldi and Hayward are differ from other grades. The plants which possess a big variation of metric indicators, are characterized by wide ecological plasticity, these grades have opportunity better to adapt in changing conditions.

The grades of Tomuri, Monty, Hayward K-8, Bruno have a highest UPPL; that grades are possesses the high photosynthetic potential. Man's grades have a bigger accumulation of dry matter (they not are spending the plastic substances on development of fruits) and grades Hayward of K-8 and Monty have a bigger accumulation of dry matter too. All studied grades were divided into three clusters, are relatives of the biological potential by results of the obtained data and the cluster analysis.

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*Materials of Conferences***PATHOMORPHOLOGICAL CHANGES
UNDER CONTUSION TRAUMA
OF SPINAL CORD IN RAT**

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A heavy contusion injury of pith has been reproduced under narcosis among mature rats of both sexes that belonged to Dowley-Spreg line according to the description (Ryabov and co-authors, 2014). Laminectomy of a spine curve within one pith sector of level Th₈-L₁. A flyweight has been thrown down to a solid brain capping of pith. Mobility of rear limbs has been lost completely among rats after a heavy contusion injury of pith. The animals could not maintain their bodyweight and crawled on front limbs. Claws grew intensively on rear limbs of rats in comparison to their front paws. The animals experienced troubles when they tried to bite them off after pith injuries of the mentioned localization. In order to remove complications of excretory system (haematuria) and prevent development of inflammatory complications, we used gentamicin (4 mg per 1 kg of an animal's weight intramuscularly). Rats that survived became chronics and mobility of their rear limbs has not been reproduced even after 4 months of the experiment. Material of the survived animals has been fixed in solution of paraformaldehyde on 0,1 M phosphate buffer and then fixed up in 1% osmic acid. Material processing and its placing into epoxide resin araldit have been carried out according to the guidance (Pavlo-

vich and co-authors, 2011). The damaged sectors of pith have been placed in sprue capsule along and across its longed axis. Half-thin 1 mm wide cuts have been colored with toluidine blue. Condition of cinerea and white substance of pith has been evaluated on cuts. Insults have been discovered in pith straight after the surgery. Destructive damage of motoneurons of front pith horns have been observed on day 2 after contusion. In longer term after the injury hollow spaces were formed in the area of pith damage. It could be located in left or right half of pith or in the center of it, or it could form as two hollow spaces, this phenomenon can be observed on across cuts of pith. At the same time cinerea and white matter of pith were exposed to significant destructions. This hollow space kept on increasing in its length and by 3–4 months after the injury it spread in both directions from the pith damage area by several millimeters, and it was expressed in cephalic direction more than in caudal. Ependymal cells of pith reproduced pith channel in its initial place among a number of rats. Sometimes multi-gap formations emerged (possibly multiple channels). Rarely ependymal cells did not form channels with gaps, but lined across pith hollow space from its dorsal wall to ventral. Insignificant changes in myelinated nervous fiber were have been revealed in front (motor) roots of pith. Also, no significant alterations have been discovered in sciatic nerve and muscles that were innerved in lower limbs of an animal.

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ARTISTIC CREATIVITY AND VISUAL THINKING

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Visual thinking is a type of non-verbal thinking. Visual thinking also helps us to ontologize the results of abstract verbal thinking so that an abstract essence becomes intellectually visible. Using it to examine and analyze various works can yield new insights and a more complete understanding in fields ranging from scientific to artistic. A painting will be taken as an example for this purpose, though results of this research may be extrapolated on other kinds of arts. Andrei Pozdeev is one of the greatest Russian artists of the 20th century. The master's creative heritage is amazingly cohesive. Nevertheless, it can be easily divided into several independent groups which are not dependent on factors of chronology or genre, but on attributively crucial characteristics.

Keywords: visual thinking, image, visual identity, artistic perceptions, painting, art, artist

Visual thinking is a human activity, which results with new images, new visual forms. These forms make visible the meanings of abstract concepts. While mediating verbal thinking and practice, images of visual thinking are comparatively free in correspondence to objects of perception. They have an ability to reflect in themselves practically any categorial relations of reality – spatial, temporal, attributive, causal, teleological, existential and so on. But they reflect these relations not by means of word's expression, but through expression of them in spatial-temporal structures, in transformations and dynamics of sensual images.

A general theory of visual thinking is to be extrapolated on arts. A. Baumgarten, the father of Aesthetics, classically defined this branch of philosophy as a theory of sensual cognition. This definition is right in general if to understand *cognition* in its categorial meaning. Some philosophers described aesthetical cognition as the lowest level of human cognition, but some of them, on the contrary (Shelling, for example), have seen in Aesthetics the top of human knowledge. *Cognition* is cognition, it is a process of penetrating into roots, essences, nature of things. If to explain an aesthetical attitude towards a world not only as plain sensations and presentations (as sense-data), but as visual thinking, then an aesthetical image may be briefly denoted as *Visible Essence*.

Simply speaking, a world around us may be divided on two parts. One part is directly visible, it is a surface of phenomenons. We can see it, touch it, smell it, etc. But the second part is invisible.

Philosophers used to call it «essence» of the objects of our perception. If the «essence» is not known, it seems dangerous and hostile to man. So it is necessary to understand the «essence» to express it in terms of sensual images. We believe that the aesthetic attitude is nothing but an expression of rationally knowable entity in structures transformed perceptions and representations, that is, in the forms of visual imagery thinking.

Aesthetical attitude is a human ability to express essences ideally, i.e. via ontologized and sensual representatives of these essences. That is why, while aesthetically expressing some deep essences, men subjectively make them known and not so dangerous; such a kind of visual thinking is accompanied with a feeling of pleasure, admiration, relief, reliability and so on positive emotions. Aesthetic attitude is a person's ability to express the essence of the ideal, that is, sensuous ontologized and representatives of these entities. That is why, while aesthetically express some deep essence, men subjectively make them known and not very dangerous, this kind of visual thinking is accompanied by feelings of pleasure, excitement, relief, reliability and so on positive emotions.

There are two sides of a work of pictorial art, mutually tied. The first side we call naturalistic tendency, the second – symbolistic tendency. Proportions of these tendencies are very different in various art works. According to his philosophical and artistic program a painter may prefer one tendency more than another, consequently one painter may be called, in general, naturalist, another – symbolist. Still two aspects of a picture, naturalistic and symbolistic, are its attributes. In order to communicate with a painter, a spectator must recognize, more or less, natural-geometric forms and shapes of a painted artistic object. So the first plan of an art work (its surface) is a naturalistic (imitationistic) key, by means of which one can enter into an author's intention, conception. Some historical and conditional details are helpful for this purpose, especially when a spectator has a good artistic experience and taste. But a real work of art has some other levels, situated within its inner plans. The more profound an artist is, the more number of these levels one can find in his picture. These levels express symbolically author's artistic conception of a human relationship towards the world, towards different aspects of reality. Author's and spectator's visual thinking starts on these levels.

Now we want to illustrate and to prove just a little this sketched conception of visual thinking in arts.

Now let us offer you explanations of several great art masterpieces from the point of view of two correlated tendencies, naturalistic and symbolistic. «Diskoflingerl» of ancient Greek sculpturer Miron is well known. But a few people can see in this sculpture not simply a sportsman, but a visible essence of Apollo – the god of peace and war. Miron expressed geometrically in his work the harmonical theory of Heraclitus, the philosophy of symmetry of peace and war forces, which are in a mutual struggle eternally. Natural lines of a human figure are subordinated to the main idea of antique dialectics. Lines of hands, shoulders and so on are the mental key to recognize a bow and an arrow in a battle position. Just the same lines with additional of a head and some other body lines are embodied an ancient Greek lyre, a musical instrument of a silver-bow god Appolo.

Contemporaries of Heraclitus and Miron did understand this visual rational image because they were accustomed to a mythological kind of thinking and highly experienced in arts. But modern people mostly see in this sculpture only a physical body, and art critics notice in it many mistakes from the point of view of anatomy of a human body. Miron's «Diskoflingerl» is an eternal masterpiece, which visually expressed a great idea in a very laconical and perfect geometrical form.

During many decades of his fruitful life, the great Russian artist of the 20th century, Andrei Gennadyevich Pozdeev (1926–1998) created many remarkable compositions, including hundreds of illustrations, engravings, watercolours and pictorial paintings. The master's creative heritage is amazingly cohesive. Nevertheless, it is quite freely differentiated into several independent spheres, volumes or groups, within the boundaries of which, the compositions community is not dependant on chronology or factors of genre, but on attributively crucial characteristics.

Another, rather integral group of his paintings presents pictorial generalizations, in effect, the summing up of the previous efforts, landmarks the development of the artist's subjective language illustrating his progress. The landmark pictures summarizing what has been achieved carry in a nutshell with the artist is subsequently infolding in large and small series and cycles pictures.

The painting *The Chalice* (1989) belongs to the artist's etalon masterpieces, which show Andrei Pozdeev to be a painter who creates not from himself, but through himself, as an intermediary between the divine forces and people.

He can be seen as a prophet, sensually showing what heaven-born is.

Trying to define the peculiarity of such favourites, Immanuel Kant called those people who possess charisma, «God's speaking-trumpets».

The painting *The Chalice* is the most original mandala because it visualizes the way an ecumenical spiritual wisdom condenses into a gracious elixir, appealing to helping a human soul restore the religious relation of the finite with the infinite, which was destroyed during the Fall of Adam and Eve. The composition demonstrates ecumenical ways which reintegrate the Macrocosm into the condition that existed before the division of the one whole human creature into the male and female hypostases. This division resulted in the excision of a finite man from the infinite Absolute, of human souls from the ecumenical Spirit.

As a mandala, *The Chalice* is created according to the row emanation principle of flat horizontal layers that simultaneously converge from the periphery towards the centre. That is why the painting is not so freely pictorial but simply graphically linear. The image of *The Chalice* is structured from a row of geometrically equal circles, crosses, squares and triangles, shown both in their separate symbolic meaning, and in symbolic correlation with each other. In such a case, numeric monad symbolism, symbolism of duads, triads, tetrads, pentads, hexads, heptads, octads and enneads play a fundamental role in the painting.

In the painting *The Chalice* the structure of ten circles shows the correspondence between the nine planets of the Solar system and the Sun (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranium, Neptune, Pluto) and the ten divine emanations of the good qualities of the Universe (Glory, Wisdom, Discernment, Compassion, Severity, Radiance, Infinity, Acknowledgment, Foundation, Kingdom) into the ten parts of Adam Qadmon's body. Such correspondence first of all confirms the resemblance between the planetary structure of the Universal macrocosmic and the macrocosmic of primeval man. Secondly, it demonstrates the geometrical elements of Adam Qadmon as the initial structure of human perfection, which was lost at the Fall. But, through the communion of the divinely spiritual and the united male and female, human spiritual energy can be regenerated.

In *The Chalice* there are astrology and Masonry, alchemical and tantric signs, symbols and emblems, but this does not mean that magical content of Cabbala or Theosophy, Christianity or Gentoo is split into separate pieces. The essence of *The Chalice* tenderly leads the viewer to the Macrocosmic. This artistic bridge

contributes to the revival of the true integration of Man and the Macrocosmic, but not one that is confessionally isolated or religious in its essence. This integration is that which existed at the beginning of the Creation, when Man was not male or female. In the Epistle of Paul the Apostle to the Galatians, it is said, «There is neither Jew nor Greek; there is neither bond nor free; there is neither male nor female; for ye are all one in Christ Jesus» (3: 28).

The Lord's Supper, which Andrei Pozdeev painted in 1990, is structured from several expressive layers, which gradually reveal their essence in a step-by-step process.

Pozdeev's method of depiction appears to be the only correct method. The painting's content is presented neither too abstractly, nor too realistically. Such an artistic interpretation of the religious event avoids exterior demonstrativeness and adheres to that mixing of form and content, which allows the spectator to pass on quite easily from the observed to the less obvious. The viewer can ascend freely from indexical and iconic sign-oriented notions to symbols. He is able to speculatively contemplate several levels of the essence. The colourful and substantial elements of the painting have different meanings. Such polysemanticity should be considered a regular phenomenon, as far as symbolic mutation represents an attributive feature of the artistic language of the master. Signs, meanings and symbols are born not outside the process of viewer's communication with the artist's creation, but they are fundamental to their interrelation.

Initially the painting discloses the essence of *The Lord's Supper*. It vividly presents one of the main events in the last days of Jesus Christ in his earthly guise. Therefore, the composition shows the most important moment of the secret meeting of the Teacher with his twelve closest followers. The Messiah institutes the sacramental mystery, or oblation, as a gracious means of uniting the faithful with Christ – the oblation of His Body and Blood as the true Holy Lamb, taking upon himself the sins of the world.

The sacral act is presented in a square chamber, cut off from the rest of the world by the hoop of the sacral circular line. The Son of the God is depicted sitting in the centre, his head wreathed by a sky-blue aureole. Near the Saviour, observing the mirror symmetry are six future apostles – three on the each side of Messiah. On the other side of the table are six more followers of Christ, in whose company the figure of Judas Iscariot is underlined. While the heads of the Teacher and His eleven apostles are white, the arch-traitor is depicted with a black-coloured head.

Here we should note that in *The Lord's Supper*, one of the dominating themes is the

symbolic motive of a grain or a seed. The grain form is appropriate for the head of Jesus Christ because the Son of God is the grain of bread, sent by the Highest Power to humanity to fulfill the mission of the promised Saviour and world Re-newer. It is not by chance that in the New Testament Jesus Christ is called the Apostle. «Consider the Apostle and High Priest of our profession, Christ Jesus, who was faithful to Him that appointed him» (Eph. 3:1, 2). In addressing his followers, the Teacher affirmed, «I am the living bread which came down from heaven: if any man eat of this bread, he shall live forever: and the bread that I will give you is my flesh, which I will give for the life of the world» (In. 6:51).

Presenting the story's essence, Pozdeev's *The Lord's Supper*, provides an opportunity to comprehend the meaning of the white crosses, placed in the corners of the painting. On the one hand, these are the signs of four canonical Gospels according to Matthew, Mark, Luke and John, whose texts narrate the Last Supper's events. On the other hand, the crosses, oriented to all the cardinal points, symbolize those apostolic paths, which the loyal followers of Christ have followed to christen people. The crosses are a stable religious symbol of the unity between the finite and the infinite.

Pozdeev's painting presents the sacramental mystery in the form of a scene of the Last Judgment at the moment of the second Advent of Jesus Christ, who has come for the judgment of the sinners. «I am not come to call the righteous, but sinners to repentance» (Mat. 9:13). In this case the event is shown as a court consisting of God's Son and the righteous saints. «For the Father judgeth no man, but hath committed all judgment unto the Son... And hath given him authority to execute judgment also, because he is the Son of man» (Jhn. 5:22, 27).

Judas Iscariot, after betraying Christ, disappeared – which meant that a new righteous man was needed in replacement. «And they gave forth their lots, and the lot fell upon Matthew, and he was numbered with the eleven apostles» (Acts 1:26). But, in Pozdeev's painting the event differs. The compositional structure of the painting unequivocally underlines the significance of the sinner Judas, who, having recognized his sin and repented it, managed to rise above it. It is not by chance that it is said in the Holy Scriptures, «Then Judas, which had betrayed him, when he saw that he was condemned, repented himself, and brought again the thirty pieces of silver to the chief priests and elders, saying: I have sinned in that I have betrayed the innocent blood» (Mat. 27:3, 4).

Andrei Posdeev's *The Last Supper* is truly religious, if we understand religion as the con-

nection of man with the fullness of existence. The painting makes visible a sacral meeting of people with the Almighty. The essence of this creation is the following: only a man who has gone beyond his sin and atoned for it by his sufferings is worthy of becoming a connecting link between infinite God and finite people. It is not by chance that the figure of the sinner Judas is presented in the form of the crucifix; it recognizes the hero's sacrifice and the forgiveness of his sins. Responding to the content of the composition, the famous prayer before the oblation is as follows: «Today, at the Lord's Supper, Son of God, receive me, the oblationer».

Knowledge of essence (natural or social) can teach or can't teach people – a basic alternative for artistic discussions also. We would not continue further on this topic; you see already the revealed logic of history of arts and historical dialogues among distinguished artists. It is very important to give freedom for all principal artistic tendencies. Only then arts, taken totally, are developing normally and effectively. Suppression of any principal artistic program leads to a disharmony in artistic creativity.

Thus every great master finds his own original form of visual thinking and materializes this form in an art masterpiece, eternally alive.

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SIMULATION MODELS OF MODERN LABOR EXCHANGES

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Important role in the functioning of the labor market play labor exchanges, in particular, their subdivisions such as employment department, employment assistance department, department to promote recruitment. In this paper, proposed the method of analysis of working of employment services and employment websites of United States, European countries and Russia as well. It is based on simulation models of these departments. There are corresponding examples.

Keywords: labor market, labor exchanges, employment websites, employment, unemployment, modeling, simulation models

Labor exchange is an integral part of the functioning of the labor market. Mediation between the employers and the unemployed persons are implemented through labor exchanges. In most countries of the world guidance over labor exchanges is carried out by public authorities such as Ministry of labor or equivalent government agencies. In addition to public employment services in the labor market exists a lot of private intermediary firms. The main directions of the activity of labor exchanges are [1]:

- preservation applications (resume) received from applicants for the post;
- preservation of existing vacancies from employers;
- research of the current state of the labor market;
- testing unemployed persons (applicants for the post);
- employment assistance to the unemployed persons (applicants for the post);
- payments of unemployment benefits.

This paper presents the results that obtained in the research of such activities of labor exchanges as employment assistance to the unemployed persons (applicants for the post) in accordance with their applications for vacancies in particular enterprises. The employment process begins by writing application (resume) from the unemployed person (the applicant for the post) for the vacant seat on the desired company. Later unemployed person is tested in order to determine whether the proposed post appropriate for this unemployed person.

Organization and modeling of employment services of Internet labor exchanges (employment websites) USA and European countries [2]. Consider first the general scheme of operation of the labor exchanges in Europe and the USA, whose activity has much in common. These labor exchanges are well-developed information systems with public access through the Internet. Applicants for the post can be registered in them, view open vacancies and post their resumes. Applications enters an information system of the labor exchange for t_{11} – t_{12} minutes.

After the applicant fills resume (which in the information system of the labor exchange is an application for the post) in the prescribed form, this application enters the queued for

processing. Processing involves checking information provided by the unemployed person (the applicant for the post) in the resume and the preservation of the application of the applicant in the database (if the resume has been checked). Incoming resume checked by moderators Internet resource. In the general case, we assume that busy n moderators in the labor exchange. The application process takes from one moderator t_{21} – t_{22} minutes. It should be noted that the resume of the applicants can enters in the information system of labor exchanges around the clock, however the processing of applications can implemented by only 8 hours a day 5 days a week. If the resume, according to the moderators, is made correctly and does not contain any invalid information, then the application (resume) of the unemployed person (the applicant for the post) is stored in the information system of the labor exchange so long as the unemployed person is interested in finding jobs. Finding the most appropriate (appropriate) vacancies for unemployed person occurs for t_{31} – t_{32} minutes immediately after saving resume. Process of finding suitable vacancies in the database of open vacancies carried by the search engine of this labor exchange automatically, so t_{31} and t_{32} are different from each other at a sufficiently small amount. In the event that suitable vacancies for the applicant are not found, then the application of the applicant placed in a queue for further service. If the search has positive results (there are vacancies, suiting of the unemployed person), the applicant is offered a choice of searching jobs that can arrange him according to information of his application. If any of the offered vacancies does not suitable to the applicant, then his application also enters the queue (above) for further service of requests applicants. The applicant takes from t_{41} to t_{42} minutes on consideration of all available vacancies.

The application is in the queue for further service so long as the vacancy of the employer appears in the information system of the labor exchange, type of activity of which the interests for that applicant. Also application from the applicant leaves the queue for further service if the applicant finds the suitable vacancies in database yourself. In general case, we

assume that each application is in the information system during $t_{51}-t_{52}$ minutes.

Consider the case where the applicant is satisfied with one of the vacancies. In this case, the applicant confirms his interest in this work, and application of the applicant together with his resume is automatically transferred to the employer. If the candidacy described in the resume satisfied the employer, the employer shall appoint the applicant an additional test and/or interview. According to the results of the check the employer makes a final conclusion about hiring candidate. We assume that employer needs $t_{61}-t_{62}$ minutes for the full considering the candidate of applicant. If the applicant for the post is hired, his application leaves the labor exchange. If the employer was not satisfied with the candidature of the applicant after the reading his resume or on the results of the employer test, then application of this applicant proceeds to stage of search for it all suitable vacancies from other employers [3, 4].

A general Q-scheme of labor exchanges of the above type constructed.

This Q-scheme of service of applications implemented using software written in the simulation environment GPSS World.

Example 1. Let $n = 5$, $t_{11} = 5$, $t_{12} = 10$, $t_{21} = 5$, $t_{22} = 10$, $t_{31} = 0,001$, $t_{32} = 0,003$, $t_{41} = 1440$, $t_{42} = 2880$, $t_{61} = 1440$, $t_{62} = 2880$, $t_{51} = 1440$, $t_{52} = 10080$, $p_1 = 0,75$, $p_2 = 0,5$, $p_3 = 0,25$.

The model should simulate the functioning of the labor exchange within 40 days every minute from the beginning of the first working day of the week.

Parameters of the model, under these conditions, the following: maximum queue before processing moderators is 130 applications, the current queue before processing moderators is 0 applications, the average number of applications in the queue before processing moderators (per unit time) is equal to 32,114, the average time of stay in the queue of a single application equals 245,1 minutes, the average occupancy of each moderator equals 0,459.

Let n sequentially receives values 4, 3, 2.

If $n = 4$, then maximum queue before processing moderators is 131 application, the current queue before processing moderators is 0 applications, the average number of applications in the queue before processing moderators (per unit time) is equal to 43,251, the average time of stay in the queue of a single application equals 329,62 minutes, the average occupancy of each moderator equals 0,575.

If $n = 3$, then maximum queue before processing moderators is 133 applications, the current queue before processing moderators is 0 applications, the average number of applications in the queue before processing moderators (per unit time) is equal to 60,899, the

average time of stay in the queue of a single application equals 477,51 minutes, the average occupancy of each moderator equals 0,679.

If $n = 2$, then maximum queue before processing moderators is 1150 applications, the current queue before processing moderators is 1041 application, the average number of applications in the queue before processing moderators (per unit time) is equal to 572,667, the average time of stay in the queue of a single application equals 4380.5 minutes, the average occupancy of each moderator equals 0.985.

The results obtained show that the case with the number of moderators $n = 3$ is the most appropriate.

Organization and modeling of employment services of labor exchanges in the Russian Federation [5, 6, 7]. Application of unemployed person enters to the considered labor exchange every $t_{11} - t_{12}$ minutes. Application comes to department of receiving, where it pass of initial processing during $t_{21} - t_{22}$ minutes. And n_1 employees of labor exchanges engaged initial processing of applications received. If the application from the applicant is received when all employees are busy, then this application is queued, organized on the principle of FIFO (first in – first out) and comes to the first available employee of labor exchanges. After initial processing employees of the department send the application back to the applicant for the collect all the necessary additional data. If the applicant does not provide all the necessary information within 10 working days, then his application leaves the labor exchange. On average, the applicant will take time T in order to supplement the application with all the necessary data and send back to the labor exchange. If the applicant within the prescribed period provides all the required data, the application passes the stage of collect additional data on the applicant in the department of receiving (there is a possible to talks with the applicant on the phone, spent from t_{31} to t_{32} minutes on each applicant). Also n_2 employees of department of receiving is collecting additional data about applicants. If the application comes to them to the processing when all employees are busy, then this application is queued. Once all the required data about the applicant are collected, the application is saved in the database of labor exchange (one of the employees of the department of receiving busy preserving applications, saving each application made by hand for $t_{41} - t_{42}$ minutes). After saving this application the data are queued for processing in the employment department. After the application of the applicant for the post comes to specialists of employment department, search of vacancies begins that satisfy of the applicant. And n_3 employees search for vacancies on each application received from the applicant.

This search is made in the database of vacancies of labor exchanges and takes from t_{51} to t_{52} minutes for each application. In case a vacancy that suits the applicant is found (the statistical probability of this event is p_1), then employees of employment department appoint interview with the applicant. If not found any vacancies for the application for job of the applicant, the further processing of the application is delayed by exactly time t_{day} working days, after which it enters the queue for job search. Total n_4 employees to interview with candidates, each interview takes from t_{61} to t_{62} minutes. If all employees are busy, then applicant is queued for interview. Service of the applicant starts at the moment when all applicants (that stand in queue for interview before this applicant) were served, and available at least one of the employees of the employment department of labor exchange that hold interview (in other words, queue on the interview organized on the principle of FIFO). If the applicant on the results of interview will have choose one of the available posts, and will be successfully made an employment contract (the statistical probability of this event is p_2), then this application of the applicant for the post leaves the labor exchange. If the applicant not satisfied with the proposed post, his application comes back to stage of search vacancies.

Q-scheme of this type of labor exchange constructed.

This Q-scheme is implemented using software, written in a simulation environment GPSS World.

Example 2. Let one minute is a measure of the time, interval (during which was considered the functioning of the labor exchange) is 40 days, $t_{11} = 5$, $t_{12} = 10$, $t_{21} = 20$, $t_{22} = 25$, $t_{31} = 25$, $t_{32} = 35$, $t_{41} = 5$, $t_{42} = 10$, $t_{51} = 1$, $t_{52} = 4$, $t_{61} = 15$, $t_{62} = 30$, $T = 960$, $t_{day} = 2$ (960 minutes), $n_1 = 3$, $n_2 = 5$, $n_3 = 3$, $n_4 = 4$, $p_1 = 0,15$, $p_2 = 0,65$.

The following results of functioning of the labor exchange were obtained under the above conditions:

1) maximum queue before the initial processing is 11 applications, the current queue before the initial processing is 2 applications, the average number of applications in the queue before the initial processing (per unit time) is equal to 3,841, the average time of stay in the queue before the initial processing of a single application equals 28,873 minutes, the average occupancy of each employee that engaged in initial processing equals 0,997;

2) maximum queue before collection of additional data is 16 applications, the current queue before the collection of additional data is 1 application, the average number of applications in the queue before the collection of additional data (per unit time) is equal to 1,046, the average time of stay in the queue before collection of additional data of a single application

equals 8,324 minutes, the average workload of each employee that engaged in the collection of additional data equal to 0,752;

3) maximum queue of applications before saving them is 48, the current queue of applications before saving them is 21, the average number of applications in the queue before saving them is equal to 20,829, the average time of stay in the queue before saving them equals 166,148 minutes, the workload of employee that engaged in the saving applications equals 0,937;

4) maximum queue before searching of vacancies is 21 applications, the current queue before the searching of vacancies is 4 applications, the average number of applications in the queue before the searching of vacancies (per unit time) is equal to 1,013, the average time of stay in the queue before the searching of vacancies is equal to 1,335 minutes, the average workload of each employee that engaged in the searching of vacancies is equal to 0,632;

5) maximum queue before the interviewing is 16 applications, the current queue before the interviewing is 3 applications, the average number of applications in the queue before interviewing (per unit time) is equal to 1,383, the average time of stay in the queue before the interviewing equals 12,28 minutes, the average workload of each employee that engaged in the interviewing is equal to 0,628.

The largest queue (21 applications) formed before the canal that save applications in the database of labor exchange, the average residence time of a single application in queue also many times greater than similar parameter in all other queues of the system. On the basis of this data, we can recommend (to the manager of labor exchange) acceleration the work of the channel (the process of saving applications in database of labor exchange).

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Materials of Conferences

**HORIZONS OF PLANNING
OF SOCIO-ECONOMIC
TRANSFORMATIONS
AND INSTITUTIONAL TRAPS
(THEORETICAL ASPECT)**

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The author marks that collapse of modern economic reform in Russia was conditioned by appearance of some institutional traps, i.e. ineffective but firm institutions or standards. At the same time, reliance on accelerated pace of reforms became the dominant cause of these traps appearance. Privatization is the obvious example of discrepancy of declared aims and real results. Chinese experience argues that success or failure of reforms depends on planning horizon.

In the twenty years that have passed since the start of market reforms several attempts to analyze what is happening and to evaluate it, to «embed» the reform in the context of Russian civilization have been made. In earlier publications [1, 4, and others] the problem of choice of conceptual frameworks and specific mechanisms to reform the country's economy still keep its validity. In the second half of the 1990s there has come the time to understand the done, to evaluate correctness / false of the choice and prospects [10, 12, and others]. This trend continued to be important also during the 2000s, although it must be admitted that the official 20th anniversary of the beginning of market reforms has passed almost unnoticed. Meanwhile, the progress and results of modern economic reform in Russia is not so much in need of journalistic debate on the topic «What was that?», but much more in the theoretical understanding, including from the standpoint of modern institutionalism.

At present, virtually there is no dispute about the thesis that the first failure in the reform of the Russian economy in 1992 is primarily due to the institutional weakness of the «government reformers» who preferred to achieve macroeconomic stability with methods of hard financial policy, but it was inconsistent and not long. A. Illarionov, summarizing first results of transformation, even called February 1992 the «honeymoon» of economic reform, and then a «silent counter-reform» has begun, and «rubles mash, devastation of the trading stocks, the explosive growth of prices, decline in living standards of the vast majority of the population have become as the result of irresponsible populist policies» [4, p. 25, 26].

So called institutional traps – inefficient but stable institutions or norms have become the logical consequence of the institutional weakness of the central part of the mechanism of the reform. In this case the author of this definition V.M. Polterovich

along with traps as byproducts of institutional solutions separately considered traps resulting from transplantation (purposeful «transplanting») of western institutions in the economies of developing countries [6, 7, and others].

It would be seemed, transplantation on Russian soil such institutions as the market-oriented organizational and legal forms of management (joint stock companies, etc.), commercial banks, exchanges, etc., should not cause difficulties, especially taking into account the fact that the institutional innovations cannot be the subject of bargaining, and its imitation does not require any payments in accordance with the rules of copyright. However, the practice of the first phase of transformation has demonstrated that a simple borrowing institutions of the western economy did not provide the desired effect.

In other words, dysfunctions of transplanted institutions were appeared. V.M. Polterovich identified four possible types of such dysfunctions:

1. Atrophy and degeneration of the institute;
2. Activation of alternative institutions and rejection of transplants.
3. Institutional conflict as a result of differences in the institutional environment of the donor country and the recipient country.
4. Paradox of transmission when consequently donor country benefit sowing to recipient country.

In this regard, the question arises about the pace of change, which may affect the success or failure of the reform. On the one hand, the results of the reform undertakings should be obvious enough for not too long period, on the other hand – the haste imits implementing is a source of emerging institutional traps. In particular, the time pressure and associated fear of failure of action of government reformers inevitably cause frequent changes in the «rules of the game» which is explained as a necessary «correction of reform course». O.S. Sukharev describes such a situation as an example of the chess game between grandmaster and beginner. With the constant changes in the rules likelihood that grandmaster will lose significantly increases [10]. E.V. Balatsky clarifies that a cascade of institutional changes leads itself to an institutional trap [2, p. 50].

Accelerating the pace of reforms was caused as it now seems a number of circumstances of subjective or even a personal nature.

First, the demonstration effect, resulting from the liberalization of prices, could make the reformist bloc of the government «dizzy with success». Although it should be taken into account that the «miraculous» filling the shelves of local stores with earlier somewhere missing goods at the time did not get a logical explanation. At least, understanding of this phenomenon suggests that either «Gaidar team» have certain unexplained features to produce

incredible volumes of consumer goods in a wide range during a few days, or commodity shortage sharply increased by the end of 1991 was made artificially and pursued quite a propaganda purpose – to demonstrate the efficiency and, accordingly, lack of options of the declared program of transformations.

Secondly, the privatization of state and municipal property as a core institutional reforms was forced consciously, despite on warnings from some representatives of political forces and academic community. Objectives were pursued both obvious and hidden. In the «Program of deepening economic reforms in Russia», prepared by the summer of 1992, when it was already clear that the inflationary spiral has begun to uncoil, there was even separated a special section «Institutional changes in the economy – the prerequisites for future growth» [8, p. 33–46], in which the formation of the market of capital goods, land and real estate pursued definite goals:

- 1) the emergence of a broad stratum of private owners to promote a socially oriented market economy;
- 2) increasing the efficiency of production through the formation of a new effective ownership structure.

However, foreign experts noted that in the conditions of the favorable political situation, when people kept faith in B.N. Yeltsin, young reformers had to pass the «point of no return», after that return privatized property to the state would be quite costly process, which would limit the activity of future conservative governments [5, p. 76].

Third, purely personal factor was affected. It's not a secret, that reformist bloc of the government wasn't consist of disinterested persons and non possessors, inspired and guided by exceptionally high ideas. Y.Y. Boldyrev, a member of the High Advisory and Coordination Council under B.N. Yeltsin, and in 1992–1993 headed Supervisory Department of the Presidential Administration, on the death of E.T. Gaidar quite clearly said about his associates: «There is no place to put hallmarks», adding that the young reformers at the time replaced the liberal revolution with criminal revolution [3, p. 123, 124].

In this regard, «multiplication» of inefficient but stable institutions of quasi-market economy is not contrary to common logic of transformations. The so-called «strategy of intermediate institutions» considered control the cultivation of the necessary institutions and even institutional experiments could be stand against institutional traps, generated by reformist bloc of the government in the first half of the 1990s like it or not. However, E.V. Balatsky recognizing the fruitfulness of philosophy of intermediate institutions rightly points out that it is aimed not at combating with institutional traps already appeared, but with administrative errors able to generate it [2, p. 50]. However, in 1992–1993 it would be hard to imagine that the country's leadership admits its mistakes and makes a radical change of economic policy, in particular – significant slow-down pace of privatization.

In this regard, the question arises about the optimal horizon of planning changes. E.V. Balatsky argues that the planning horizon is a leading factor in technological and institutional evolution. Thus, because the developing countries and countries with transition economies are characterized with political and economic and legal instability, the planning horizon there is usually negligible. In turn, this fact determines the dominance of short-term interests of companies on long-term and promotes preservation of national production [2, p. 56–57, 58].

Thus, in the Russian economy of the 1990s a unique situation was evolved: accelerated pace of reforms aimed also at the technological renovation of production, made the opposite effect – not only preserving, but also the deepening of technological backwardness of the country.

In this regard, reforming economy of China gives a different picture. III Plenum of the CPC Central Committee 11th convocation in December 1978 had announced a policy of deploying a broad and comprehensive reform of the economic system in China, it found that the solution of the main problem – improving the productive forces of the country for the purpose of satisfaction of ever-growing material and cultural needs of the people – will be provided only to the middle of the XXI century. Accordingly, the first phase transformations (up to 1990) suggested a solution to the problem of providing the population with food and clothing. Society of «middle-income» was to occur by 2000, and half a century was given for comprehensive modernization of the national economy as a whole [11, p. 4–5].

At the same time, Chinese reformers, led by Deng Xiaoping chose not to destroy the public sector industries, only allowing private capital to occupy market niches where it was more productive. Strictly speaking, the presently observed retooling of national production and improve the quality of Chinese products – the result of joint efforts of the state and national and foreign private investors, and institutions associated with these processes were cultivated in China for decades.

Naturally, fans of liberal democracy can reply that the economic success of China provides a totalitarian regime that violates human rights, etc. In addition, rapid economic growth, especially in the free economic zones and the metropolitan area, does not cancel the fact that the Chinese village and small provincial towns differ with much lower standard of living. Nevertheless, the fact that of real effectiveness of the public sector in a market or quasi-market conditions is impossible to deny.

In other words, truth so hated mainstream's representatives was reaffirmed again: economic efficiency is not determined with ownership of the means of production but with quality of management. Accordingly, retro-alternative variant of modern economic reforms at low rates of privatization would determine the formation of large stages on the principle «guilder-to-guilder» sufficiently long

term, and institutions of a market economy would be basically not transplanted but grown, presumably in frameworks of different variants of public-private partnership.

Institutional traps cannot be avoided in this case too, but the state and society would be better able to minimize the consequences of its occurrence.

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THE INNOVATIVE TYPE OF DEVELOPMENT OF ECONOMY OF RUSSIA AS THE NECESSARY CONDITION OF ENSURING ITS COMPETITIVENESS

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This article defines the role and importance of innovative models of development for the Russian economy, comparative analysis of two types of economic development in a macroeconomic aspect. Defined features innovative economy and formulate

its definition as an economic category, has revealed the role of the national innovation system and innovation infrastructure, as a tool of implementation of innovative activity. The used methods of research: comparative approach, deduction, analysis and synthesis.

Leading world states, such as USA, European countries, Japan, have already transitioned towards a new innovative development model that is the next step of development after industrial model. Russia has just initiated the forced transition towards innovative development model, as development along the path of supplying raw materials leads to transforming our country into raw materials adjunct of economies of developed countries and inevitable limitation of competition by other countries that have more favourable conditions of processing materials, such as India, China (cheap labour, low energy costs) [1, p. 3].

Active innovative development, outlining prior directions and sectors of innovative development, including modern technologies, will allow Russian economy to achieve competitiveness and establish leadership. The major problem of Russia in this context is lack of demand at our internal market, while a stable demand for Russian innovations from USA and European countries exists.

Nowadays an obvious lag in innovative development is clearly expressed. According to the available statistic data of international economic body Organization for Economic Cooperation and Development (OECD), GDP expenses for R&D in Russian equaled USD 20,03 million, while this index equaled USD 366,30 million in USA, that exceeds Russian level 16 times [5]. Besides, according to global index of competitiveness, Russian occupied 67th place of all world countries in 2013. The three leading position have been occupied by Switzerland, Singapore, Finland during 2013–2014, besides, Russia ascended 3 positions in 2014 and occupied place 64, Germany is 4th, USA – 5th, Japan – 9th, China occupied 29th place, and India – 60th place [4].

Positive trends are being registered in Russia nowadays: inclusion of our Country into WTO; redirection of economy development course from raw materials supply towards innovation; orientation of market towards consumers' priorities, including sector of high technologies; acceleration of technics development rate; creating of new technologies, etc. All these factors form specific features, typical for innovative economy: continuous improvement of technics and technologies, output of highly-technological products and their export to the world market, high level of professionalism, developing knowledge on network and informational technologies, developing sector of new technologies. A specific feature of innovative economy that distinguishes it from the former development model, is represented in prioritizing knowledge in all of its expressions that transform into a new product, enriched with new qualities, and thus lead to creation of market advantage and bring a significantly

greater income than common, well-known industrial product can bring, and establishing innovative development and leading positions to an enterprise, region, or country.

Comparing features of the two types of economic development, one can conclude that the existing industrial model of economy and modern innovative type of it have the common platform of economic development – scientific-technical devel-

opment, but differ in directions of its implementation: broadening of production in the first case, and introduction of new technologies (innovations) in the latter case. At the same time, their common basis, scientific-technical development, creates conditions for innovations to emerge.

Table provides the results of comparing two models of economic development: industrial and innovative.

Comparative characteristic of industrial and innovative model of economic development

| Name of characteristic | Model of economic development | |
|------------------------|--|--|
| | Industrial | Innovative |
| Type of development | Intensive type of broaden reproduction (intensification, mechanized production) | Economic development at the foundation of scientific-technological innovations |
| Objective | Growth in efficiency due to decrease in costs | Creation of a competitive innovative product |
| Criterion | Results of scientific-technical development | Introduction of new technologies (innovations) according to achievements of scientific-technical progress |
| Basic principle | Growth in volumes of production due to its broaden at the basis of resource-saving | Qualitative novelty of goods, technologies, services in terms of efficient resource consumption |
| Moving force | Scientific knowledge, material production (resources) | Scientific knowledge (intellect, creativity, uniqueness), qualified labour |
| Result | Growth in efficiency due to increase in quality of the used resources | Provision of competitiveness at the basis of producing and realizing qualitatively new goods, technologies, services |

Final result depends on quality of implementing directing knowledge in innovative economy, while it is defined by efficiency of creating material goods in industrial economy. Industrial economy is based upon increase in efficiency of the facilitated technics, foremost and recourse-saving technologies, and it leads to an increase in efficiency without increase in amount of consumed resources. Innovative model exists in account of introducing novelties and, therefore, entering new markets. Besides, developing innovations in Russia is based upon the existing industrial powers, and concentration of initiators of innovations around them leads to formation of innovatively-developed centers, territories, regions, etc. In this case ideas, intellect, and information in all possible forms should become main resources [3].

According to the provided analysis, we shall formulate the following definition: innovative economy is not an economic category that allows people to create an absolutely new demanded product, technology, or service with new qualities, at the foundation of such resources as knowledge or information via transforming an idea into innovation, and realization of such product can provide a competitive advantage.

Thus, according to our justifications, we can define advantages of innovative development of Russia:

- An ability to achieve significance and competitiveness at the world market through realizing innovations;

- Liquidation of the existing gap in development of technologies between Russia and the developed countries;

- An ability to achieve leadership at new markets;
- Decrease in share of procuring sector products in the country's GDP with a simultaneous growth in high-technological sector of economy;
- Preservation of the existing branches of economy and development of new ones.

Russia has potential abilities to produce innovations, however, a problem of their realization exists, and solution of it must be provided by institutions of innovative infrastructure with support of the government [2, p. 154].

Choosing innovative path of development requires an active participation and support of the government in aspect of developing complex innovative policy and stimulating demand for innovations. Therefore, formation of infrastructural component is a significant problem, and temper of innovative development of Russian economy depends on how quickly it will be solved.

Formation and functioning of innovative infrastructure implies creation and development of:

- elements of subsystem of general purpose and small business;
- regions via formation of innovatively-active territories, special economic areas, and industrial zones;

- mechanisms and tools of financial support for elements and subsystems of innovative infrastructure;
- normative-regulation base.

We should also outline that formation of innovational system and its infrastructural component should be directed first of all towards developing regions, as necessary resources are concentrated in regions, and the necessary productive base and territories exist there.

Realization of regional innovative policy in regions will require restructuring of regional economy and result in an active innovative development of regions. In this case regions can become leaders in the chain of realizing stages of further development.

Innovative infrastructure in this case serves a tool that helps a state to realize rational distribution of the possessed resources, technologies, developments, and also bring an idea to a complete innovative product and sell it on the market.

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INNOVATION STRATEGY IN IT BUSINESS

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The first five-year plan of boosted industrial and innovation development has started in year 2010 within the scope of implementation of National Strategy «Kazakhstan-2030». Amongst top-priority goals of industrial and innovation strategy is development of IT industry infrastructure. IT industry in Kazakhstan at the present state of its development faces with a series of complex issues, successful solution of which is possible on

the way to radical changes in engineering, process and methods of organization. Strong competition in world market and progressive depletion of resource base made issues of implementing of advanced researches IT industry more important in field production and oil refining. Research and experience of foreign IT companies in organization and implementation of innovation policies, introduction of innovative technologies are necessary in modern market environment.

The objective of the article is to study world innovation practice in miscellaneous fields of IT industry, assess top-priority goals of technological improvement, ensuring high competitive level of production, and to draw up recommendations for improvement of innovative activity of IT companies in Kazakhstan. Theoretical basis for article are: scientific provisions, published in papers of domestic and foreign scientists regarding to the investments management's issues of ventures companies; evolution theories on management of innovations and innovative processes at the enterprises.

Analysis of the concepts of innovative economy and a new approach to the understanding of innovation as a separate process concludes that innovative activity is qualitatively different from other types of economic activities [1]:

- Major difference are in the laws of creation, existence and development of the intellectual and material capital;
- Human resource management laws: a consequence of the practical impossibility of effective replacement in human capital compare with other production or commercial activities;
- Innovative activity has deeper affect to overall management processes.

Development of innovation as a cyclic process of competitive interaction of several systems is determined by the relationship of the following mechanisms [2]:

- Restrictions in defining exact limits of development of the innovation process due to physical, economic, social, legal, and other factors which affect to the system. Deterrent factors of innovative enterprise development are shortage of financial support in risky projects, venture capital deficit, also lack of experience and knowledge in effective commercialization;
- The inability and unwillingness of innovatively motivated institution to further development, because there are various risky factors that can partially or totally block innovative process.
- The feedback received from information transfer since later to earlier stages of innovation process. Crucial feedback is consumer response to introduction of a new product in the market;
- Time delays occur in whole life cycle of innovative process including feedback part.

Accumulation occurs when elements of innovation processes have positive influence on each other which is called a synergistic effect, so-called

«mutual accumulation stage» [3]. For example, new technologies contribute to the development of new equipment that increase demands in training of employees and labor productivity, which leads to growth in product quality, sales, profit growth of a company, where investment is directed to new technologies.

Analyzing the special characteristics of innovative industry as a part of national economy defines that world widely innovation is characterized by governmental protection and the creation of imitative barriers to entry business for strangers. Innovation driven economy is the main advantage developed countries which shows their competitiveness level.

Optimal ration of supply and demand in venture capital investment is reached by public policies, which is aimed to:

- Develop infrastructure for high risk investment funds;
- Create competitive stock markets for small high-tech innovative companies;
- Equal information availability for all participants in venture capital, including structures of national venture capital system.

Particular features of innovative companies are qualified scientific and technical employees, production is focused on long-term economic indicators, gradual financial support to every innovative process steps, using not strict and formal organization management style (project-based organizations) [4].

Analysis of the current situation of innovation processes in Kazakhstan shows an overall low level of innovative planning and management concepts. Previously developed government programs have not yielded the expected results. Currently, amendments to the law «About government support on innovation» had enhance new models for building technology parks and models for establishing science management are in progress.

However, innovative IT industry in Kazakhstan is still not established. Analysis in innovative processes features in global IT environment verifies necessity for creating conditions to develop venture business. Unlike other sector, IT industry has competitive environment, where innovation is the main criteria for individual companies to achieve competitive advantage among others. Therefore, one of the most essential tasks for Kazakhstan is establishing institutional flexible fund for venture businesses.

Major part of innovation, regarding to international experience, is created by entrepreneurship companies dealing with organization, financing and commercialization in research and development. The largest transnational corporations cooperate small high tech companies as they are engaged in the global scanning for new ideas and new market and prosperity, management of production process in different countries. Dominant IT corporations try to keep technological barriers as long as possible

in order to obsess certain competitive advantages regarding to national IT companies.

Venture capital funds and venture capital activity have become an important issue in the economically developed countries. It has significant influence on the creation and development of small high-tech enterprises. Venture capital funding is long-term high-risk type of investment, which provides increasing number companies that are focused on development and production of high-tech products.

There are many arguments that investment through venture funds is better than direct public investment because government is not always made reasonable investment decisions. Involvement of public investment in innovation process requires additional regulation, which is not convenient for the private investors.

Stock model of government involvement in creation of venture capital industry is based on trust of government to private sector and allowing them to make right strategic decisions. However, in countries with low level of social capital stock efficiency scheme might be dejected. Generally, stock and capital market infrastructure is not complicated in less-developed countries (LDC).

The fractional financing is more specific to innovation driven company. Financing into innovative enterprises is divided in phases that correspond to the phases of product life cycle. Each phase has a particular approach that require different techniques to make decisions both from financially and technical standpoint.

In developed countries, the program for the development of venture business is aimed to support to companies in the early stages of their development. International experience states that newly created innovative companies require financial support in the early stages of development. Additionally, transaction costs in early stages of development for such companies are higher than for other small firms. Therefore, world practice underlines the practical interaction between scientific research and production capacity through technology parks regulated by government.

No county in the world was able to reach a high level of venture capital development based only on pure market system. In each particular case, direct or indirect government interposals take place [5]. Currently, government support in venture business can be divided to the areas:

- Enhancing direct state participation in the development of business venture, especially in those countries that were lagged behind the leading countries in the early 1990s (Germany, Israel, Finland);
- Public participation in the infrastructure (funds of funds) to encourage the development of venture capital financing;
- The most successful venture programs are funded by the government but managed by professionals from the private sector. Government should monitor processes and evaluate the results

of innovative programs, but its influence to strategic decisions should be minimal.

Innovation driven economy of the country is based on creating attractive business opportunity for local market companies, where main accelerators are government or major financial institution. Creating conditions for competitive market among local companies protects deep penetration from foreign competitors. New technologies influence to the development of international competitive economy [6]:

- Increasing value assets and performance of companies, where consumers, shareholders and investors receive maximum benefits.

- Rising opportunities to develop in different segments helps to diversify market which contributes to the emergence of many development aspects within the company;

- Reducing production costs. Applying new technologies along with the restructuring are the best solution to reduce production cost of allocation processes.

Development of venture activity is determined by a combination of methods, techniques and measures to stimulate public venture activities. Thanks to foreign experience, the model of development of venture activity can be defined: direct investment to public funds in innovative companies. Investment of public funds through venture capital financing, venture mixed development program activities, warranty of venture activity development.

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INSTITUTIONAL AND STRUCTURAL CONSTRAINTS OF THE RUSSIAN ECONOMY

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The main result of the global financial crisis for most developed countries and developing markets has become a forced process of

modernization of the productive forces, and as a consequence – the phase transition to the new technological order. This process, along with the volatility of world markets and the gradual recovery of the world's leading economies, is a significant pressure to the losing competitive advantages Russian economy.

Unfortunately, domestic economic policy has not pursued enhance of competitiveness¹ and, given the increasing openness (eg. WTO and Customs Union) and the free movement of capital, this problem will occur particularly acute. Potential GDP at constant domination of the commodity sector and unfavorable investment climate, almost reached, and «conservative» economic policies have led to the loss of the «natural» competitive advantage of Russia – the ability to use cheap and available resources. Not the last role has played here ambiguous activities of the institute of «state corporations» (singular «parastatal» forms of business on factor markets).

So-called infrastructure «mega projects» does not bring real results. The reasons for their weak influence on the development of the economy, is the abandonment of the principles of macroeconomic multiplier – namely, the use of materials and equipment of domestic production, as well as the use predominantly of resident workforce. The presence of «corruption tax» strengthens immunity monetary stimulus to the economy and reduces the multiplier.

An overindulgence of devaluation tool, except of short-term budget replenishment, do not have a stimulating effect on the economy that is largely depended on consumer and industrial importing goods.

Small and medium business, the most important base of socio-economic development and innovation, is continuing shrinking. The business environment is influenced by negative factors such as the rise of resources cost and limiting access to them, the lack of cheap long money, the poor competitive environment, the weak protection of property and the imperfection of the judicial system, the deficiency of incentives for innovation and of qualified personnel.

Large business having principally an offshore character is protected from the imperfections of the business environment. 9 and 10 deals of large businesses take place outside Russia². Over the last years there has been significant annual capital outflows, and accumulated funds (pension fund, the National Welfare Fund, etc.) are not used in the economy. Opportunity costs of this process due to

¹ Global Competitiveness Report 2012–2013 // World Economic Forum [electronic resource]: [site]. Mode of access: <http://www.weforum.org>.

² Annual President Message for the Federal Assembly (in 2012) [electronic resource]: [site]. Mode of access: <http://www.kremlin.ru>.

the multiplier effect are greater than the value of funds themselves.

Naturally, the expected result is a slowdown of economy growth and the practical cessation of growth of industrial production.

Modernization of the economy structure and institutions is essential for sustainable growth and competitiveness in the global market. According to IEF RAS calculations economic growth of at least 8%³ needed for modernization (compared to the projected rate of about 1%)⁴.

Thus, a structural transformation and modernization of institutions is needed to overcome the

limitations of economic development, to reach a sustainable GDP growth on intensive basis and to create a favorable business environment. The most difficult problem here is the problem of synchronized affecting the formal and informal institutional matrix elements, according to their characteristics and relationships.

Conservative economic policies must be transformed into a policy of re-industrialization and innovative development. Full integration in the global economy as a strong independent player is impossible without a strong economy.

³ See Institute of Economic Forecasting / Russian Academy of sciences [electronic resource]: [site]. Access mode <http://www.ecfor.ru>.

⁴ Forecasts of socio-economic development [electronic resource]: [site]. Access mode <http://www.economy.gov.ru>.

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METHODOLOGICAL BASIS OF ETHNOPEDAGOGIC RESEARCH

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The article is devoted to methodology of ethnopedagogical research. There are a lot of investigations on ethnopedagogics, but they are mostly of applied character. There is a need in modern science to develop the theoretical level of ethnopedagogics. This will help to systematize and optimize scientific studies of this sphere. We hope that conclusions made in our work will open new facets of methodology of ethnopedagogics.

Keywords: ethnopedagogic research, methodology

Research activity in the sphere of ethnopedagogics is significant for the individual and society. Reflecting properties and peculiarities of the development of this science, it provides the development of value priorities of the younger generation, preserves and enriches folk culture. Due to the existence of different schools of thought and approaches in ethnopedagogics, due to numerous standpoints there arises necessity to work out a methodology of ethnopedagogical research. Its final objective is to elicit the truth by identifying laws and regularities developing and applying theories, concepts, approaches, methods and ideas.

The problem of development of methodology of ethnopedagogical research is determined by the multitude of applied scientific works, a large number of teachers, who show interest to ethnocultural upbringing and education, by the requirement of the scientific community for the quality of theses in ethnopedagogics. As the analysis of Russian theses on ethnopedagogics shows each author takes a different approach detecting significant differences in methodological tools. This fact is determined by scarcity of scientific literature on the methodology of ethnopedagogical research.

Russian ethnopedagogics has the data, which can serve as a basis for development of a methodology ethnopedagogical research. In scientific publications of Sh.M.-Kh. Arsaliev, G.N. Volkov, K.Zh. Kozhahmetova, V.V. Lezina, O.D. Mukaeva, E.L. Khristova the conceptual framework and philosophical categories of ethnopedagogics are defined, ethnopedagogical regularities are singled out, some aspects of ethnopedagogical methods are disclosed, ethnopedagogical source study is described. However in ethnopedagogical papers the methodology of ethnopedagogical research is not presented. Thus, this problem still remains outside of vision of the researches.

To resolve this contradiction, we carried out an analysis of the methodology of ethnopedagogical investigation as a subject of study. In this context we adopted typology referring such researches to descriptive and prescriptive (normative) ones. As a result of consideration of the

methodological connection of ethnopedagogical knowledge with other sciences we clarified the subject of ethnopedagogical researches: national education and training. Perspective of ethnomethodology was reflected as an area of high-mentioned knowledge in its study of ethnocultural specifics of national life in ethnopedagogical researches. A conclusion was drawn that modern ethnopedagogical research must be justified in terms of its starting points, logic, proposed outcome and the way of its achievement.

The structure of methodology of ethnopedagogical knowledge introduced by K.Zh. Kozhahmetova (laws, concepts, theories, principles, hypotheses, methods, facts, categories, terminology), we expanded and deepened with such items as «a regularity as a steady trend», «problem», «function», «criterion», «approach», «factor», «ethnopedagogical project development», «ethnopedagogical technology, model», revealing their contents. In particular, to the regularities of ethnopedagogical research we referred the following dependencies: of ethnopedagogical practice from the national educational policy, of ethnopedagogical theory from the level of development of ethnopedagogical practice and vice versa, of the quality and efficiency of ethnopedagogical activity from the quality of professional training of the corresponding personnel, of ethno-cultural development of society from the quality and level of development of ethnopedagogical infrastructure of settlement.

Methodological problem relates to the subject of ethnopedagogics, to its place in the system of scientific knowledge, relationship with other sciences, general and specific objectives of ethnopedagogics and includes philosophical, general methodological, specific methodological levels, and the level of methods and techniques of specific research. Sh. Arsaliev pointed out cognitive, critical, evaluating, reflexive functions. We supplemented this list with diagnostic, prognostic, educational, ecological ones. As scientific criteria we named experimental verifiability, rationality, reproducibility, formal consistency, deterministic or hypothetical thinking, the use of ethnopedagogical

instruments and data from allied sciences, strictness, credibility, validity, progressivism, informativeness, heuristicity, verification.

We agree with the conclusion made by SH. Arsaliev about the fact that to ethnopedagogical researches different approaches on specific levels of analysis can be applied. The scientist proposed a classification which we supplemented and its final version looks as follows: a philosophical level (genetic, evolutionary, civilizational, synergetic, hermeneutic approaches), general scientific level (anthropological, structural, comprehensive, system, functional, paradigmatic, integral, sociocultural approaches), level of specific science (culture – historical, axiological, person-centred approach, activity, competence-based approaches), methodological level (communicative, technological, sense-oriented approaches).

Traditionally singled out methods of ethnopedagogical research are: empirical ones (observation, comparison, experiment, grouping, classification, survey) and theoretical ones (axiomatic, idealization, abstracting, hypothetico-inductive, mental experiment, projecting, modelling, conceptualization). We added the methods of selection of respondents (filtering method, the “snowball” method, selection by indirect limitations, the use of statistics data, data of population census, the regional migration services, statistical form D-7, which includes information on the number of schools with instruction in the native language, publications of regional programs of national education development, textbooks and methodical manuals, content analysis of press and fiction), contextual methods (appeal to tradition, authority, common sense), or the method of field research. A detailed study of the method of projecting in ethnopedagogical research allowed us to highlight the principles and objects of project activities, to differentiate its types, levels, criteria of effectiveness.

As research tools we offer material ones (satellite communication, cell phone, computer equipment, Internet, informational technology), logical ones (argumentation, evidence), linguistic tools (description, summary, communication), mathematical statistics. Ethnopedagogical facts integrate documentary sources and monuments of history and culture. They are registered in the ethno-cultural traditions, customs, folklore. The most acceptable forms of representation of ethnopedagogical facts are tables, graphs, classifications, mathematical formulae, graphic models. Ethnopedagogical factors can be grouped on the principle of mega – (planet, world), macro- (country, ethnos, society, state), meso- (location and type of settlement), micro – (family, peer groups, educational, religious private organizations).

We affirm the possibility and relevance of typology by V.V. Kraevsky in the methodology of ethnopedagogics. According to it epistemological, philosophical, logico-epistemological and scientific levels are pointed out. On the epistemological level we distinguish ethnic, ethno-cultural, ethnopedagogical, civilizational, psychological approaches. We note that philosophical level includes propositions about the mentality, language, nature, work, religion as factors of formation and development of the child. Generalization and systematization of available scientific data on logico-epistemological and scientific levels allow us to make a conclusion about their insufficient development. This fact determined the further succession of our research.

We studied and described logico-epistemological level of methodology of ethnopedagogical research. System vision of this process allows us to consider it in among philosophical foundations, epistemological resource of this methodology, the problem field of the researches. Theoretical investigations of the philosophical foundations of ethnopedagogical researches led us to the conclusion that different schools of thought can be realized. Traditionally distinguished are existentialism, pragmatism, dialectical materialism, Neo-Thomism, neo-positivism, philosophy of life, Freudianism and neofreudism, behaviorism) and unconventional ones include evolutionism and neo-evolutionism, diffusionism, sociological and ethnopsychological schools, mentalism, cultural relativism).

Epistemological resource of ethnopedagogical knowledge includes the following categories: ethnicity, ethnic culture, inculturation, socialization, cultural transmission, language, myth, folklore, religion, faith, educational traditions, customs, ethnospecific ritual rites, family life, art (folk song, dance, decorative and applied arts), game. The study of these areas allows to obtain comprehensive, accurate, objective picture of the ethnic education and training.

On the basis of theoretical and empirical generalizations we concluded that the problem field of ethnopedagogical research present methodology of ethnopedagogical knowledge, love as the content, purpose and means of education, conscience, discipline, guilt and shame as mechanisms of social control, prenatal education, adaptation of migrant children, the Church as a religious educational mechanism, health saving customs and traditions, the interaction of family and school in matters of ethnopedagogical education.

Developing the methodology of ethnopedagogical research on scientific level we generalized and systematized methodological aspects of this study and gave a detailed description of

its implementation. Among these aspects are regularities of ethnopedagogical knowledge:

1) all natural and social phenomena represent a single historical process of evolutionary self-movement of substance;

2) educational customs and traditions preserve rational models of adaptation of the children to the ambient conditions;

3) their specificity, due to climate conditions and landscape, strengthened the ethnopedagogical education.

The forms of ethnopedagogical knowledge include everyday, gaming and personal knowledge and folk pedagogy.

The national educational space can be distinguished as a specific factor of ethnopedagogical research. It includes climate, geography, social and cultural environment, worldview, axiological views and stereotyped behaviour, information and bioenergetic field of a person.

The characteristics of ethnopedagogical theory are the following ones: generality, abstractiveness, systemacy, consistency, credibility, generalization of factual material, penetration into the essence of national customs and traditions, continuity of the positive experience, integrity, complexity.

Implementation of ethnopedagogical research involves organization, control, monitoring, projecting, verification.

To the organization of such a research the following approaches can be applied: system, situational, process, strategic, creative. Research is carried out at the preparatory, exploratory proper and final phases. Reflection of the object and subject in the forms of schemes, figures and tables can be used as a tool. There are the following stages of study management: analysis, prognostication, planning, fulfilment, control, monitoring, correction.

As a result of projecting in the ethnopedagogical studies a variety of educational technologies develop: theoretical (manual, tutorial, study guide), technological (methodology, program), technologies of development (ethno-cultural, multicultural and so on), technologies of upbringing (spiritual

and moral, intellectual, labor, family, physical, health-saving, aesthetic, emotional, artistic etc.), technologies of training (classical, using technical facilities, using the manual, group, differentiated, individual). According to orientation on the personality structure educational technologies are divided into heuristic and applied; according to stylistic characteristics of the teacher – person-oriented, human-centred, didactic, complex, penetrating. Towards modernization several groups of such technologies are singled out: on the basis of revival of ethnic and cultural mechanisms of training and education; strengthening and intensifying of traditional types of training and education (game, folklore, folk art, applied art, sports, health-saving techniques), efficiency of organization and management of the teaching process (the traditional mechanisms of competition, subordination of junior to senior and respected members of society, responsibility for the family, kin and others), ethnonational technologies of the differentiated, individual study, technologies on the basis of methodological improvements and didactic reengineering of the educational material, nature-aligned, those using methods of folk pedagogy.

The procedure of verification of ethnopedagogical project-based activity unites target-oriented observation and experiment. The latter includes theoretical, methodological, experienced, analytical stages and can be natural, laboratory, long, short, forming, transforming, insulating, control.

We believe that conclusions made in our work are useful for pedagogical science. As a result of scientific analysis of trends of ethnopedagogical knowledge, we drew a conclusion that it is developing according to a consistent accumulation of methodological potential, expansion of the source base, increasing understanding of folk pedagogy, methodological shift from the analysis of ethno-cultural educational traditions and customs to the theoretical basis of the ethnopedagogics, strengthening of the interdisciplinary character of the ethnopedagogical knowledge.

THE STUDY OF THE CONSISTENT PROPERTIES OF GLYCEROGEL CONTAINING ST. JOHN'S WORT

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A study of consistent properties of glycerogel based on St. John's wort tincture has been performed using «Rheotest-2» rotational viscosimeter. It has been revealed that the analyzed properties of glycerogel characterize the system as being thixotropic providing recovery of glycerogel after stress. Values of mechanical stability equal to 2,6 and coefficient of dynamic flow ($Kd_1 = 34,64\%$; $Kd_2 = 72,58\%$) is an evidence of quantitative confirmation of satisfactory degree of system distribution on application on skin and mucosal surfaces as well as during technological stage of preparation. The revealed hysteresis loops are an evidence of thixotropy of studied glycerogel. This characterizes good spreading and extrusion properties. It also confirms prevalence of reversible thixotropic bonds capable of restoration after system destruction. It is revealed that increase in temperature leads to appropriate reduction of all the consistent properties of the analyzed glycerogel. The obtained information allows make a prognosis of storage conditions of elaborated glycerogel based on St. John's wort tincture.

Keywords: St. John's wort tincture, consistent properties of gel, thixotropy, dynamic viscosity, hysteresis loops, mechanical stability

Rheological properties directly affect quality, stability, as well as therapeutical and consumer properties such as release of drug substance from ointment base, comfort and easiness of application, packagability and extrusion from tube. The process of application and distribution of ointment on the skin and mucosal surfaces is analogous to the process occurring during the shear of visco-plastic material in rotational viscosimeter, whereas spent effort is consistent to tension of shear characterizing resistance of a material to shear deformation on certain speed measured with instrumental methods [1, 2].

Considering the aforementioned, evaluation of consistent properties is important and necessary part of research on creation of soft pharmaceutical forms [3, 4, 5].

The faculty of pharmaceutical form technology of the Tashkent Pharmaceutical Institute lead a study on creation of glycerogel based on St. John's wort tincture. The aim of the research is evaluation of consistent properties of the developed gel composition.

Materials and methods of research

For evaluation of the consistent features a gel of St. John's wort tincture on hydrophilic base (sodium carboxymethylcellulose glycerogel) was used. This properties were studied with a «Rheotest-2» rotational viscosimeter using a cell consisting of coaxial cylinders S/S2 with a constant $Z = 8,06$. For this a batch of glycerogel was placed into measuring device and was kept in thermostat for 30 min keeping temperature constant. Considering hot climate of the republic, three temperature levels were used during the study – 25, 40, 55°C. Then the cylinder in the measuring device was rotated using twelve increasing speed of shear levels and each reading of indicator device was noted. Destruction of glycerogel structure was achieved with rotation of the cylinder on the maximal speed for 10 min. Then the rotation was stopped for 10 min and readings at each of twelve speed of shear level was noted on its reduction. On the basis of obtained results maximal tension of shear and effective

viscosity was calculated and the rheograms of glycerogel flow were composed.

Tension of shear (τ) was calculated as follows:

$$\tau = Z \cdot \alpha,$$

where τ – tension of shear, Pa; Z – cylinder constant equal to 8,06 Pa; α – reading of measuring device.

Effective viscosity was calculated as follows:

$$\eta = \frac{\tau}{\gamma},$$

where η – effective viscosity, Pa·s; τ – tension of shear, Pa; γ – gradient of shear flow velocity, s^{-1} .

Mechanical stability (MS) was calculated as follows:

$$MS = \frac{\tau_1}{\tau_2},$$

where τ_1 – limit of durability of intact structure; τ_2 – limit of durability of destructed structure.

A separate series of experiments performed quantitative evaluation of glycerogel flow containing St. John's wort tincture. During the experiments the aforementioned «Rheotest-2» rotational viscosimeter with cylindrical device was used and viscosity of glycerogel was determined using the speed consistent to the speed of spread of pharmaceutical form on the skin surface and mucosa (shear velocity 3,0 and 5,4 s^{-1}). Also, velocity of technological processing (shear velocity 27,0 and 145,8 s^{-1}) was estimated with subsequent calculation of coefficient of dynamic flow of glycerogel [6]. In addition, a dynamic viscosity and its dependence on temperature was determined.

Results of research and their discussion

The relation of effective viscosity to shear velocity for glycerogel on 25, 40, 55°C temperature levels is demonstrated in Table.

The results show the increase of maximal tension of shear and decrease of effective viscosity with increasing deformational forces. This suggests presence of structure in the studied sample of glycerogel.

Fig. 1 and 2 characterize change of effective viscosity logarithm ($\ln \eta_{\text{eff}}$) in relation to gradient of shear flow velocity (γ) and dependence of gradient of shear flow velocity on tension of shear (τ) for studied glycerogel on 25, 40, 55°C temperature levels.

The results of determination of maximal tension of shear and effective viscosity for glycerogel containing St. John's wort tincture

| Velocity gradient, s^{-1} | Tension of shear, Pa | Effective viscosity, Pa·s | Tension of shear, Pa | Effective viscosity, Pa·s | Tension of shear, Pa | Effective viscosity, Pa·s |
|-----------------------------|----------------------|---------------------------|----------------------|---------------------------|----------------------|---------------------------|
| | Temperature 25°C | | Temperature 40°C | | Temperature 55°C | |
| 1 | 88,66 | 88,66 | 64,48 | 64,48 | 48,36 | 48,36 |
| 1,8 | 112,84 | 62,69 | 80,60 | 44,78 | 64,48 | 35,82 |
| 3 | 137,02 | 45,67 | 88,66 | 29,55 | 72,54 | 24,18 |
| 5,4 | 161,20 | 29,85 | 104,78 | 19,40 | 88,66 | 16,42 |
| 9 | 185,38 | 20,60 | 120,90 | 13,43 | 104,78 | 11,64 |
| 16,2 | 201,50 | 12,44 | 137,02 | 8,46 | 112,84 | 6,97 |
| 27 | 217,62 | 8,06 | 161,20 | 5,97 | 128,96 | 4,78 |
| 48,6 | 249,86 | 5,14 | 193,44 | 3,98 | 161,20 | 3,32 |
| 81 | 282,10 | 3,48 | 225,68 | 2,79 | 185,38 | 2,29 |
| 145,8 | 322,40 | 2,21 | 265,98 | 1,83 | 233,74 | 1,60 |
| 243 | 370,76 | 1,53 | 306,28 | 1,26 | 274,04 | 1,13 |
| 437,4 | 403,00 | 0,92 | 354,64 | 0,81 | 330,46 | 0,76 |

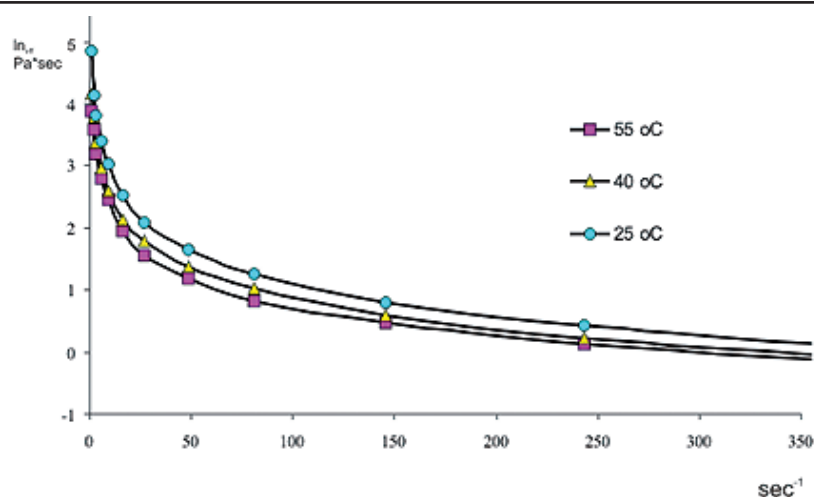


Fig. 1. Relation of effective viscosity logarithm to velocity gradient of shear flow for glycerogel containing St. John's wort tincture

Fig. 1 demonstrates that increase of gradient of shear flow velocity, i.e. velocity of deformation leads to reduction of viscosity of solutions till a certain point: $\gamma \sim 250 s^{-1}$. Further, the graphs practically do not change. The increase in temperature shifts the graphs to the area of smaller readings of viscosity.

The change of viscosity to $\gamma \sim 250 s^{-1}$ characterize destruction of primary structure of glycerogel in result of disruption of intermolecular (intercomponent) bonds (nonchemical, i.e. hydrogen, ionic bonds, etc.). Stabilization of fluidity ($1/\text{viscosity}$) at $\gamma > 300 s^{-1}$ indicate establishment of intermolecular bonds of the level at which they do not influence system viscosity.

Fig. 2 allows estimation of hysteresis taking place in direct and indirect change of velocity gradient in relation to tension of shear.

The width of hysteresis loops is a relative estimate of degree of structureforming processes which increase its stability [7]. The area of hysteresis loops narrows down with increase of temperature. This is determined by increased thermal motion of the components, i.e. diminished interaction of the components in the sample. Meanwhile, the shift of hysteresis loops to the smaller values of velocity gradient and tension of shear determined by reduction of viscosity of glycerogel samples with increasing temperature.

Presence of hysteresis loops is an evidence of thixotropy in a studied glycerogel which characterizes good spreading and extrusion properties. Moreover, it can be concluded that reversible thixotropic bonds, which can reestablish after destruction of system, are prevailed in the studied glycerogel.

In the result of research a value of mechanical stability is calculated to be 2,6. This also indicates that the studied glycerogel possesses high thixotropic properties and allows com-

plete restoration of the structure after applied tensions occurring during the technological process of production of current pharmaceutical form.

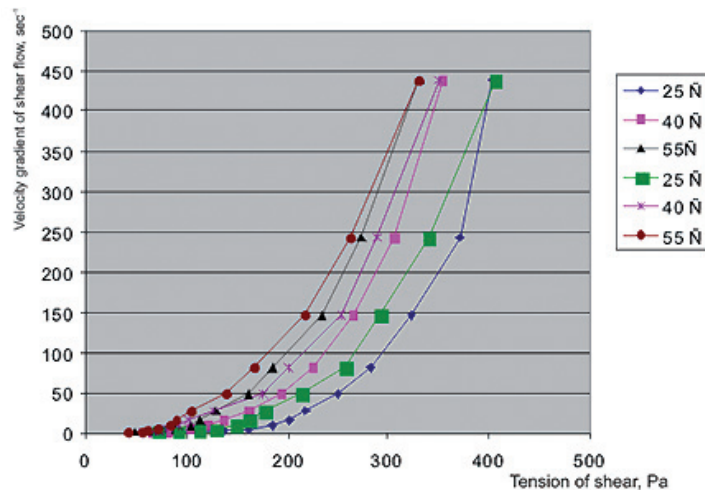


Fig. 2. Relation of velocity gradient of shear to tension of shear

The estimated coefficient of dynamic flow of glycerogel at temperature 25°C ($Kd_1 = 34,64\%$; $Kd_2 = 72,58\%$) is an evidence of quantitative confirmation of satisfactory degree of system distribution on application on skin and mucosal surfaces as well as during technological stage of preparation.

To estimate dynamic viscosity values extrapolation of velocity gradient to zero was performed in a separate series of experiments tak-

ing into account available data on temperature influence on consistent properties of ointments.

Fig. 3 demonstrates that increase of temperature leads to decrease of all rheological properties of glycerogel. For example, reduction of temperature 1,6 and 2,2 times entails decrease of dynamic viscosity values 1,78 and 2,39 times respectively. The data obtained allows to make a prognosis on storage conditions of elaborated pharmaceutical form containing St. John's wort tincture.

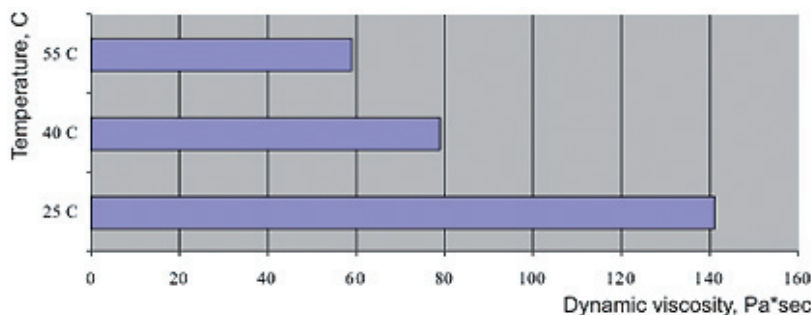


Fig. 3. Relation of dynamic viscosity of glycerogel containing St. John's wort to temperature

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A SURVEY OF THE PRACTICES OF CAMBRIDGE LANGUAGE ASSESSMENT

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This paper presents a survey on the practice of the development of English language assessment. Since a certain attainment from international English language assessment tests has become one of the requirements, not only for people who want to enter a foreign college or university but for other educational institutions in non-English speaking countries, it is important for English teachers from those countries to understand how ESL tests are built and how the knowledge of the language is assessed. Cambridge English Language Assessment (CELA) is the main organisation which develops ESL tests and has experience leading back 100 years. Its language tests are used in approximately 130 countries. Nevertheless, there is the question how CELA organises its work on language test development, and how it administers and introduces tests into practice. This paper attempts to give a survey of CELA language assessment practice. The data used in this paper are based on studying the historical background of CELA and its research activity in creating tests. In conclusion, the survey shows the main points English teachers should consider in creating tests, and the result of the survey can be useful for developing national test standards in Kazakhstan as well.

Keywords: CPE, EFL, Cambridge ESOL, CELA

The first Cambridge English examination for non-native speakers was taken by three candidates in 1913. Today, the exams are taken by nearly four million people a year in 130 countries and cover a wide range of needs, from English for young learners to specific qualifications for university entrance and professional use... They have benefited from – and contributed to – research in education, language learning and assessment to ensure that they offer valid, reliable and fair qualifications [2].

Cambridge English Language Assessment (CELA) has a deep history. Its activity is directed towards being professional in creating and providing language tests of all ranges and levels. In the portfolio of CELA, nowadays, there are tests in eight fields such as English for young learners, general English, academic and professional English, Business English, European languages, teaching qualifications for new teachers, teaching qualifications for experienced teachers, and special diploma tests for teachers [10]. Working out various tests by CELA is evidence of systematic work in the purpose of attaining an excellence in developing language tests. This makes a person, who is interested in language tests and language teaching, think how CELA develops its tests, and why its tests have the confidence of users of tests. People who are involved in English language assessment examinations or preparation literatures to those examinations can come across different abbreviated names in this field. To give precise understanding it is worth starting by giving a brief survey about the history of CELA. In the course of this paper, so as not to confuse readers the abbreviation CELA is used to explain examination types and activities prepared by the organization for both past and recent periods. CPE (Cambridge Proficiency

Examination) was introduced by UCLES (the University of Cambridge Local Examinations Syndicate) in 1913[3]. CPE tests were created by EFL (English as a Foreign Language) department within the UCLES. The name of EFL was a traditional label name. Then EFL was replaced by Cambridge ESOL (English for Speakers of Other Languages). Peter Falvey, in his paper on the history of Cambridge Language Examinations, says: «This was a traditional form of labelling until relatively recently when the concept of EFL was superseded by the label ESOL. ESOL is a more generic label than EFL as it encompasses not only those candidates for whom English is a foreign language, such as a Mandarin speaker, but also those for whom English might be a second, or other language, like someone from the Commonwealth for whom English is a second language but who also uses English as a third (other) language. This change was reflected in the re-naming of EFL Examinations to Cambridge ESOL in 2002» [1].

From the resource «Research Notes», the regular publication resource for CELA research activities, we can refer to the same statement in respect to the change of the name of the organization: «From October 2002 UCLES EFL will officially become «Cambridge ESOL Examinations». UCLES EFL is adopting the title Cambridge ESOL for all of its activities. The full title of the EFL division of the UCLES group will change to «University of Cambridge ESOL Examinations». The change of identity is recognition of the broader needs and backgrounds of learners and teachers throughout the world, and the many different reasons for which they take the examinations» [4]. The change of the name is connected with the widening of the activities of the organization on

test developments for the countries where English language is a third language. CELA, which is used in the course of this paper, is a current name which replaced Cambridge ESOL due to a centenary anniversary revision of the organisation's activity. «2013 is the 100 year anniversary of Cambridge English exams. Coinciding with this important milestone, we are also changing our name to Cambridge English Language Assessment. We are changing our name to make it easier for people to understand what we do. Over 4 million candidates a year take Cambridge English exams around the world. This enormous growth reflects how English has evolved into a key skill, and how our exams focus on the real-life communications skills candidates» need for success at university, in the workplace and for immigration [11].

It is seen from the historical background there are three labelling names of the English language assessment organisation: EFL, Cambridge ESOL and CELA. Examinations offered by CELA are widespread. The first one was called CPE. The examination was based on grammar method. Weir characterises the

tests according to archive copies of CPE (Cambridge Proficiency English) tests as following: «The examination was academic in orientation and initially modelled on the traditional, essay-based, native-speaker language syllabus including an English literature paper, an essay, and also a compulsory phonetics paper with a grammar section, and translation from and into French and German. There was also an oral component with dictation, reading aloud and conversation» [8]. These tests set goals for colonial people who wanted to study in Britain [3]. The primary two-dimensional tests (written and oral) provided by CPE are the core basis of modern differentiated test models. About this Weir states that «Its multidimensionality is testimony to an eclectic approach to language testing that was to survive to this day [8]. «The CPE examination tests were changed in their structure and tasks throughout their development. Here five main formats of examination tests are given. These examination formats are illustrated in the paper by Weir «A survey of the history of the Certificate of Proficiency in English (CPE) in the twentieth century» [8]:

| | | |
|---------|--|-----------|
| Written | (a) Translation from English into French or German | 2 hours |
| | (b) Translation from French or German into English, and questions on English Grammar | 2,5 hours |
| | (c) English Essay | 2 hours |
| | (d) English Literature | 3 hours |
| | (e) English phonetics | 1,5 hours |
| Oral | Dictation | 0.5 hour |
| | Reading aloud and Conversation | 0,5 hour |

The Test Format 1. 1913 Examination

A survey of the history of the Certificate of Proficiency in English (CPE) in the twentieth century» [8], page 2.

| | | |
|---------|--|-----------|
| Written | English Literature | 3 hours |
| | General Economic and Commercial Knowledge | 3 hours |
| | Translation from English (2 out of 3 passages) | 2 hours |
| | Translation from into English (2 passages) | 2 hours |
| | English Composition | 2,5 hours |
| Oral | Dictation, Reading aloud and Conversation | |

The Test Format 2. July, 1938 exam

A survey of the history of the Certificate of Proficiency in English (CPE) in the twentieth century» [8], page 6.

| | | |
|---------|---|--|
| Written | (a) English Literature (alternatively a general English paper was offered for overseas centres which were unable to obtain the texts prescribed for the Eng.Lit.paper) or Science Texts or English Life and Institutions or Survey of Industry and Commerce | |
| | (b) Use of English or Translation from and into English | |
| | (c) English Language (composition and a passage of English with language questions) | |
| Oral | Dictation, Reading aloud and Conversation | |

The Test Format 3. *1953 paper*

A survey of the history of the Certificate of Proficiency in English (CPE) in the twentieth century» [8], page 9.

| | |
|---------------------------------|--------------------|
| PAPER 1 Composition | 3 hours |
| PAPER 2 Reading Comprehension | 1,15 hour |
| PAPER 3 Use of English | 3 hours |
| PAPER 4 Listening Comprehension | 30 minutes |
| PAPER 5 Interview | Approx. 12 minutes |

Test Format 4. *Content of the 1975 Certificate of Proficiency in English*

A survey of the history of the Certificate of Proficiency in English (CPE) in the twentieth century» [8], page 26.

| | |
|---------------------------------|-------------------|
| PAPER 1 Reading Comprehension | 1 hour |
| PAPER 2 Composition | 2 hours |
| PAPER 3 Use of English | 2 hours |
| PAPER 4 Listening Comprehension | Approx.30 minutes |
| PAPER 5 Interview | Approx.20 minutes |

Test Format 5. *The 1984 Revision*

A survey of the history of the Certificate of Proficiency in English (CPE) in the twentieth century» [8], page 33.

The first two Test Formats are close to each other in their task varieties. Slight changes in the second Format are explained as a facilitation of test tasks for the purpose of spreading tests overseas countries as that period coincided with the war time in Europe. «By 1939 the CPE was offered in 30 countries» [8]. Another interesting fact is mentioned by Weir (ibid.) referring to Taylor: «With the outbreak of the WWII entries declined, not picking up again until 1943 when the official figures record 861. The majority of candidates in Britain in this year were members of the Allied Forces». About the decline and increase of test takers during that period Falvey states as follows: In 1923 there were 13 candidates; 15 years later there were 675, of whom 212 sat the CPE overseas. By the end of the Second World War, in 1945, the number of candidates was fewer than in 1928 but overseas candidature had increased to 972. By 1960, there were almost 8,000 candidates, growing steadily until 1980 when there were almost 20,000, a figure which had more than doubled by 2001 to 48,514 [1]. «Replacement of *Literature to General Economic and Commercial Knowledge* was evidence that these tests were taken by students and end-users» [8]. Phonetics was withdrawn from the task list because the knowledge of phonetics was not required by any organizations which required Language Certificates [5]. However, as can be seen from the Test Formats, the time allocated remains without changes. The third Format differs from the previous ones with an introduction of a newly emerged test task *Use of English*. Time allocation was reduced by up to 9 hours as well. *Use of English* was offered

as an alternative to Translation task, i.e. candidates were able to choose one of them. Weir notes: It starts with a reading passage with short answer questions, and then a sentence reformulation task, a task requiring recombining sentences into a more coherent paragraph, a task involving knowledge of how punctuation can change meaning, an editing task, a descriptive writing task and finally a task testing knowledge of affixes [8]. In addition, it is seen from the first three Formats and description of *Use of English* by Weir that test tasks of that period were based on grammar translation and structural approach in linguistics which, it is known, were basic theories in the sphere of language teaching. In the case of the last two Test Formats – Test Format 4 and 5 – it is obvious that language testing approach was totally changed in both task types and allocated time. Relating to the characteristics of tests [8], in his survey paper, divides test development periods into 3 stages corresponding to research work on test characteristics done by other researchers: «...historical survey examined the influence of the Oral – Structural – Situational Approaches to English language teaching that emerged in the United Kingdom between 1921 and 1970. The 1920s saw the birth of «structural linguistics» that was to have a powerful and long-lasting influence on the theory and practice of language teaching for the next 50 years». Weir continues, «Finally, the authors traced the effects of the communicative movement (1971–2012) on Cambridge English examinations. In the 1970s and 1980s we can determine a gradual shift in the United Kingdom away from structural approaches to language

teaching towards approaches that involved using language as a means of communication. This takes us into Stage 3 of the historical survey: Communicative Approaches to Language Teaching and Testing [9].

Falvey [1] makes a similar statement: «The work of N. Chomsky in Linguistics, J.R. Firth in Applied Linguistics, and D. Hymes and M.A.K. Halliday in Sociolinguistics began to focus on language and, in particular, language in use, rather than the study of language as a system». According to the statements done by researchers of the history of English examinations, it becomes clear that the CPE test developments were affected by the theories in linguistics. The other issue, which concerned test developers and researchers who were interested in the history of the test development are issues such as validity, reliability, objectivity, fairness, etc. About test qualities, Spolsky [7] remarks that these test questions are evidence that there is *no place for objective questions*. Here, Weir, supporting the remark by Spolsky, says that «there is no surprise as examinations were focused on literature and translation». As well, this was noted in the research work of Falvey [1]; «... marking should be, first of all, objective, not liable to the whims of individual examiners, and secondly, reliable, in that the results obtained in one test by a candidate should, on the whole, be replicated in a further test with an allowance for further learning, natural development and so on». If, to refer to Saville's work on «*The Process of test development and revision within UCLES EFL*» (Saville, 2003), it is seen that by CELA's discussion result about test usefulness «*four main examination qualities: validity, reliability, impact and practicality must be achieved*». Concerning earlier tests, Falvey [1] also commented that «two other concepts were embraced and became important in creating and developing examinations in English. They are «impact» and «practicality». These concepts consider how practical, useful and ethical an examination is». In pursuing the creation of useful tests, keeping in mind test results, examiners» comments, CELA has made use of a clear approach in developing its language tests. The usefulness of the tests is characterized as a main reason to revise tests continuously. Nowadays tests, developed by the Research and Validation Group of CELA, are worked out in accordance with these approaches. These approaches have developed not only the test quality but examination types are also a result of these approaches. The first examination, as it is seen in the course of this paper, was CPE. FCE (First Certificate Examination) or it is also called as LCE (Low Certificate Examination and KET (Key English Test) or PET (Preliminary English Test) occurred in

the course of test development and, particularly, in this case the reason why these examinations took place, was tied to creating tests for a wider audience. On the other hand, to increase the number of test takers was also of great interest. These tests aimed to define the general language level of test takers. Falvey comments about the examination types as follows: A lower examination in English proficiency, the First Certificate in English (FCE) was created on the eve of the Second World War. It was originally named the Lower Certificate in English [1]. As well as commenting on the structure of the test he says (ibid.): «The First Certificate contains five papers with a similar format to the CPE. The use of the title «First Certificate» did not rule out the development of lower forms of an English proficiency test, as new names for lower-level examinations, such as Preliminary English Test 1980 (PET) and Key English Test 1994 (KET), were created and are now in common use». Relating to the reason why these types of examinations took place, Falvey comments in his work as follows (ibid.) «Newer ESOL examinations grew even more rapidly in those years. This is not because the CPE was less attractive to candidates and their teachers, but because it is a difficult examination. It sets a high standard of proficiency, one that is not appropriate for everyone's needs».

There are three other big batches where CELA examinations can be clustered according to their intended audience. In the second half of the last century, demand for the certificate in relation to the university degree programmes lead CELA to work on creating tests for academic purposes. Falvey [1] «To test and find appropriate level of English for university degree programmes a suite of examinations were developed during 1966 and 1980». This fact is cited by O'Sullivan [3] as follows: «By the early 1980, test developers in the UK began to explore the possibility of creating tests of language for specific purposes and developed with ELTS (the English Language Testing Service), which soon became IELTS (International English Language Testing Service). The renaming of ELTS to IELTS was caused by the reason that CELA develops this test in collaboration with the British Council and with the International Development Program of Australian Universities and Colleges [1]. Increase in the sphere of business collaboration is also reflected by its influence on developing new tests which define appropriate language level for the commercial field. BEC (Business English Certificates) and BULATS (Business language Testing Service) were introduced in 1993 and 1998 respectively. In respect of the occurrence of these tests Falvey remarks: Worldwide demands for Business English tests

emerged in response to the growth of Business English Programmes throughout the world as English became the lingua franca for millions of people working in Business and commercial fields, and Human Resource managers, English teachers and course participants realised that neither general English course books nor tests from Cambridge's main suite were appropriate [1].

To the group of these tests it is appropriate to cluster ILEC (International Legal English Certificate), which was introduced not long ago in 2005. The purpose of this examination is to define the appropriate language level of lawyers. This examination is considered to be an internationally collaborated test. CELA works out these tests in collaboration with Translegal-Europe's leading firm of lawyer-linguists [1]. Finally, there is another group of examinations which is directed toward testing language teachers' qualifications. CELTA (the Certificate in English Language Teaching to Adults) and DELTA (the Diploma in English Language Teaching) are the examinations which meet the needs of test takers who want to teach the English language. CELTA is an initial Certificate while DELTA is a substantial diploma which allows those who seek promotion in their teaching career [1]. To this group the test of TKT (Teacher Knowledge Test) can be included as well. The purpose of this type of test is to test the teaching knowledge of English Language teachers [1].

CELA, as can be seen from the resources, is the main organisation working on language examinations and certificates. In this paper only the case of English language tests are considered. Starting its activity a hundred years ago, CELA has worked out its test structures and contents according to the principle

of usefulness. Validity, reliability, impact and practicality have enabled CELA tests to be further developed, and also facilitates CELA tests to be embedded both within and outside of the UK. Test tasks are worked out in the context of a communicative oriented approach. These factors allow CELA to create various tests that are able to test appropriate language levels for both academic and non-academic purposes.

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MEDIEVAL ALCHEMY – THE PREDECESSOR OF EXPERIMENTAL SCIENCE OF NEW TIME

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At each stage of the development of culture there are unique historical types of science. Alchemy is the phenomenon of medieval culture, the predecessor of the experimental sciences of the New Time. It is the result of the birth of the spirit of pragmatism. Greed has forced people to look for easy ways of enrichment. One such way seemed to be alchemy, which set the task of turning base metals into precious, lead into gold with the help of a special mediator, philosophers' stone (Latin: *lapis philosophorum*). The science of New Time has adopted some of the ideas, technical devices, and even technology of Alchemy. But in general, the idea of fast enrichment using traditional alchemy today is thrown aside. In our time, mankind has gone the other way.

Keywords: «Alchemy», «Science», «Middle Ages», «New Time», «Pragmatism», «Transformation», «Philosophers' stone», «Elixir», «Lead», «Gold»

Thinking of each era is peculiar. It takes different forms and contents at different times. And science is a historical product, the most important cultural phenomenon of its time. We are interested in medieval alchemy as a phenomenon with independent cultural value, and at the same time acting as a step in the history of science that led to the emergence of new scientific thinking.

It is well known that the world outlook of medieval Western European man was for the most part Christian, that church dogma was the starting point and the basis of all thought, that all forms of spiritual activity depended on theology, were its «maidservants», performing a supporting role. Spiritualist principles that lead man to the world of symbols and ideas and show him the way from the visible world of ordinary reality to the unseen world of angels and fallen spirits triumph in culture.

People in the early Middle Ages preserved to the great degree the momentum of the New Testament mysticism. Their first commandment was «Do not lay up for yourselves treasures on earth... but lay up for yourselves treasures in heaven...» [13, Mt. 6: 19]. Therefore, tens of thousands of people literally apprehended the evangelical ideal of poverty renounced all personal property and left the world, became hermits, monks, beggars, pilgrims, seeking first of all, «the kingdom of God» [13, Mt. 19: 23–24].

Gradually, however, in the life of Western European society certain changes begin to occur, the growth of cities, craft guild, the development of commodity-money relations come to the fore. The spiritual atmosphere of culture in which a person becomes a pragmatist changes as a whole, and his New Testament mysticism and asceticism becomes a mere bourgeois thrift. Spirit of practicality and greed supercedes and modifies the Christian ideals, and is becoming a major determining factor in the system of moral values of medieval man, both a layman and a priest of the Catholic Church [3]. Formally, all remains in their places, but

even now the salvation of his soul depends on the thickness of the purse, as the by widespread sale of indulgences evidences. People of all classes are increasingly starting to worry about when, where and how you can quickly and without much effort to get money to meet the ever-growing material and cultural needs.

Nature of alchemy

Against this background, in the late Middle Ages appears «devil» activity of alchemist unofficially recognized by members of that society as one of the easiest and the most convenient ways to get rich. Nature and purpose of medieval alchemical activity can be expressed in a very short formula: artificial transformation of base metals into precious. This problem was being solved on the basis of a number of ideas that were borrowed by the alchemists from the ancient teachings of the Miletian sages, Heraclitus, Democritus, Aristotle and were being interpreted in accordance with the general mood of the Christian era [4].

Alchemists borrowed two fundamental ideas from Greeks: first, they adopted the idea of existence of some primal matter, from which all five elements of nature (earth, water, air, fire, ether) come, and then the material bodies of this world, and second, the idea of cyclical development, variability of the space was being used. The transition from one substance into another or elements in each other was seen as a natural pattern. These thoughts of ancient philosophy fit perfectly into the context of medieval culture.

Christianity is not alien to the idea of the emergence of the world and beginnings of life on Earth from some primal matter, created by God, in which future five elements, as well as embryos of plant and animal life were mixed together and were not different yet. For example, Prophet Moses, speaking about genesis of cosmos, clearly says that at first the earth was «without form and void» [13, Genesis. 1: 2]. This point of view is also emphasized in the

book of Solomon Wisdom. According to the Hebrew wisest king and prophet, God created the world from «non-pictorial matter» [14, Wisdom. 11: 18].

The Antique idea of a possible transition from one substance into another in Christianity takes the form of the final transformation of the material beginning into spiritual. Godman Jesus Christ rose from the dead to spiritualize the whole nature of man. But since man is understood as a microcosm and the concentration of all the cosmic forces and elements of nature, so His transformation marked the beginning of transformation of the whole world, the whole cosmos, its transition to a higher stage of development.

The official position of the Church was to wait for this universal cosmic transformation by the Holy Trinity, God the Father, God the Son and God the Holy Spirit at the end of the centuries. But from the formal-logical point of view, it was impossible to exclude other possibilities, which are based on the activity of the person himself replacing the creative activity of God. The alchemy chose this path, placing itself in the category of semi-formal or even informal science.

The search of alchemists was originally aimed at identifying the substantial base of some three ideal first principles: sulfur, mercury and salt, the combination of which should have led to gold. However, later alchemists chose another path associated with the search for a particular intermediary substance – the philosophers' stone, allegedly possessing remarkable properties, some magical powers, the ability to manipulate the first principles of metals. R. Bacon, in his treatise «The Mirror of Alchemy» explained that if we added philosophers' stone to base metals, they would turn to precious metals [1, p. 864].

In the Middle Ages the production was of natural character, and therefore its product had the imprint of the master, manufacturing and consuming it. No wonder treatises of alchemists are full of a huge number of individual rules and recipes. Each alchemist had his own specific procedure of «great deeds», the creation of the alchemical god – the philosophers' stone. Science of New Time puts algorithm having the qualities of universality and necessity in place of individual recipes. No wonder New Time is the flowering of methodological problems, the creation of both inductive and deductive methods of cognition.

Theory of R. Bacon (1214–1294)

Of particular interest are the ideas of the English philosopher and naturalist R. Bacon. He developed his own theory of getting the philosophers' stone connected with the foundation

of experimental science as such. The thinker believed that the alchemist in his activity must imitate nature. In the XVII century, this slogan of the medieval scientist R. Bacon was taken by his namesake, F. Bacon, who developed an empirical inductive method of cognition. Therefore, Hegel said that the spirit of Bacon's philosophy was permeated with empiricism [6, p. 281–294].

Putting forward nature to the first place in scientific knowledge, R. Bacon emphasized that neither the authority nor the opinion or habit should serve as a guide to the alchemist's activity [3, p. 864]. However, the author stipulates that he does not criticize the unshakable authority of the Church, faithfully reproducing the idea of st. Augustine's about Church as a criterion of Truth. This thesis is confirmed in his teaching that the human sensual experience is insufficient in the empirical sciences.

According to R. Bacon, a mystical experience supplementing empirical is also needed. Experience is twofold. Empirical experience is acquired through the external senses, and the mystical comes through religious faith and divine inspiration [1, p. 864]. Thus, on the one hand, there is a persistent focus on the thing, on the research of nature in sensual experience. On the other hand, there is respectful adherence to ecclesiastical authority and a mystical experience [1, p. 874].

God creates the world, being of a second order, a lower reality, but closely connected with Him. He gives knowledge of the world through Revelation to man. Therefore, knowledge of the position of Church, Sacred Tradition and Sacred Scripture (the Bible) is a necessary condition for empirical cognition of the mysteries of nature. Reading the Book of Nature is only possible in the light of the books of the Bible or personal mystical enlightenment. Therefore, the main task of a medieval alchemist, scholar, poet, painter was to see the divine in the earthly, the earthly through the divine.

So medieval thinking is symbolic. Medieval man longs to see in the earthly – the heavenly, in the temporary – the eternal, in the created – the uncreated. After all, the essence of the symbol is to express one reality through another [8]. That is why in the alchemy there was identification of seven metals with seven planets. Any element on earth must correspond to some celestial body. If all the planets in the sky strive for the Sun as a source of earthly light, the metals in the world should strive for Gold, earthly Sun. The result was a series of correspondence: Gold – Sun, Silver – Moon, Copper – Venus, Iron – Mars, Lead – Saturn, Tin – Jupiter, and Mercury – Mercury.

Celestial analogy in the minds of the medieval practitioner of black magic is often

replaced by earthly analogies. So, John Isaac Goland in his treatise «About the hand of philosophers» finds a match between the chemical processes and the human hand. Cartography of celestial bodies he transferred to the human hand, which showed what to understand and what to do to the alchemist [12].

Such transfer of symbolism of the Heaven to the Earth was due to certain reasons. The main reason is antinomy of medieval thought. On the one hand, the Heaven had in hierarchy of Being a higher status than the Earth, because «in the beginning God created the heavens» [13, Genesis. 1: 1], and then the earth. On the other hand, the Earth was recognized as a center of physical space and place of evolution. It is there that God incarnated in Jesus Christ.

Symbolically-shaped, high-quality perception of reality by medieval alchemists was connected with systematic attempts to quantify natural phenomena. These attempts were based on the biblical thesis that the world was created by God by «the measure, number and weight» [14, Wisdom. 11: 21]. This implies the recognition of a large role of mathematics in the learning process. According to R. Bacon, its strengths lie in the fact that it combines rational evidence with sensual perception. Owing to this there can't be doubts in mathematics [1, p. 869]. Then mathematical derivations must be checked by the alchemist by experiment in practice. And it is natural for the alchemist because his theory should have led to practical results, to produce gold, which all the society longed for. However, the ultimate criterion of truth was not even in the experiment, but in Holy Scripture and Holy Tradition. Any attempts to change the paradigm of thinking were painfully perceived.

The fate of the alchemy

The alchemists in search of the philosophers' stone, made a number of important scientific discoveries. They studied the properties of a variety of things, a lot of ways of influencing them, carried out the obtaining of various alloys and chemical compounds, acids, alkalies, mineral paints, created and perfected equipment and installations for the experiments: alembic, chemical furnaces apparatus for filtering and distillation [15, p. 449].

Apart from alchemy, which belonged to the category of informal science in the medieval culture, seven liberal arts (grammar, dialectic, rhetoric, arithmetic, music, geometry and astronomy) developed in the educational system. Theology was considered the most important science. Nevertheless, the medieval alchemists' call to experimentally investigate the nature was later heard by F. Bacon, and was realized in the science of New Time.

Experimental science of New Time

Experimental science of New Time, with its orientation to nature, to things themselves, is the product of a different culture. It is a product of the «spirit of capitalism» (M. Weber), the spirit of profit and entrepreneurship of the bourgeois culture and the capitalist mode of production. The basics of this culture are the capitalist commodity-money relations. These relations start to dominate. They are accepted as independent, supposedly defining all relations in society [10]. Hence scientific thinking assumes the character of commodity relations. Therefore, the main task of cognition leads to the study of relations of things existing independently of man. The consequence of this is the appeal to experience, experiment to find out how things themselves behave. The call of F. Bacon to do experiments was taken up by society. Hence the teaching of F. Bacon and other philosophers of New Time about the empirical method of learning developed.

Another reason for the birth of New Time science is the change of technological process labour. Labour process is being transformed from personal art of the medieval craftsman to the algorithm and becomes a formal sequence of actions. Labour skills turned into abstract operations, which are then transmitted to machines. Knowledge is reduced to the study of properties and relations of natural bodies for the purpose of using knowledge in material production. You must assess the theory «by the fruit – says F. Bacon – and consider fruitless which is barren» [2, v. 2, p. 38].

Thus, the experimental science of New Time dialectically «removes» preceding medieval science that focuses on the study of various supermaterial entities controlling nature and man. The analysis of properties of natural objects existing by themselves and acting as objects of practical operating in material production – a symbol of the power of man, having replaced the «dead» God becomes the purpose of scientific knowledge. Science of New Time, according to A.F. Losev, was to increase the power of man on earth, «work wonders and stun all living by its own methods» [7, p. 495–496], skillfully manipulating nature and man. At that time the whole meaning of life was seen in the fact that «scientific and technological means create and transform the whole nature like God» [7, p. 492]. And all the major philosophers and scientists of that time had to solve this problem in their own way.

Conclusion

In our time, the belief in the limitless possibilities of science has historically compro-

mised itself. Science is not the only form of cognition of the world, which gives a person the necessary knowledge. It does not study being in its general forms and can not determine its ultimate meaning. In search of world outlook grounds one should turn not to science but to religion, philosophy and art. Scientific knowledge can only be an important auxiliary material. Science gives the «facts», and philosophy and religion explain them, each in their own way. Only together with the ordinary, artistic, mythological, religious and philosophical knowledge, science can help a person to develop a holistic picture of life and point out the place of man in it. Finally, it can not lead a man in his private life, can not know the inner strength of the human soul and human relations. Science itself is constantly in need of guidance. Therefore, the words of K. Marx «then natural science will include the science of man in the same extent that the science of man will include natural science: it will be one science» have not lost relevance.

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THE MEANS OF PRODUCTION OF POTASSIUM PERMANGANATE THROUGH CALCIUM PERMANGANATE

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Permanganate is produced from the existing lean ores for which the cheap carbonate ores are used and which are not of the deficit in the Russian Federation. A lot of studies were taken and was chosen the liquid phase process with using the gaseous chlorine as an oxidant. To maintain the neutral pH the carbonate ore contains carbonate of calcium, which acts as a buffer in the liquid phase chlorination of the carbonate ore. At 400-800C temperature the ideal conditions are made for chlorine hydrolysis with producing the hydrochloric acid (HCl) and hypochlorous acid (HOSl). The weak hydrochloric acid reacts with the calcium carbonate (CaCO_3), and in these conditions HOSl oxidizes manganese oxide IV (MnO_2) to $\text{Ca}(\text{MnO}_4)_2$. The liberated CO_2 promotes the oxidation of the unstable manganese salt due to the other with direct production of $\text{Ca}(\text{MnO}_4)_2$ and MnO_2 .

Keywords: dioxide of manganese; chlorine; potassium permanganate; calcium carbonate

Potassium permanganate has a reasonable industrial significance. Its facilitation is based upon oxidation characteristics; KMnO_4 is used as a rective for permanganatometry, revealing dual links, synthesising glycols, oxides, aldehydes and ketones, saccharin. Potassium permanganate is also used for bleaching variuos materials, in processes of synthesising and analysing organic substances, colorants. It is

known that it is facilitated as an indicator of polymerization, in production of catalysts, air cleaning, pyrotechnics, antiseptic medications, oxidising «caps» of nanotubes [1–2].

Historically the first method of receiving potassium permangant [3] is synthesising potassium manganate (VI) from polianite and alkali in reaction with oxygen and baking on the air:



Then the received alloy is lixiviated with water, and transformation of manganate into permanganate takes place in the received alkali solution. Stage of transforming manganate into permanganate can include:



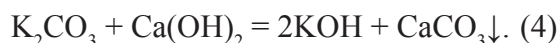
2. While processing CO_2 solution the process of disproportioning acceler-

1. Boiling the solution – formation of potassium permanganate takes place as a result of disproportioning manganate (VI) according to equation of reaction:

ates, the reaction takes place according to equation:



Due to formation of MnO_2 the process is unfavourable and it is necessary to regenerate KOH from the formed potash according to the reaction:



3. Oxidation of manganate with chlorine according to reaction:



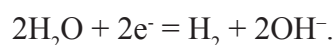
is also unfavourable due to losses in potassium as KCl, regenerating KOH form them via electrolysis requires a lot of resources. Therefore, electromechanical method of transforming manganate into permanganate is being developed.

Nowadays a technology of receiving potassium permanganate through a combined (two-stage) method is generally accepted [4]. Polianite is mixed with KOH abd exposed to alloying in baking pots at the first stage, the reaction takes place according to equation (1).

The received allow is lixiviated, and the received solution is exposed to electrolysis at the second stage. At the same time, ion MnO_4^- is oxidized on anode:



and alkali and hydrogen are formed on katode:



Final equation:



Crystals $KMnO_4$, formed on electrolytic cell, are discharged, washed, and exposed to re-crystallization, and then dried and packed [3].

The described combined technology of receiving potassium permanganate has the following disadvantages: long duration of alkaline alloying, low output of potassium manganite, high energetic costs. Therefore, works on improving production process have been undergoing constantly, their objective is to decrease energy costs and increase product output.

One-stage technology of receiving potassium permanganate from manganese dioxide has been suggested by an author of American patent [5]. This technology consists of electromechanical oxidation of MnO_2 suspension in solution of potassium hydroxide with implementation of katode in porous container and high concentration of alkali (10–25 mole/dm³) inside the container. The method has been suggested for regenerating permanganate in alloying baths and is described by a great consumption of electric energy (14 kVt·hr/kg) that exceeds energy consumption (0,7 kVt·hr/kg) of the combined technology. The listed methods testify for a continuous search in the studied area that is linked to developing methods that provide for a complete facilitation of raw material (transforming a greater part of initial materials into the product) and increase in product output.

Dozens of patents are known. One-stage technologies are being developed. However, only one method is used in industry – electromechanical oxidation of potassium manganate (IV).

Disadvantages of the existing method of receiving potassium permanganate:

1. Long duration of the process of alkaline manganate alloying. This stage continues for no less than 24 hours.

2. Insufficient output of potassium manganate (VI) during the stage of alloying – no more than 60%, and, therefore, greater consumption of raw materials.

3. The process of producing $KMnO_4$ includes many operations with a powerful alkaline solution.

4. Potash is formed in case of continuous contact with air, and therefore, a necessity to regenerate alkali emerges. During caustification of potash with quicklime – CaO or slaked lime – $Ca(OH)_2$, consumption equals 0,7 t (in calculation to 100% of CaO) per ton of permanganate.

5. High specific consumption of energy – 1383 kJoule/mole of permanganate. Therefore, development of methods that possess improved characteristics is reasonable [1].

The objective of this work is to receive permanganates of the existing impoverished ores, cheap carbonate ores that are commonly present in Russia, have been used for this purpose. As a result of numerous exams, we have defined liquid-phase process with facilitation of gaseous chlorus as an oxidant. In order to maintain nearly neutral pH of the solution, carbonate ore contains calcium carbonate that serves the purpose of buffer during liquid-phase chlorination of carbonate ore. Perfect conditions for chlorus hydrolysis with receipt of HCl and $HOCl$ are created under temperature 40–80°C. A weak hydrochloric acid interacts with $CaCO_3$, and $HOCl$ oxidates MnO_2 to $Ca(MnO_4)_2$ in these conditions. The discharged CO_2 provides of oxidation of one unstable manganese salt by another with a direct receipt of $Ca(MnO_4)_2$ and MnO_2 .

Chemism of the process is represented as:

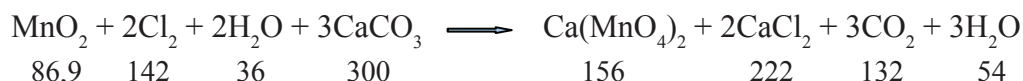


Table 1

Composition of manganese ore

| Composition of manganese ore | Mass, g | Percent contents, % |
|------------------------------|---------|---------------------|
| MnO_2 | 10,72 | 10,72 |
| Mn_2O_3 | 0,42 | 0,42 |
| $CaCO_3$ | 77,05 | 77,05 |
| Fe_2O_3 | 3,73 | 3,73 |
| Al_2O_3 | 1,19 | 1,19 |
| SiO_2 | 4,75 | 4,75 |
| $MgSiO_3$ | 2,14 | 2,14 |
| Total: | 100 | 100 |

Composition of carbonate ore during introduction of chlorine is presented in Table 1.

During introduction of a certain amount of chlorine into water suspension of carbon-

ate manganese ore in order to receive HCl, mass of which equals 100 g, destruction of ore with receipt of the corresponding products takes place.

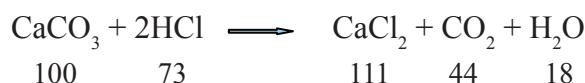
Table 2

The amount of product destruction in ore after introducing chlorine into suspension of carbonate manganese ore and formation of reaction products

| Mass, g (MnO ₂) | Mass, g(Cl ₂) | Mass, g (H ₂ O) | Mass, g (CaCO ₃) | Mass, g (CaMnO ₄) | Mass, g (CaCl ₂) | Mass, g (CO ₂) |
|-----------------------------|---------------------------|----------------------------|------------------------------|-------------------------------|------------------------------|----------------------------|
| 0,06 | 0,1 | 0,03 | 0,21 | 0,11 | 0,16 | 0,09 |
| 0,09 | 0,15 | 0,04 | 0,32 | 0,17 | 0,23 | 0,14 |
| 0,19 | 0,3 | 0,08 | 0,63 | 0,33 | 0,47 | 0,28 |
| 0,37 | 0,6 | 0,15 | 1,27 | 0,66 | 0,94 | 0,56 |
| 0,77 | 1,25 | 0,32 | 2,64 | 1,87 | 1,95 | 1,16 |
| 1,53 | 2,5 | 0,63 | 5,28 | 2,75 | 3,91 | 2,32 |
| 3,06 | 5 | 1,27 | 10,56 | 5,49 | 7,82 | 4,65 |
| 6,12 | 10 | 2,54 | 21,13 | 10,99 | 15,63 | 9,3 |
| 9,18 | 15 | 3,8 | 31,69 | 16,48 | 23,45 | 13,94 |
| 10,71 | 17,5 | 4,44 | 36,97 | 19,23 | 27,36 | 16,27 |
| 12,24 | 20 | 5,07 | 42,25 | 21,97 | 31,27 | 18,59 |

Chemism of calcium carbonate destruction process during introduction of chlorine into sus-

pension of carbonate ore for stabilization of pH solution is presented as the following reaction:



During introduction of a certain amount of chlorine, a certain amount of chlorous cal-

cium (CaCl₂) forms. The results are provided in Table 3.

Table 3

Dependence of chlorous calcium formation (grams) on the introduced chlorine into the system for destruction of calcium carbonate

| Mass, g (CaCO ₃) | Mass, g (Cl ₂) | Mass, g (CaCl ₂) |
|------------------------------|----------------------------|------------------------------|
| 24,65 | 17,5 | 27,36 |
| 21,13 | 15 | 23,45 |
| 14,12 | 10 | 15,67 |
| 7,05 | 5 | 7,82 |
| 3,52 | 2,5 | 3,91 |
| 1,76 | 1,25 | 1,95 |

Thus, solution of manganese oxide salt and chlorous calcium is retrieved from carbonate ore. This is how retrieving of manganese oxides are retrieved from ore. Disproportion of salt with receipt of Ca(MnO₄)₂ and MnO₂ takes place in the solution. Oxidation of one molecule due to another molecule of the same substance is a common phenomenon in chemistry. It always goes on along with losses of free en-

ergy that is possessed by the system initially. Independent reaction is defined by the fact that free energy of the system in the end of reaction is lower than it was in the beginning of it. Condition, described by the lowest amount of energy is the most stable.

Under a careful examination one can see that flow of a chemical reaction is not defined by general amount of energy, but free energy.

Table 4

Dependence of manganese compounds lixiviation on addition of chlorine into reaction area

| Com- position of man- gane- se ore | Initial composi- tion of manga- nese ore | | Composition of manganese ore after its lixiviation with chlorine | | Dependence of manganese ore composition on amount of the introduced chlorine | | Dependence of manganese ore composition on amount of the introduced chlorine | | Dependence of manganese ore composition on amount of the introduced chlorine | | Dependence of manganese ore composition on amount of the introduced chlorine | |
|---|--|---------------------------|--|-----------------------------|---|--------------------------------|---|--------------------------------|---|---------------------------|---|--------------------------------|
| | Mass, g | Percent contents, % | Mass, g | Percent con- tents, % | Mass, g | Percent con- tents, % | Mass, g | Percent con- tents, % | Mass, g | Percent contents, % | Mass, g | Percent con- tents, % |
| MnO ₂ | 10,72 | 10,72 | 0,02 | Remains | 1,55 | 2,64 | 4,61 | 6,37 | 7,67 | 8,92 | 9,2 | 9,9 |
| Mn ₂ O ₃ | 0,42 | 0,42 | Re- mains | Remains | Re- mains | 0 | Re- mains | 0 | Re- mains | 0 | Re- mains | 0 |
| CaCO ₃ | 77,05 | 77,05 | 40,08 | 77,26 | 45,35 | 77,26 | 55,92 | 77,31 | 66,48 | 77,35 | 71,76 | 77,39 |
| Fe ₂ O ₃ | 3,73 | 3,73 | 3,73 | 7,19 | 3,73 | 6,35 | 3,73 | 5,16 | 3,73 | 4,34 | 3,73 | 4,02 |
| Al ₂ O ₃ | 1,19 | 1,19 | 1,19 | 2,29 | 1,19 | 2,03 | 1,19 | 1,65 | 1,19 | 1,38 | 1,19 | 1,28 |
| SiO ₂ | 4,75 | 4,75 | 4,75 | 9,15 | 4,75 | 8,08 | 4,75 | 6,56 | 4,75 | 5,52 | 4,75 | 5,11 |
| MgSiO ₃ | 2,14 | 2,14 | 2,14 | 4,11 | 2,14 | 3,64 | 2,13 | 2,95 | 2,13 | 2,49 | 2,14 | 2,3 |
| Total: | 100 | 100 | 51,9 | 100 | 58,71 | 100 | 72,33 | 100 | 85,95 | 100 | 92,77 | 100 |

The fact that calcium manganite solution of manganese acid, in which manganese valency equals six, decomposes easily, point us to the conclusion that free energy in a system that consists of four- and seven-valent manganese, is lower than free energy that is contained in a system that keeps all manganese in six-valent form. However, conditions are usually opposite, and the state of intermediate valency proves to be the most stable condition. Thus, permanganate and salt of bivalent manganese react and form four-valent manganese.

Conclusion

While analyzing the research results, we can establish a possibility of simultaneous receipt of permanganates with the following obtaining of highly-concentrated manganese

dioxide of no less than 85%, as well as possibility of retrieving only manganese oxides from impoverished carbonate ore.

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CORRELATIVE ANALYSIS AND OPPOSITION VARIABLES

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The article explores the correlates as the additional parameters for describing objects. At the same time, it reveals the essence of the concept of «correlative indicators», and describes three approaches to the correlative analysis – systematic, categorical, and parametric. We describe the parameters of the model at three levels: primary – not correlative, secondary – correlative, the parameters of the third level – the correlative parameters or functions. The article describes the complementary correlates and opposition correlates, as well as reveals the concept of opposition variables as a particular case of opposition correlates.

Keywords: correlative analysis, systemic analysis, modelling, parametric description, opposition variables, information models

The term «correlate» was introduced by Aristotle [1], which he uses to indicate a relative concept (the first correlative), the contents of which becomes clear when compared with some other concept (second correlate). This implies that there are at least two correlates, but their number may be greater. Therefore, there is reason to use the term correlates, bearing in mind their multiple origin. For example, the Cartesian coordinates are three related correlates describing the position of a point in space.

In the broad sense, the word correlate is used to describe factors or concepts, between which there are relationships. These factors relate to a common object, as its properties or attributes. [2] When considering models, correlates are the model parameters, between which there are relationships or connections. Correlative analysis includes three approaches: systematic, categorical and parametric.

1. System approach to correlative analysis includes the following principles.

1.1. All test events can be presented as models of systems that include elements [3], units [4, 5], communication [6], relationships [7].

1.2. The test object or phenomenon is in the microenvironment.

1.3. The test object and its microenvironment in the outer environment.

2. The categorical approach is based on the work of Aristotle's «Categories». The correlative analysis includes the following principles:

2.1. Main substantive part of the objects and phenomena can be denoted by the term «entity», which has a set of attributes that describe the basic properties of the entity and distinguish it from other entities.

2.2. An entity can be primary, which can be prepared from derivatives of secondary entity or entities (a mechanism for modelling).

2.3. What may be a comparable characteristic feature is called categories. Aristotle distinguishes the following categories [1 ch. 4] (*substance, quantity, quality, relation, place, time, position, state, action, or affection*). The concept of «relationship» is introduced by

Aristotle, is different from the English term «relation». It consists of three words (Greek *τοπροστί* – «is in relation to what») – «the way in which one thing can be linked to the other». This is a very important definition because it gives the difference between the «attitude» and «communication». Aristotle defines attitude as «the ability to communicate».

3. Parametric approach to correlative analysis includes the following principles:

3.1. All test objects and phenomena are natural information field from which the researcher on the basis of measurements and observations creates their parametric description.

3.2. Parametric descriptions of objects are not arbitrary, and have the form of various models.

3.3. The construction of the model is its primary identification with the help of information-determined parameters [3]. These parameters should be considered as primary attributes or parameters of the first level.

Object parameters are correlates, if relationships or connections are identified between them. These relationships or connections define the correlative dependence. A special case of such correlative dependence is correlation.

Initial model parameters typically do not include descriptions of the correlative dependence. The identification of the correlates is based on the secondary processing after the creation of the models and determination of the primary parameters. Identifying correlates is the process of finding the hidden or implicit properties, which are not included in the primary models. Correlates can be considered secondary parameters, or the parameters of the second level. Identifying correlate allows one to create additional options or parameters of the third level. These third-level parameters are referred to as correlative parameters.

Correlative parameters are the parameters, which are calculated on the basis of various mathematical equations of the initial correlates. The set of parameters of the second and third level increases the completeness of the description of the model and the object.

The number of the correlates may be two or more. There are two types of correlates: *opposition*, expressing «opposites» relationships («revenues – expenses», «advantages – disadvantages») and complementary («length – width of the land»). Correlates can express limits. For example, the category of «complexity», as a correlate, is opposed to the correlate of the category of «simplicity».

Opposition correlates allow the introduction of opposition variables [9]. The term «opposition variables» requires a fact or essence that these variables describe. Otherwise, the evaluation of complexity would be inadequate. Opposition variables of qualitatively different entities may be incomparable. Opposition variables is a rather broad concept. Therefore, they need to be specified in the framework of the correlative approach.

Opposition variables can be viewed as a couple of opposition correlates that have qualitative and quantitative values and reflect a property of an object, process, phenomenon or model.

Let us consider the requirements for the opposition variables.

Oppositional variables have to be measured in the same scale and in the same units. The opposition variables form bound pairs. Opposition variables can be expressed in quantitative values and qualitative attributes. For example, the qualitative characteristics of the «complexity – simplicity», «presence – absence» pairs. They may be indicated by faceless numerical values «0–1». If we designate one opposition variable A and the second B, the probability P is defined as

$$P(A \text{ or } B) = 1.$$

Correlates allow for comparative degrees: difficult, more difficult, the most difficult. Opposition variables exclude the comparative degree («good – better», «sure – highly-sure»). Logically they comply alternatives, which makes it possible to apply the logic of the first order.

The peculiarity of the term «opposition variables» in that it is not an independent entity, and is related to another entity. This term requires an object of relation, with respect to which these variables are introduced. Otherwise, the analysis with the opposition variables is inadequate.

Let us consider how the correlates affect the formation of the model, for example, the information model.

The *information model* [8, 10], (*IM*) – a formalized, interconnected set of identifiable and certain information parameters, which reflects not only the basic properties of the modeling object, but also the most significant relationship between them and the environment. Thus,

the information model of the object (*IMO*) is a formal description that includes: a set of parameters (*P*), connection (*C*) between the parameters, the most significant relationship (*R*).

$$IMO = F(P, C, R).$$

This approach is referred to as parametric and such information model – as parametric. Correlative approach involves additional analysis, which aims to identify correlates of (*Cr*) and relationship types (*ToR*) between the correlates. It leads to a correlative information object model (*CrIMO*).

Using a correlative relationship between the correlates enables the creation of *derivative correlative parameters* (*DCP*). As a result, the correlative information model of the object is given by:

$$CrIMO = F(P, C, R, [C, ToR, DCP]).$$

In the square brackets, we put additional information that details the structure and increases the complete description of the object of analysis or research.

What does the correlative analysis give us? First, the presence of one correlate implies a search for another correlate. Only then can we analyze the object to describe these correlates. The existence of relations allows to form an additional parameter *DCP*. The *DCP* allows to generate additional parameters of the object, which remain unknown and unused in the non-correlative parametric approach.

Consider the area of real estate. Complementary correlates «width» and «length» of land for different sections are not an element of comparison and do not allow for any assessment [11]. However, their product gives the *derived correlative indicator* «area», which is comparable for different strips of land. The quantitative value of the index multiplied by the statutory market value per unit gives an economic assessment of the value of the land. The cost of land makes it possible to compare them and engage in transactions in the market. Thus, the correlative indicators provide the opportunity to receive comparable general characteristics associated with economic categories based on the individual characteristics of objects.

Consider the application of the correlative model to the SWOT-analysis. Essentially the SWOT-analysis pairs «strengths – weaknesses», «opportunities – threats» are opposition correlates that complement each other. This makes it possible to display graphically the opposition correlates. If these figures cancel each other out, we get a balanced state for the organization – the central rectangle (the SWOT-matrix). If the opportunities and strengths outweigh, we get a competitive state – the upper right-hand rectangle. If the threats and

weaknesses outweigh, then we are in a non-competitive state – the lower rectangle.

Thus, the correlative model provides current information on the state of the object and the information to make the necessary decisions. [12]

Findings

Using the correlative approach provides the ability to create additional object characteristics that increase the completeness of its description and justification in decision-making. Using the correlative approach allows for additional comparisons of objects, their states, and thus extends the possibility of evaluation and comparison of different objects, which increases the validity of decisions.

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Materials of Conferences

**THE MATHEMATICAL MODELS,
LING IN BASE OF MODELING
OF THE HOOKS FISHING SYSTEMS**

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The Mathematics is an universal language of any science. She possesses the stupendous potential, allowing solve the most complex technical and economic problems. As was pointed out by K. Marks «Any science only then reaches the perfection, when she manages to use the mathematics». The Industrial fishing, as science, must rest in identical mathematical models (MM) fishing gears and fishing systems. But MM themselves do not yet solve the problems industrial fishing. For their decisions necessary to develop the algorithms of the decision of the tasks and corresponding to computer programs. Thereby, only triad *Mathematical Model-Algorithm-Program (MM-A-P)* allows to solve the tasks industrial fishing.

Since, the majority of the mathematical models element fishing systems present itself systems of the differential equations, that happens to solve the marginal tasks for these systems. Hitherto no general algorithm of the decision of the marginal tasks. The Decision of each marginal task requires the individual approach and intuitions.

At present we learned; learnt to solve many marginal tasks industrial fishing, connected with modeling Trawls, Long Lines and Traps of the fishing systems and with just cause can confirm that industrial fishing today rests in powerful mathematical foundation.

The Trouble is concluded in that that hitherto in fishing of the Russia works little specialists, solving tasks by method of computer modeling with use the triad MM-A-P that greatly holds up the progress in this branches.

Introduction. Flexible ropes and fishing hooks is main by elements any longline fishing system. The Decision of the problem about the form and tension of the flexible rope (thread, chain) in field of power to gravity, got by J. Bernoulli in 1691 [7]. Bernoulli has got the general decision for symmetrical thread. In the event of asymmetrical thread he complemented it before symmetrical way of the complex mathematical transformations.

Material and methods. Proceed with development of the methods of mathematical modeling hook fishing systems, and having got acquainted with work J. Bernoulli [7], author came to conclusion that its decision for asymmetrical flexible rope too in a complicated way for practical use under mathematical modeling hook fishing systems with asymmetrical manline, which are basically used on providence. So was necessary search for other way of the decision of this problem.

Balance flexiblerope in resting liquids is described by vector equation

$$d(T\vec{\tau}) / dl + \vec{q} = \vec{0}. \tag{1}$$

Here \vec{q} – a weight 1 m flexible rope in water; T – Tension of the flexible rope in the current point; $\vec{\tau}$ – ort of tangent to flexible rope, directed aside growing of the arc coordinate l .

Projektion this equation on axis x and z , shall get the differential equations of the balance of the flexible rope in resting liquids in Cartesian coordinate system:

$$\begin{aligned} d(Tx) / dl &= 0; \\ d(Tz) / dl &= -q_z. \end{aligned} \tag{2}$$

The Author received general decision of the system (2) in the form:

under $q_z \neq 0$:

$$\begin{aligned} x &= p_x [\operatorname{arsh}((l + C_3) / p_x) - C_1]; \\ z &= p_x \cdot \operatorname{ch}(x / p_x + C_1) - C_2; \\ l &= p_x \cdot \operatorname{sh}(x / p_x + C_1) - C_3; \\ C_1 &= \operatorname{arsh}(T_{AZ} / T_{AX}); \quad C_2 = p_x \cdot \operatorname{ch}C_1; \quad C_3 = p_x \cdot \operatorname{sh}C_1; \\ T_{AZ} &= 0,5q_z \left[l_K + z_{BA} \sqrt{1 + 4p_x^2 / (l_K^2 - h_{BA}^2)} \right]; \quad q_z > 0; \\ T_{AZ} &= 0,5q_z \left[l_K - z_{BA} \sqrt{1 + 4p_x^2 / (l_K^2 - h_{BA}^2)} \right]; \quad q_z < 0; \\ T_{AX} &= 0,5|q_z| \sqrt{[(2p_z - l_K)^2 - h_{BA}^2] (l_K^2 - h_{BA}^2)} / h_{BA}; \\ T_B &= T_A - q_z \cdot z_{BA}; \quad z_{BA} = z_B - z_A; \quad h_{BA} = |z_B - z_A|; \\ p_x &= -T_{AX} / q_z; \quad p_z = T_{AZ} / q_z; \\ q_z &= k_w G_z = k_w mg; \quad k_w = 1 - m_w / m; \end{aligned} \tag{3}$$

under $q_z = 0$:

$$T = C_4 = \text{const}; \quad z = C_5 x + C_6,$$

where m_w – a mass of water, displaced by 1 m flexiblerope; m – linear density of the tightrope (the mass 1 m flexiblerope); q_z – a projection on axis z weight in water 1 m flexiblerope; l – an arc coordinate of the current point of the flexiblerope; l_k – a length of the flexiblerope; C_1, \dots, C_6 – a constants; A, B – initial and end point of the flexiblerope; z_A, z_B – coordinates initial and end point of the flexiblerope; T_{Ax}, T_{Az} – a projections of the Tension of the flexiblerope in point A on axis x and z ; p_x, p_z – a parameters of the flexiblerope.

The Second, the third and eighth equations in (3) – an integrals J. Bernoulli.

At reception of the system (3) was used cartesian coordinate system Axz , which axis z is directed on speedup of the free fall i.e., Fig. 1. Begin coordinates (the point A) was chosen on one of the end of the flexible rope. Moreover begin cartesian coordinate system and begin counting out the arc coordinates coincide. Besides, correlation was used for differential of the arc coordinate, where before radical will take the sign (+). It faithfully only then, when and have an alike signs. So at decision of the concrete practical problems axis x necessary to direct so that with growing of the arc coordinates l grew and abscissas x , as shown in Fig. 1.

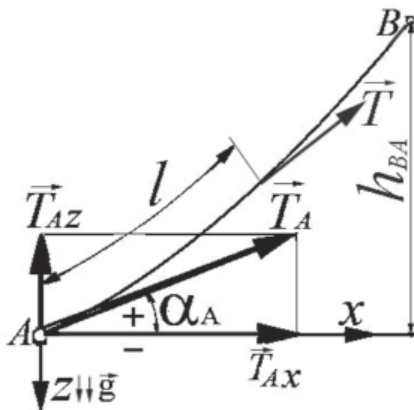


Fig. 1. Parameters of the asymmetrical rope in resting water

The System (3) are a mathematical model of the uniform still flexible rope in resting liquids. Moreover the form of the flexible rope (symmetrical, asymmetrical) counts for nothing. This system allows to execute mathematical modeling any flexible flexible rope in resting water, made from material as heavy of water, when (the polyamides $k_w = 0,10$; полиэстер $k_w = 0,13$), so and easier water, when (the polyethylene $k_w = -0,07$; полипропилен $k_w = -0,14$, danline $k_w = -0,10$). On the base MM

(3) designed methods modeling any hook fishing systems (stationary horizontal and vertical pelagical and bottom Longlines) in resting water. The Ensemble example, illustrating these methods of modeling was provided in monograph [3; 4].

For symmetrical flexible rope, when axis of the coordinates are chose so, as shown in Fig. 2, are executed condition: $z_A = z_B, C_1 = C_3 = 0, C_1 = p_x$ MM (3) takes the type:

$$x = p_x \operatorname{arsh}(l / p_x); \quad z = p_x \cdot \operatorname{ch}(x / p_x) - p_x;$$

$$l = p_x \cdot \operatorname{sh}(x / p_x);$$

$$b_k = 2x_B = 2p_x \operatorname{arsh}(l_k / 2 p_x); \quad (4)$$

$$T_{Ax} = T_O = |q_z| (l_k^2 - 4h^2) / 8h;$$

$$T_{Az} = 0,5 q_z l_k; \quad p_x = -T_{Ax} / q_z.$$

Here b_k – a chord of the flexible rope (main-line); l_k – a length of the flexible rope; h – an arrow of the sagging.

The Equations (4) are a mathematical model of the symmetrical flexible rope in resting water, they are broadly used at modeling manlines of the stationary pelagical hook Longlines.

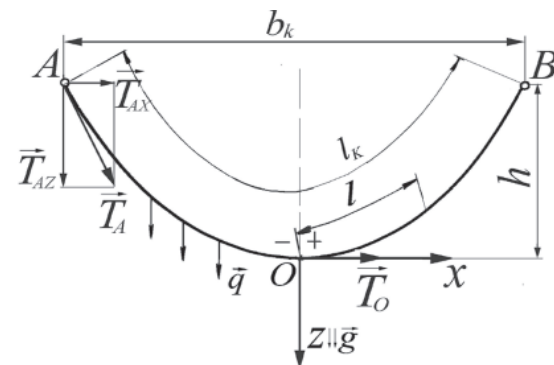


Fig. 2. Parameters of the symmetrical flexible rope in resting water:

T_O, T_A – Tensions in lower point O and end point A ; q – weight in water 1 m of the flexible rope

The Mathematical models flexible rope (3) and (4) allow modeling any of the stationary hook fishing systems in resting water.

For modeling ropes with account of the currents we shall consider the balance of the rope in flow of water (Fig. 3).

The Vector equation of the balance of the flexible rope in flow of water:

$$d(T\vec{\tau}) / dl + \vec{q} + \vec{r}_w = \vec{0}. \quad (5)$$

Here \vec{r}_w – hydrodynamic power, coming on unit of the length of the rope.

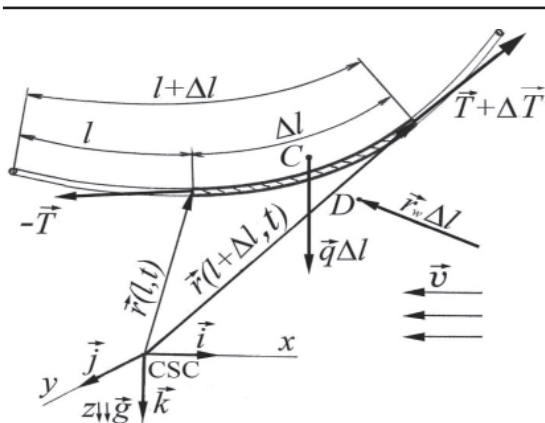


Fig. 3. Forces acting on an element of the rope in the water stream (KYC – earth coordinate system, the z axis is directed along the plumb line)
 $T = T\vec{\tau}$ – tension of the rope at the current point; $\vec{\tau}$ – Unit vector tangent to the axis of the rope directed towards growth arc coordinates

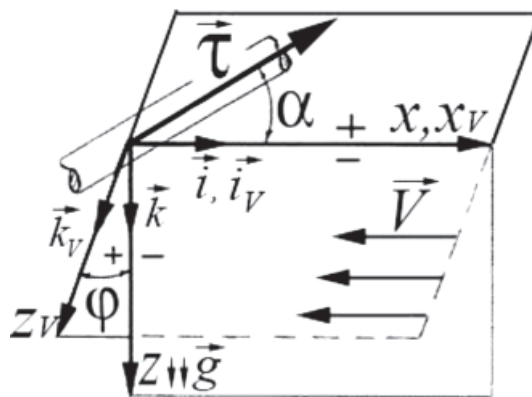


Fig. 4. Terrestrial xyz and flow x_v, y_v, z_v coordinate systems of the flexible rope: $x_v \uparrow \downarrow \vec{V}$, $z_v \subset (\vec{\tau}\vec{V})$; $z \downarrow \downarrow \vec{g}$; α – a corner of the attack of the flexible trope; ϕ – a corner of the list to planes of the flow of the flexible rope; $\vec{\tau}$ – ort axis of the rope

At study of the balance flexible rope in flow of water use two coordinates system: terrestrial xyz and flow x_v, y_v, z_v (Fig. 4).

The differential equations of the balance of the flexible rope in flow of water in flow coordinate system, got by author, when axis x and x_v coincide, are of the form of:

$$\begin{aligned} \dot{T} &= q_z \sin \alpha \cos \phi - r_{xv} \cos \alpha + r_{zv} \sin \alpha; \\ \dot{\alpha} &= (q_z \cos \alpha \cos \phi + r_{xv} \sin \alpha + r_{zv} \cos \alpha) / T; \\ \dot{\phi} &= -(q_z \sin \phi + r_{yv}) / (T \sin \alpha); \\ \dot{x} &= \cos \alpha; \quad \dot{y} = \sin \alpha \sin \phi; \quad \dot{z} = \sin \alpha \cos \phi; \quad q_z = k_w mg; \\ r_{xv} &= C_{xv} (0,5 \rho V^2) d, \quad (x_v, y_v, z_v); \\ C_{xv} &= -(c_{11} \sin^2 \alpha + c_{12} \sin^4 \alpha + c_{13} \cos^2 \alpha), \quad \alpha \in (-\infty, \infty); \\ C_{yv} &= \pm(c_{21} \sin \alpha \cos \alpha + c_{22} \sin^3 \alpha \cos \alpha), \quad \alpha \in (-\infty, \infty); \\ C_{zv} &= -(c_{31} \sin \alpha \cos \alpha + c_{32} \sin^3 \alpha \cos \alpha), \quad \alpha \in (-\infty, \infty), \end{aligned} \tag{6}$$

where $\dot{} = d/dl$ – a derivative on arc coordinate l ; T , α – tension and corner of the attack of the flexible rope in the current point; ϕ – a corner of the list to planes of the flow of the flexible rope; T_0 , α_0 – tension and corner of the attack of the rope in lower point O ; r_{xv} , r_{yv} , r_{zv} – forces of the resistance, lateral and lifting power, happening to on 1 m rope; C_{xv} , C_{yv} , C_{zv} – coefficients hydrodynamic forces of the rope in flow coordinate system; R_x^w – a resist-

ance of the whole rope; \vec{V}_w , \vec{V}_s – a velocities of the current and ship.

On the base MM (6) is executed mathematical modeling towrope for towing fishing systems.

The MM (6) possible use for modeling manline of longlines with account of the currents. But in this case it is necessary to take into account the action an hook legs on manline.

The Mathematical model manlines of the hook longlines with provision for evenly portioned on length manline power from pull legs is of the form of:

$$\begin{aligned} \dot{T} &= q_z^{xp+y} \sin \alpha_{xp} \cos \phi_{xp} - (r_{xv} + t_{xv}^n) \cos \alpha_{xp} + (r_{zv} + t_{zv}^n) \sin \alpha_{xp}; \\ \dot{\alpha}_{xp} &= (q_z^{xp+y} \cos \alpha_{xp} \cos \phi_{xp} + (r_{xv} + t_{xv}^n) \sin \alpha_{xp} + (r_{zv} + t_{zv}^n) \cos \alpha_{xp}) / T; \\ \dot{\phi}_{xp} &= -(q_z^{xp+y} \sin \phi_{xp} + r_{yv} + t_{yv}^n) / (T \sin \alpha_{xp}); \\ \dot{x} &= \cos \alpha_{xp}; \quad \dot{y} = \sin \alpha_{xp} \sin \phi_{xp}; \quad \dot{z} = -\sin \alpha_{xp} \cos \phi_{xp}; \end{aligned}$$

$$\begin{aligned}
 q_z^{xp+y} &= k_w^{xp} m_{xp} g + k_w^Y n_{kp}^S M_Y g / l_S; \\
 r_{XV} &= C_{XV}^{xp}(\alpha_{xp}) \cdot (0,5\rho V^2) d_{xp}, \quad (x_V, y_V, z_V); \\
 R_{XV}^n &= C_{XV}^n(\alpha_n) \cdot (0,5\rho V^2) d_n l_n, \quad (x_V, y_V, z_V); \\
 t_{XV}^n &= t_X^n; \quad t_{YV}^n = t_Y^n \cos \phi_{xp} + t_Z^n \sin \phi_{xp}; \quad t_{ZV}^n = -t_Y^n \sin \phi_{xp} + t_Z^n \cos \phi_{xp}; \\
 t_X^n &= n_{kp}^S (R_{XV}^n + R_X^n) / l_S; \quad t_Y^n = n_{kp}^S (R_{YV}^n \cos \phi_n - R_{ZV}^n \sin \phi_n + R_Y^n) / l_S; \\
 t_Z^n &= n_{kp}^S (R_{YV}^n \sin \phi_n + R_{ZV}^n \cos \phi_n + R_Z^n + Q_Z^n + Q_Z^{n+kp}) / l_S; \\
 Q_z^n &= k_w^n m_n l_n g; \quad Q_z^{n+kp} = k_w^n M_n g + k_w^{kp} M_{kp} g; \\
 C_{XV}^{xp} &= -(c_{11} \sin^2 \alpha_{xp} + c_{12} \sin^4 \alpha_{xp} + c_{13} \cos^2 \alpha_{xp}); \\
 C_{YV}^{xp} &= \pm(c_{21} \sin \alpha_{xp} \cos \alpha_{xp} + c_{22} \sin^3 \alpha_{xp} \cos \alpha_{xp}); \\
 C_{ZV}^{xp} &= -(c_{31} \sin \alpha_{xp} \cos \alpha_{xp} + c_{32} \sin^3 \alpha_{xp} \cos \alpha_{xp}), \quad (xp, n),
 \end{aligned}
 \tag{7}$$

where q_z^{xp+y} – a projection on axis z of the weight in water 1 m manline with nodes (double stopper system (Fig. 5)) of the fastening to her of the hook legs; M_Y – a mass of the node of the fastening of the leg to manline; d_{xp}, d_n – diameters manline and leg; l_n – length of leg; t_X^n, t_Y^n, t_Z^n – a projections on axis terrestrial coordinate system tensions of the hook legs, happening to on unit of the length manline; $R_X^n, R_X^{n+kp}, (x, y, z)$ – a projections hydrodynamic forces of leg and baits with hooks; α_n – a corner of the attack of the leg; $T, \alpha_{xp}, \phi_{xp}$ – tension, corner of the attack of the manline and corner of the list to planes of the flow manline in the current point; r_{XV}, r_{YV}, r_{ZV} – projections of the hydrodynamic forces, happening to on 1 m manline, on axis flow coordinate system; Q_z^n, Q_z^{n+kp} – weight in water of the leg and bait with hook accordingly; m_{xp}, m_n – linear density of the mainline and leg.

For successful catch hydrobionts necessary to provide the finding all hooks in layer of fish. The Position of each hook is defined his cartesian coordinate in terrestrial coordinate system with beginning of the coordinates at the beginning initially i section of the longline – a point A_i (the Fig. 5).

For successful catch hydrobiontov necessary to provide the finding all hook in layer of fish. The Position of each hook is defined its cartesian coordinate $x_{ij}^{kp}, y_{ij}^{kp}, z_{ij}^{kp}$ in terrestrial coordinate system A_ixyz with beginning of the coordinates at the beginning initially i part of the longline – a point A_i (Fig. 5).

By decisions of the differential equations of the balance mainline (7) define the coordinates a point fastening поводцов to хребтине, then from conditions of the balance of the system «bait-hook-leg» find the coordinates of hooks $x_{ij}^{kp}, y_{ij}^{kp}, z_{ij}^{kp}$.

Integrating differential equations:

$$\begin{aligned}
 \dot{x} &= -\cos \alpha_n; \\
 \dot{y} &= -\sin \alpha_n \sin \phi_n; \\
 \dot{z} &= \sin \alpha_n \cos \phi_n
 \end{aligned}$$

we shall get the coordinates a hook in coordinate system under rectilinear legs (Fig. 5):

$$\begin{aligned}
 x_{ij}^{kp} &= x_{ij} - \cos \alpha_n l_n; \\
 y_{ij}^{kp} &= y_{ij} - \sin \alpha_n \sin \phi_n l_n; \\
 z_{ij}^{kp} &= z_{ij} + \sin \alpha_n \cos \phi_n l_n,
 \end{aligned}$$

where x_{ij}, y_{ij}, z_{ij} – a coordinates of the point of the fastening of j leg to manline on i section of the longline; $x_{ij}^{kp}, y_{ij}^{kp}, z_{ij}^{kp}$ – a coordinates of the fishing hook.

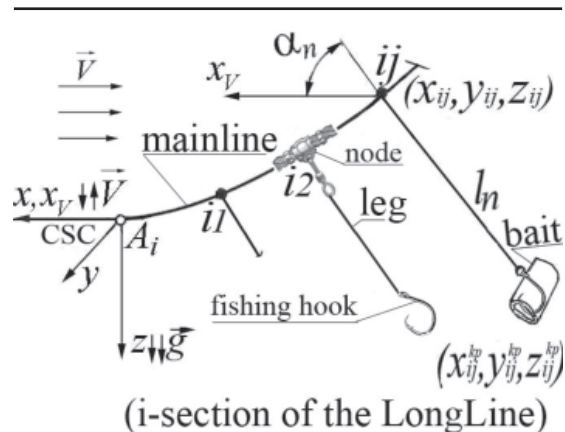


Fig. 5. To determination of the coordinates j fishing hook on i – section of the longline:
CSC – Cartesian System Coordinate;
Node – double stopper system

Under greater length hook legs $l_n = 20-30$ m their it is impossible consider rectilinear. In this case their features necessary to get the way of the numerical decision of the problem Koshi for differential equations of the balance of the tightrope in flow (5).

On base MM (7) is designed program CM-LongLine (Computer Modeling LongLine) [3], work-

ing in ambience Borland Delphi and allowing prototype the longline, *выметаемые* both parallel current, and under any angle to current. She consists of set of the programs, which can work as autonomous, prototyping separate elements of the tier, so and system, prototyping whole tier. The Main form of the programme complex of the modeling tier is shown on Fig. 6.

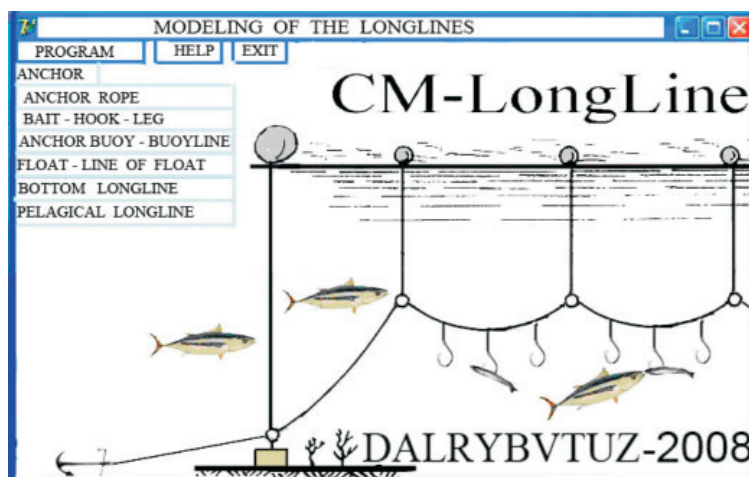


Fig. 6. Main form of the programme complex of modeling horizontal hook longline fishing order with account of the currents CM-LongLine (Computer Modeling Long-Line)

This form contains seven buttons: «Anchor», «Anchorline», «Bait-hook-leg», «Anchor – buoy – buoyline», «buoyline», «bottom longline with buoy in the middle each section», «longline with buoy on end of each section» by means of which are included corresponding to program.

Conclusion

The system differential equations of the balance of the rope in resting liquids (3) and system differential equations of the balance of the in flow (6), and equations of the balance of the manline (7) allow to solve the broad class of the fishing problems. They allow to execute mathematical modeling of the any type horizontal longlines as in resting liquids, so and at presence of the currents.

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THERMIC STRENGTHENING OF MOOVING CORNER PROFILES IN THE STREAM OF ROLLING MACHINE

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The given laboratory experiment are Brought on searching for optimum mode termal processing of building renting for kazakhstan producers. In the given work the opportunity of improvement of quality of reinforcing bar from uninterruptedly-casted bars by deformation and thermal hardening is researched. Complex research and development of technology of deformation and thermal hardening of reinforcing bar from uninterruptedly-casted bars.

Introduction. Shaped profiles of rolling (corners, channels, double-T and others) are characterized by irregular distribution of metals in section, which demands regulated selection of heat from different parts of their section in combined deformational and thermic working with rolling heat.

During thermic correcting and deformational and thermic working of corner profiles it is necessary to consider that metal volume per unit top, therefore it is necessary to supply increased heat selection from the corner top for equal cooling. In this connection the water quantity given to the top must be more over 15–20% than on the leg [1].

For the providing with equal structural and phase transformation in section of the profile the water outlay correlation per unit corner surface from above and below for the legs must be 1:1, for the top 1: (1,2–1,4). The researchings show that in the process of interrupted heat strengthening hogging happens to the side of more intensive cooling. In the result of this the maintenance in the process DTU of given water outlay correlation from above and below for the top and it will provide equal cooling and prevent hogging [2].

Problem statement. According to these conditions the universal installation of intensive and regulated cooling was used for the thermic correcting and DTU of equal corner profiles, which allowed, from the first side, to prevent large thermic and phasal voltage calling hogging and from the second side, to intensity cooling process, which is important for DTU low-carbon steel (Art. 3, art. 5) with high sense of critical heat strengthening speed [1, 2].

The installation of rapid and regulated cooling includes two important blocks: the block of selected cooling of different elements of corner profile water stream and the block of deep cooling in vortical water stream.

Owing to good steam conditions and uninterrupted blows of steams on the metal surface film

boiling stage by stream cooling is practically absent, that is conform to the cooling increasing.

Results. Moreover at the result of rich inflow to the cooling surface and short – term contact with it water has no time to overheat and its cooling ability does not change. Stream cooling dignity, which is realized in the installation of rapid cooling, is an opportunity of intensive cooling changing in wide limits due to the changing of quantity and speed of water stream from the nozzle, and also cooling zone width by means of nozzle turning in collectors during tuning on definite profile size.

High cooling effectiveness in the second knot – in the rapid water stream on big stages of vortical water stream – may be explained by intensive diversions and team condensation, and also uninterrupted renewal incoming to the reaction water volume on the whole surface of cooling corner part, which is not possible to reach on the other ways of cooling.

For the installation of the technological factors on the machanical means of corner profiles from the art. 3 kp and art. 3 sp. the deformational and thermic working was realized by different conditions. Temperature of rolling rinks was changed, and also duration of a pause between the end rolling rinks and the beginning of intensive cooling. Duration of intensive cooling and pressure of water in the chamber of intensive cooling constantly supported. Keeping Si in the steel was estimated on its mechanical properties. Technological conditions of processing and measured on standard methods mechanical properties of the strengthened structures from steel art. 3 kp and art. 3 sp. are presented in the Table 1–2.

Table 1

Mechanical properties of steel art. 3kp after rolling and intensive cooling during 2 seconds under pressure 0,6 MPa

| $t_{k,p}, ^\circ$ | $\Delta\tau$ | σ_B | σ_T | $\sigma_s, \%$ |
|-------------------|--------------|-------------------|-------------------|----------------|
| | | N/mm ² | N/mm ² | |
| 900 | ≤ 1 | 390 | 280 | 24 |
| 1000 | ≤ 1 | 370 | 250 | 25 |
| 1070 | ≤ 1 | 365 | 235 | 25 |
| 940 | 5 | 370 | 260 | 25 |
| 1000 | 5 | 355 | 245 | 26 |
| 1070 | 5 | 350 | 230 | 25 |
| 940 | 10 | 365 | 240 | 25 |
| 1000 | 10 | 350 | 235 | 26 |
| 1070 | 10 | 345 | 225 | 26 |

Commentary – st. 3kp (%: – 0,19; Mn – 0,56; Cr – 0,23; Si – 0,04; P < 0,04; S < 0,04).

The given tables show, that important technology factors DTU of lowcarbonic steels in which strengthening processes during and upon termination of hot deformation proceed with the big speed, is t , r , and r , directly influencing tempera-

ture and final mechanical properties of a strengthened product.

The temperature of the rolling end has special value, which for the investigated angular structures makes 880–900°C. Coolings from such

temperatures can pass processes static cell formation and recrystallization, that changes structure in comparison with that, which was at the moment of the end of rolling.

Table 2

Mechanical properties of steel art. 3sp after rolling and intensive cooling during 2 seconds under pressure 0,6 MPa

| $t_{k,p}, ^\circ$ | $\Delta\tau$ | σ_B | σ_T | $\sigma_s, \%$ |
|-------------------|--------------|-------------------|-------------------|----------------|
| | | N/mm ² | N/mm ² | |
| 900 | ≤ 1 | 580 | 400 | 14 |
| 975 | ≤ 1 | 525 | 380 | 19 |
| 1070 | ≤ 1 | 485 | 370 | 21 |
| 900 | 5 | 560 | 385 | 15 |
| 975 | 5 | 515 | 375 | 20 |
| 1070 | 5 | 485 | 345 | 21 |
| 900 | 10 | 515 | 375 | 16 |
| 975 | 10 | 480 | 340 | 19 |
| 1070 | 10 | 460 | 325 | 20 |

Commentary – st. 3kp (%: – 0,19; Mn – 0,56; Cr – 0,23; Si – 0,04; P < 0,04; S < 0,04).

Therefore among parameters on which the structure formed during hot rolling is estimated, for results of deformational and thermal hardening its thermal stability is important. As it was already marked, it is connected with the structure and properties of martensite, formed at deformational and thermic hardening, in many respects inherit sub-grain structure and dislocational textures of initial heat formed austenite. In this connection the preservation of optimum structure, formed during and

upon termination of hot deformation, has important and in some cases defining value [3].

The results of industrial experiments on influence establishment of the temperature of the end of rolling t , pauses between the end of rolling and the beginning of intensive cooling r , at constant duration of intensive cooling r on mechanical properties of equal corner 50×50×50 from the steel%: C – 0,21, Mn – 0,62, Si – 0,27, S < 0,03, P < 0,04, Cr – 0,26 are given in the Table 3.

Table 3

Influence of technological parameters on mechanical properties of the equal corner from the steel

| $t_{k,p}, ^\circ$ | 900 | 975 | 1070 | Parametres of cooling |
|------------------------|------|-------|------|--|
| σ_B, MPa | 580 | 523,0 | 485 | $\Delta\tau = 0,2 \text{ s}$ $\tau = 2 \text{ s}$ $P = 0,6 \text{ MPa}$ |
| σ_T, MPa | 397 | 380,0 | 371 | |
| $\sigma_s, \%$ | 14,0 | 19,0 | 21,0 | |
| σ_B, MPa | 559 | 515,0 | 483 | $\Delta\tau = 0,2 \text{ s}$ $\tau = 2 \text{ s}$ $P = 0,55-0,6 \text{ MPa}$ |
| σ_T, MPa | 383 | 376,0 | 347 | |
| $\sigma_s, \%$ | 14,0 | 20,5 | 21,0 | |
| σ_B, MPa | 513 | 482,0 | 461 | $\Delta\tau = 6 \text{ s}$ $\tau = 2 \text{ s}$ $P = 0,5-0,6 \text{ MPa}$ |
| σ_T, MPa | 375 | 339,0 | 288 | |
| $\sigma_s, \%$ | 16 | 19,0 | 19,0 | |

Conclusions. From experimental data follows, that decrease in the end of rolling with 1070 up to 900°C leads to growth of strong properties though at pauses 3 s and 6 s growth of strengthening properties weakens in a greater degree, than more pause

(6 s). Mechanical properties of carbonaceous steel St. 3 sp by deformational and thermic hardening can be raised up to a level of mechanical properties of low-alloyed steels 12G2S, 09G2S by the standard 27772-88 rolling for the building steel

constructions. It gives the opportunity to replace low-alloyed steel 12G2S, 09G2S by deformational and thermic hardening of carbonaceous steel with the economy of alloying elements. Besides such replacement allows to improve technology of hot rolling as a rolling of firmer and less plastic alloyed steel, it is replaced soft rolling with more plastic low-carbon steel. The experiments show, that, despite of a heat of the end of rolling, the effect of high-temperature machining expressed in additional increase of durability at satisfactory of plasticity in comparison with properties, received at usual training from oven heating, comes to light absolutely definitely.

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READING WITH COMPUTER INNOVATIVE TECHNOLOGIES AND E-BOOKS: COURSE AND INSTRUCTIONS

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The system of reading learning with the help of computer technologies, e-books, multimedia and interactive tools (Professional English in Medicine, Interactive CD + Workbook) was tested on the basis of the Astana Medical University, Astana city, Kazakhstan [8, 9]. Reading learning was performed on a specially given part of the lesson and took 30–40 minutes. As a result of course with the help of a computer the time of students' reading of the text is decreased, they rarely ask the teacher, and the cases of recurrent asking for assistance are decreased significantly. Students significantly less ask for a help, encountering the word which meaning can be understood independently and they definitely determine the type of difficulty that they have to overcome. Test results were more higher. Thus, we can assume that the given system of training is effective and we recommend it to use in Universities with the necessary equipment.

Computer-innovative technologies, e-Books, multimedia and interactive tools are highly being introduced into the process of foreign languages learning in universities. [1, 10]. We investigated such technical and methodological possibilities of the computer as ability of modeling conditions of communicative activity, the bulk increase of language training in the process of mastering the lexical and grammatical skills, individualization and differentiation of learning, principle implementation of the feedback, objective and complete control of skills; unification possibility of the educational process in different educational institutions, stimulating teachers to use various innovative techniques.

Our exercises from e-Book (Professional English in Medicine, Interactive CD + Workbook) provide visual, detailed orientation, and really quite effective solve tasks – according to the extra motivation students memorize given material more deeply, and use it better during the speech activity as shown on the Fig. 1, 2. [4], [6].

Therefore, we consider that the use of unique opportunities of the computer in the teaching field of reading and writing on foreign language is an important task now. The main task of learning to read in foreign language – is to teach students to read the simple original text and to overcome difficulties.

The use of a computer is necessary for more effective formation of reading ability in the process of teaching reading. The computer can simulate, motivate, optimize self-education, and provide the transfer of linguistic material to the other types of speech activity.

A computer is a supplementary device which solves only certain tasks. Using a computer in training presumes wide practice in reading of traditional printed texts. The computer at the same time will perform the following functions: to be a controlling device, determining the correct understanding; to be learning device, regulating the degree of student's self-sufficiency in the process of text understanding; to provide individualization of text understanding, its stages; to give the opportunity to perform a differentiated approach in the selection of texts and types of exercises for each student; to serve as a means of forming of self-control skills in the process of reading; to be a trainer-simulator, allowing you to work out quickly a particular speech action, necessary for the success of the activities in general; to be a source of extra motivation [2, 3].

Thus, the computer can give the opportunity to manage pliantly with the reading process of the group of students. Using a computer can be effective in the training of skills variety in reading: to teach correctly intone of the text, to help mastering necessary skills of reading technics, to expand the perception field during reading, to increase the individual rate of students' reading, to form the ability how to use dictionary and reference books, to teach students to overcome a variety of language difficulties themselves, to divide the received information from the text into the primary and secondary, etc.

Talgat Dz. Kutebaev Professional English in Medicine Gulbanu M. Akhmetova

Unit 1 2 3 4 5 6 7 8

Complete the text using words from the box.

vertebra mucous larynx cavity tissue
throat name air mouth skull

Pharynx is another name for the throat. The term throat is popularly applied to the region about the front of the neck generally, but in its strict sense it means the irregular cavity into which the nose and mouth open above, from which the larynx and gullet open below, and in which the channel for the air and that for the food cross one another. It extends from the base of the skull down to the 6th cervical vertebra separated from the upper six vertebrae only by some loose fibrous tissue, and is about 5 inches long.

It is completely closed behind by a layer of muscles, and by mucous membrane, but in front it opens into the nose, mouth, and larynx in succession from above down.




Fig. 1

Talgat Dz. Kutebaev Professional English in Medicine Gulbanu M. Akhmetova

Unit 1 2 3 4 5 6 7 8

Complete the text using words from the box.

organs peritoneum rectum stomach abdomen
pharynx accessory tongue visceral pancreas

The digestive system consists of the alimentary canal and related or accessory organs. The alimentary canal is formed by the mouth, pharynx, esophagus, stomach, small intestine, large intestine and rectum. The accessory structures are the teeth, tongue, salivary glands, hard and soft palates, liver, gallbladder and pancreas. The alimentary tract from esophagus to rectum conforms to a definite structural plan. The organs of the digestive system contained in the abdomen are covered with the serous coat, the peritoneum. The peritoneum has two layers, the visceral and parietal.




Fig. 2

Series of tasks of independent training to overcome difficulties in the process of reading are given as an example of computer using for learning to read. We marked out series of tasks for the

teaching of students' reading in English language. We presumed that students already knew the system of rules and basic skills of reading techniques (Fig. 3).

Talgat Dz. Kutebaev Professional English in Medicine Gulbanu M. Akhmetova

Unit 1 2 3 4 5 6 7 8

Complete the text using words from the box.

| | | | | |
|--------|----------|---------|--------|--------|
| grey | however | cranial | brain | cortex |
| spinal | midbrain | masses | fibers | three |

This mass of nerve tissue, contained within the _____ cavity, is a greatly enlarged continuation of the _____ cord, and, like the cord is formed by both _____ and white matter. The grey matter is found on the outer surface where it forms a rather thin layer, the _____, and in addition masses of grey matter are found embedded within the _____. The bulk of the brain is, _____, formed by white matter which consists of nerve _____. In man the brain of the adult weighs approximately _____ pounds. In the lower animals the brain is formed by three distinct _____, easily recognized as the fore-brain, the _____, and the hindbrain.




Fig. 3

The purpose of these series of tasks is to form students' skills to overcome with language difficulties of text understanding. Gradually each link of series is considered here separately, although in fact they are combined into a unified basic program.

The program includes the instruction, text and words in the form of keys as a support (at the level of vocabulary and grammar), which includes all words from the text, and exercises to control reading comprehension. Reading the text, which is on the display screen (with the possibility to return to any previous part of the text), student can apply the keys at the difficult moment during the process of reading. Particular importance in our program is paid to the word-keys. Gradually, students learn to overcome a variety of difficulties in the process of reading: to understand the word and guess its meaning according to the context, etc. [5].

We considered following requirements for the program material: clarity, accuracy, instruction availability to the programs use; facility of movements in the program; the possibility to control and regulate the feed rate of the text; the opportunity to register students success and informing students about them; the ability to provide a variety of exercises in the program, potentially interesting for the learners; the opportunity to use the program both in the group and individually.

The system of reading learning with the help of computer technologies, e-books, multimedia and interactive tools (Professional English in Medicine, Interactive CD + Workbook) was tested on the basis of the Astana Medical University, Astana city, Kazakhstan [8, 9]. Reading learning was performed on a specially given part of the lesson and took 30–40 minutes. All students worked with the computer with great interest and pleasure [7].

Achievement checking of the given learning system was performed in such way: control experiment on the two different in content, but identical in volume and difficulty of the text was carried out in two parallel groups in the beginning of training. Results were recorded. After the training course the same texts were used as final, but the control texts were being changed between the groups. Therefore the results can be compared according to the same text in groups of students who have studied and who haven't studied with the help of computer. As a result of course with the help of a computer the time of students' reading of the text is decreased (average from 10 to 15 minutes), they rarely ask the teacher, and the cases of recurrent asking for assistance are decreased significantly. Students significantly less ask for a help, encountering the word which meaning can be understood independently and they definitely determine the type of difficulty that they have to overcome.

Test results were more higher. Thus, we can assume that the given system of training is effective and we recommend it to use at Universities with the necessary equipment.

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Materials of Conferences

**FORMATION OF OXIDE TUNGSTEN
BRONZES ON W – SUBSTRATE
BY ELECTROCHEMICAL SYNTHESIS
FROM MOLTEN SALTS**

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The work is related to the field of high-temperature electrochemistry, in particular, obtaining nanostructural coatings of oxide tungsten bronzes (OTB) by molten salts electrolysis [1–5]. The obtained samples may find application in medicine, electrical engineering, radio engineering, food and chemical industries.

The following melts were used in this study:

1. $0,30 K_2WO_4 - 0,25 Li_2WO_4 - 0,45 WO_3$.
2. $0,25K_2WO_4 - 0,25Na_2WO_4 - 0,50WO_3$.
3. $0,55 Li_2WO_4 - 0,45 WO_3$.

The polycrystalline coatings OTB ($K_xLi_yWO_3$) of hexagonal structure were obtained (Fig. 1) during the electrolysis in the $0,30 K_2WO_4 - 0,25 Li_2WO_4 - 0,45 WO_3$ melt under pulsed potentiostatic conditions on the textured W-plate. Each microcrystal is an oriented nano-needle structure, in which the needle clusters are linked between each other with the intermediate neck. By increasing the pulse duration up to several seconds the space between the nano-needles becomes filled by layer-by-layer growth from the needles along the intermediate neck and formation of hexagonal OTB plates with smooth faces occurs (Fig. 2).

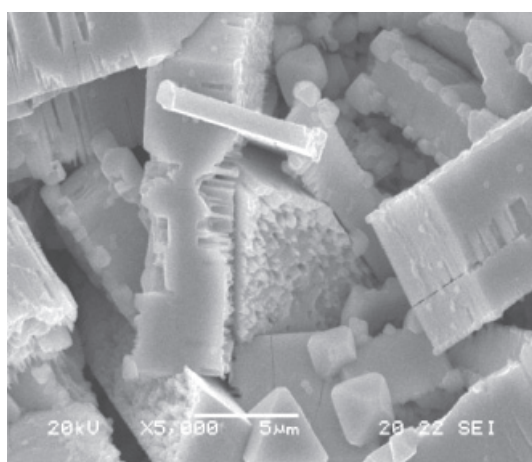


Fig. 1. Morphology of the hexagonal OTB nanocrystalline deposit:
 $T = 700^\circ C$, $\eta = 200$ mV, $t = 0,5$ s

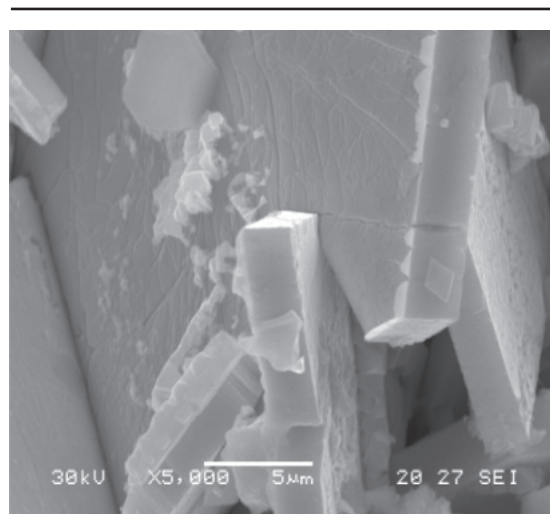


Fig. 2. Morphology of the hexagonal OTB:
 $T = 700^\circ C$, $\eta = 200$ mV, $t = 15$ s

The unformed tetragonal prisms are deposited from the $0,25 K_2WO_4 - 0,25 Na_2WO_4 - 0,50 WO_3$ melt (Fig. 3). The tops of individual crystals are composed of needles, having the orientation $\langle 001 \rangle$ (the needle thickness at the half-height is 80–150 nm). The process of formation of the regular OTB microcrystal ($K_xNa_yWO_3$) with the tetragonal structure was found to be faster than that of the microcrystal with the hexagonal structure. The formation time is 0,5–1 s.

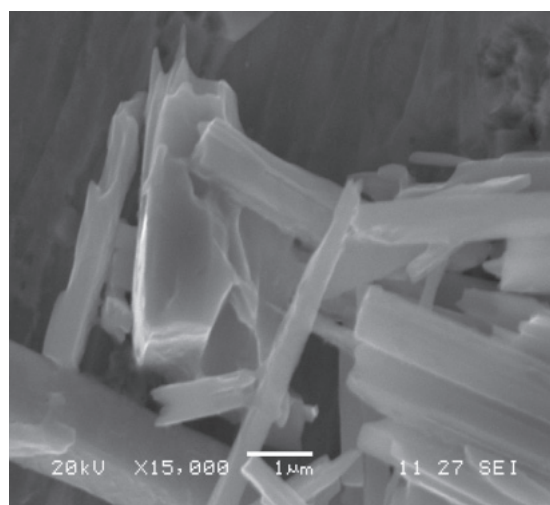


Fig. 3. Morphology of the tetragonal OTB:
 $T = 700^\circ C$, $\eta = 130$ mV; $t = 0,2$ s

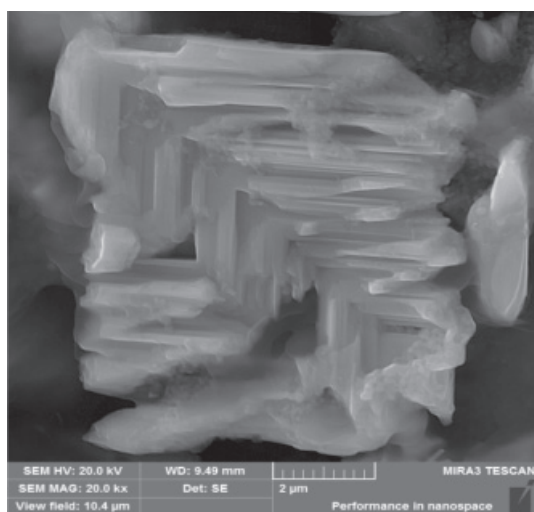


Fig. 4. Microcrystal of the cubic OTB:
 $T = 800^{\circ}\text{C}$, $\eta = 250 \text{ mB}$, $\tau = 0,1 \text{ s}$

During the $0,55 \text{ Li}_2\text{WO}_4 - 0,45 \text{ WO}_3$ melt electrolysis the polycrystalline deposits consisting of cubic OTB crystals (Li_3WO_3) are formed. These crystals are formed by the intergrowth of separate needle clusters. The formation mechanism of OTB with different structures (cubic, tetragonal and hexagonal) is assumed to be the same and includes the following stages: the formation of nanoclusters; their interaction with the formation of the intermediate neck; the subsequent filling of the space between the needles. At the same time, these clusters can be positioned both in parallel, as in the case of

tetragonal and hexagonal OTB, and perpendicularly to each other, forming stepped structures in the case of cubic OTB (Fig. 4). In the process of growth the stepped structures become porous and then form crystals with smooth faces.

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1. Nanocrystalline oxide tungsten bronzes obtained by melts electrolysis in catalytic oxidative processes of desulfurization and refining of oil fractions (The program of the Ural Branch of the Russian Academy of Sciences № 12-I-3-2058).

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*Materials of Conferences***THE INFLUENCE OF ENERGY EFFICIENCY ON ENERGY DEVELOPMENT BURYATIA**

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Nowadays solution of the efficient energy use problem is one of the priority directions in Russian national politics [1]. According to the definition of Federal Court № 261 «About energy saving and increasing power efficiency», efficient energy use is a characteristic, which features ratio useful effect of energy resources use to energy resources costs. Thereby, power efficiency is efficient power use, which results resources saving, raising of industrial productivity and competitive capacity, reduction of exhaust gas emissions into the atmosphere, household running costs and fuel cost.

Last ten years the purpose of the Russian Government was to establish normative economic and information mechanisms, which can encourage increase of efficiency energy use, and to develop and to implement the federal programmes of improvement energy efficiency [2].

To define the main trends of fuel and energy sector of Republic of Buryatia (FES of RB), It was developed «Strategy of fuel and energy industry of Republic of Buryatia over the period to 2030», approved by Buryatia Government of the 15th of May 2009 № 177. The document determines priorities, conditions, goals and objectives of развития fuel and energy sector of Republic and its main industries.

There are the following objectives to solve:

- investment and entrepreneurship improvement, innovation technologies encouraging, infrastructure development;
- creating of leading tourism centre of the Eastern part of Russia;
- efficient use of productive and natural capacity;
- modernization of infrastructure;
- enhancing of natural resources management, ensuring ecological safety and environmental protection;
- mining enterprises development on the territory of Republic of Buryatia.

Gusinoozerskaya state district power station and Irkutsk energetic system provide the work of existing power consumption of Buryatia and surrounding areas. Nowadays it is enough for normal functioning of energetic system, however there are limits on the connections of new consumers in the Baikal district, round the Baykal-Amur Mainline, in the eastern parts of Buryatia and in the City of Ulan-Ude.

Significant growth of a power consumption is expected and power deficiency is predicted to 2015 year due to the further economic development of the republic and put into operation new large industrial enterprises, mining and processing works.

For ensuring and economic development of the Republic of Buryatia and elimination of deficiency the electric power, two strategy of energy security development are possible. The first consists in construction of the new power networks, the second – in effective use of energy.

So, input of power capacities on combined heat central 2 (CHC2) can solve a problem of developing power deficiency. Continuation of construction of the Ulan-Ude CHC2 is the fastest, effective and economic action for a covering increasing thermal and electric load of Ulan-Ude and the Republic of Buryatia, and also solution of environmental.

The perspective directions and the most worked in the sphere of development use of renewable sources are: energy of the small rivers and solar energy.

The Republic of Buryatia possesses the potential of the small rivers energy. At meeting on development of electronetwork economy of Siberia in November, 2013 (Chita) the question of construction of Mokskaya hidroelectric power station was brought again up. The hidroelectric power station is considered as basis of Baikal-Amur mainline electrification and as one of sources of a covering of deficiency of the Buryat power supply system. Export of part of the electric power to China is possible.

Besides, Center of Power Effective Technologies ltd. actively realises projects on use solar energy making the equipment on own technology in the Republic of Buryatia.

Solar installation are used for a heat supply of social objects, the industrial enterprises, houses.

Also one of strategic plans are gas supply and republic gasification. In 2008 Buryatia signed the cooperation agreement with Gasprom. Now the Republic of Buryatia is partially installed gas by the liquefied hydrocarbonic gas. Delivery liquefied gas is carried out by Buryatgaz which main activities is acquisition, transportation, storage and realization of the liquefied gas, transfer of motor transport to gas fuel, construction and installation of autogas-filling stations.

Thus, it should be noted three priority directions in development of power industry of Buryatia: expansion of the Ulan-Ude CHC-2, construction of Mokskaya hidroelectric power station and justification of construction of the gas pipeline.

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ECOLOGIZATION OF CONSCIOUSNESS

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In the beginning of 20 century K.A. Timiryazev wrote, that if the humanity wanted to survive it had to «become greener». Economic direction that dominated till the end of the 20th century more and more often is replaced by ecological one. The future of the humanity depends on its ability to attain the rational combination of economic and ecological interests. The formation of the new consciousness is a lasting process that is carried out through grafting people knowledge, ability, possession and is supported by new economic relations between producers and society in general. Theoretical and practical classes of students of pharmaceutical faculty in «fundamentals of ecology and nature protection» are necessary primarily for formation ecological consciousness of a modern citizen of our Planet-ecocentrism. For this purpose several directions are chosen: theoretical knowledge of discipline, because we can't answer the question «why do we need this?» without it; lab research, which proves the existence of the problem, case of technology give the opportunity to analyze the problems independently, creative works stimulate people to active search for the answers.

During lab classes we make several computational researches that show us a condition of human habitat in the definite place. In his work «lungs of my town» a student-pharmacist describes phytocenosis of a certain location and using some spe-

cific methods calculates its gas productivity. Students make a conclusion that green plants of cities are not capable for providing all city-dwellers with oxygen, thus forests of our planet are global lungs of the world and we need to protect them. Students also make computational researches in other subjects: lichenoidication, morphological status of the plants, chemical consist of a leaf in places with different anthropogenic influence; the consist of the air in towns, main and minor highways and other researches. Of course, we didn't ignore a new direction «green chemistry», as a new way of thinking in chemistry and a hope for a clean human habitat on our planet. The last century is characterized by increasing of production and consumption of medicines, accordingly, the content is arising in the environment. It can become the treat to the people's health and the whole planet. In this connection the questions of the solution of this ecological problem is becoming especially actual. Pharmaceutical pollution of the Earth is a serious reality of our time. The students suggested a new way of solving of this problem on the basis of the case-game, introduction of the «chemical chips», which become more active under definite conditions and situations. The forming of ecological conscious is the double problem: preservation of environment and forming the new human.

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Materials of Conferences

**VEGETATION OF SPECIALLY PROTECTED
NATURAL TERRITORIES
OF THE WESTERN REGION
OF AZERBAIJAN (IN CASE
OF THE NATIONAL PARK OF GOYGOL)**

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For the last time in Azerbaijan increased interest in the development of national environmental policy. In Azerbaijan, a National Biodiversity Strategy. Created new state natural reserves, national parks, expanded existing reserves. After establishing the status of a state-level protected areas of the western regions of Azerbaijan (GoyGol National Park, Karayazi, Korchay and Eldar nature reserves). Floral biodiversity we studied over 1,200 species belonging to 471 genera and 112 families [2].

Given the vegetation protected areas of the Western regions. When typology of vegetation protected areas of the western regions of Azerbaijan (on the example of Goygol National Park), we used the principles razrabotanyaye A.A. Grossgeym [7, 8], L.I. Prilipko [10] V.D. Gadzhiev [5, 6] These authors in vegetation type united by all the formations which belong to the dominant one life form, or set of associations and formations, PhD, the unity of the dominant life forms – edificator.

Our classification of the type of complex, takes into account the location and conditions of vegetation. This approach best reflects the nature of the vegetation cover, vegetation types:

- 1) mountain steppes;
- 2) highland xerophytes;
- 3) shrubs and bushes;
- 4) forest;
- 5) meadows and lugastepi;
- 6) wetland vegetation;
- 7) vegetation of rocks and scree.

Land covered with forest vegetation and located on the slopes of ridges surrounding the lake Gay gel, have all the characteristics of the forests of the upper and middle part of the mountain zones of the northern boundary of the Lesser Caucasus ranges. These forests are mainly deciduous and consist of different types of motorcycle kovyh, hornbeam, beech, hornbeam and mixed forests.

At the upper edge of the forest in some places, especially on the western slope, dominated by forest park type low efficiency, where a well-developed herbaceous vegetation, which has in its composition subalpine elements. By leteraturnym data (2, 4, 5, 6, 7) comprising 342 species collected in the Lake Gay gel contains: trees – 21 species, shrubs – 31 species, polkustarnikov – 2 species of herbaceous stretch – 342 form. After changing the status Goygol National Park in the flora includes

643 species of flowering plants, including 487 species of perennial, biennial 23,45 annuals, tree – 9,49 shrubs, polukeustaroniki – 7 species. Meadow vegetation in Gay gelskovo National Park occupies Zone between 1600 (1700) – 3200 (3300) m asl and represents a serried groups (projective cover 75–95%) formed in temperate soil and climatic regime.

On physiognomy, structure and floristic composition of alpine meadows and steppes are three classes of formations: poslelesnye meadows and subalpine meadows lugastepi, alpine meadows and carpets. For the representatives of the first two classes characterized by high growth, caused by a combination of favorable environmental factors, moderate temperature, soil moisture, light, intense solar radiation. Alpine meadows and carpets with supportive role of all the factors set relatively low temperature, adversely affecting the growth ecobiomorphs. As special studies on the marshy meadows and wetlands in Azerbaijan can specify works A.A. Grossgeim [4], D.A. Alieva [1], D.A. Aliyev, HajiyeV.D. [2], L.I. Prilipko [4], Flora of Azerbaijan [13], E.M. Gurbanov [4] and others, which are characterized by high structure Tsenotichesky swamps and made a number of provisions. Shhgapsoev S.H. [10] describing the vegetation of the Caucasus, indicates that the species inhabited the highland marshes are among the Pleistocene migrants. He believes that the relic is associated marshes on the genesis of a glacial process. In the floristic composition of swamps he distinguishes two groups of plants: 1 – largest group of migrants glacial, 2 – less than a large group of species formed from the forms that are not met in over vast Euro-Asian continent.

According A.L. Reyngardta [11] more species of marsh vegetation belong to the Pleistocene ice age period. Therefore, he believes swamp landscapes relic. Overarching alpine plants carpet the study area are: *Carum caucasicum*, *Campanula tridentata*, *Veronica gentianoides*, *Erigeron alpinus*, *Alchimilla* sp. *Potentilla crantzii* etc.

Sparse vegetation cover on the mountain xerophytes backgrounds are four formations:

- 1) friganoidno – shiblyakovaya (*Rhamnus pal-lasii*, *Capparis spinosa*);
- 2) tragakantnikovo – grass (*Astragalus marschallianus*);
- 3) tragakantnikovo – motley (*Astragalus aureus*, *A. caucasicus*);
- 4) chebretsovo – fescue (*Thymus daghestanicus*, *T. collinus*).

Shrubs and bushes in various proportions are found in all plant composition gruppirovon where there though young but developed soil. Principal place of their distribution are less dry slopes of the northern and northwestern exposures at the lower boundary of the forest. Many of them (*Rosa spinosissima*, *Spiraea crenata*, *Cotinus coggygria*, *Alnus incana*, etc.) developing here a long time, have a

zonal character. Patchy form thickets polydominant structure. Rock vegetation formed many species belonging to different life forms, but having xerophytic properties, and represented as sparse groups, as well as certain types of small shrubs, leaf cushions and herbs. By spurs, river gorges and mountain peaks rocks take frontal shape, the place looks a terraced planes. At first glance they seem utterly lifeless, devoid of soil cover. Formation of vegetation on the rocks, stones and ruins is in close connection with the processes of nutrient and soil environment [12]. Rocks are characterized by a peculiar environmental conditions, adapting to whom settled here plants produce special fittings – tearproof roots, vegetative organs with lots of veins and developed transpiration device pillow form. Complexes rocks kamennikov and accumulation of rock fragments at the base and the bottom of the mountain slopes (Osipov), unconsolidated deposits of detritus (placer) and milder forms of relief in the form of a cup-shaped depressions, gullies, Losinj, narrow saddles are landscape-based elements limiting heights. They only in late spring is slowly released from the melting snow, from which flow down the icy waters calm. At lower levels of water melting snows, rain and springs merge into swift, violent origins, and eroding propilyvayuschie rock slopes and narrow valleys forming outside vertices [5, 11]. Rock vegetation up to the alpine meadows represented by the following species: *Valeriana alpestris*, *Aster alpinus*, *Dianthus caucaseus*, *Sempervivum caucasicum*, *Silene pygmaea*, *Campanula petrophila*, *C. Saxifraga*, *C. Ciliata*, *Draba brunifolia*, *D. mollissima*, *Saxifraga adenophora*, *S. exarata*, on wet rocks: *Cystopteris fragilis*, *Asplenium viride*, *Draba incompta*, *Saxifraga moschata*.

Calcareous rocks cause specific difference: *Campanula alliariifolia*, *C. tridentata*, *Jurinella moschus*, *Asperula alpine*. Of pressed shrubs are confined to the rocks: *Rhamnus depressa* etc. Structure rock vegetation varies with altitude. It becomes more ornamental species. Among them, the brightness of different colors *Draba siliquosa*, *Betonica nivea*, *Campanula saxifraga* etc. In the alpine zone above and rock vegetation is gradually replaced by species better suited to the harsh alpine climate subnival belt. On scree and rocks, located from 2500 to 3200 m above sea level. m flora composition represented 183 flowering species. Significant role in settlement lifeless rocks and scree subnival zone Lesser Caucasus play lichen groups. Tsenotichesky role lichens increased by barren rocks and scree highlands of the Lesser Caucasus, occupying large spaces (9).

As special studies on the marshy meadows and wetlands in Azerbaijan can specify works A.A. Grossgeim [4], D.A. Alieva [1], D.A. Aliyev, Hajiyev V.D. [2], L.I. Prilipko [4], Flora of Azerbaijan [11], E.M. Gurbanov [5] and others, which are characterized by high structure Tsenotichesky swamps and made a number of provisions. Shhagapsoev S.H. [10] describing the vegetation of the Caucasus, indicates that the species inhabited

the highland marshes are among the Pleistocene migrants. He believes that the relic is associated marshes on the genesis of a glacial process. In the floristic composition of swamps he distinguishes two groups of plants: 1 – largest group of migrants glacial, 2 – less than a large group of species formed from the forms that are not met in over vast Euro-Asian continent. According A.L. Reyngardta [8]. Dominating this formation is *Epipactis palustris* (L.) Crantz, *Caltha palustris* L. Floristic aspect of their stand: *Equisetum ramosissimum* Desf., *Juncus articulatus* L.; impurities found: *Înula britannica* L., *Carex transcaucasica* Egor., *Agrostis gigantea* Roth, *Caltha polypetala* Hochst., *Rubus caesius* L. involving the edges of the formation *Salix pentyan-droides* A.Skvorts., *Ulmus glabra* Huds. etc.

In Agstafa Kazakh and woodland on the banks of the Kura-moistened meets *Alnus incana* (L.) Moench, Meth. accompanied by herbs: *Equisetum telmateia* Ehrh., *Calamagrostis pseudophragmites* (Hall.fil.) Koel., *Dryopteris filix-mas* (L.) Schott., *Nepeta mussinii* Spreng., *Acinos arvensis* (Lam.) Dandy, *Rubus buschii* Grossh. ex Sinjkova, *R.caesius* L. et al, these same species are found on the floodplain swamps formed along boundaries constantly moistened. These kinds of marsh-riparian vegetation are confined to the valleys and lowlands. A whole series of wetlands represented at lower steep slopes. On older ones formed in the subalpine zone formation – sedge -grass marsh. Its dominant feature is: *Blyumus compressus* (L.) Pauz.ex Link, *Catabrosa aquatica* (L.) Beauv. B as components involved: *Phalaroides arundinacea* (L.) Rauschert., *Glyceria notata* Chevall., *Poa palustris* L. *Caltha palustris* L., *Carum carvi* L., *Trifolium fontanum* Bobr., *Plantago major* L.

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*Materials of Conferences***HISTORICAL – ETHNOGRAPHICAL ANALYSIS OF NATIONAL CULTURE**

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This article is devoted to historical ethnographical analysis of applied art, the most important field of national culture, existing from time immemorial and shows its world view roots. The thoughts and ideas, nature and truth have their solutions in concept of colors. National applied art of the Kazakh nation dates back to the centuries.

The objective of research: determine the ideological fundamentals of the Kazakh applied art. Folk art is a reflection of knowledge of the universe, which forms many centuries, understanding the complexity and ambiguity of life, their desire to establish symbols of this knowledge. Symbols, in turn, used in the ornament, decoration, household items were designed to resemble the important spiritual truths in everyday life, by creating a line of continuity from ancient ancestral knowledge to succeeding generations.

Goals and tasks of training on the basis of the Kazakh applied art are directly connected with the concepts of the role and content of folk art in life, the direction and the process of transfer to the younger generation of spiritual and artistic heritage in art. Thus, the complex study of these problems defines the scientific and pedagogical relevance of the training of the future specialists on the basis of the folk applied art.

Introduction. Historical ethnographical analysis of applied arts as the most important and ancient field of national culture can show its deep rooted world outlook: spiritual aesthetic cognitive bases of artistic nature are calendar, Orhon and other monuments and symbols; Images of three-structured world, four corners of the universe, the sky, the soil, under the ground or images of eagle, wolf, poplar, trivet, snake and ears can be pictured on the ornaments; images of soil, water, mountain, stone can be manifested on substantivized talismans and jewelleryes.

Spiritual aesthetic cognitive bases of artistic nature are pictured on calendar, Orhon and other monuments and substantivized symbols. People depicted natural phenomenon on symbols figuratively. They drew symbols on the stones in order to show beliefs, on ears of sheep to show property, on carpets and furniture of *yurts* to show their dreams and imaginations.

As an example, we can take the calendar of our ancestors, which could join natural phenomenon and the group of symbols such as day, week, month, year, century etc. According to this calendar, the time was defined by sky surrounding and the volume of space was defined by soil surrounding. Moon, Sun and Star of sky world as cosmogonical time is considered beginning of the life. For example, there are twelve months in a year and thirty

days in a month. According to this structure, our ancestors used methods of dividing sky circle into twelve parts on the Sun way, grouping and naming the stars in each part. That is why a year is divided into twelve months and a month into twenty-eight or thirty or thirty-one days and time is measured by this structure. The name of the year is associated with names of animals living on the ground and they mean a space and life on the earth.

Animals (horse, dog, tiger etc.) have own cognitive meaning. For example, a horse had an important role in nomadic people's life. Man could master world space with the help of animals, the source of life. The paw and skull of animals are considered a holy thing. For example, one of ancient tribes *Scythian* tied the paw of horse on man's belt to bring good luck on the way and kept from death and Kazakhs worshiped the images of horse depicted on the stones. Such stones with the images of horse are kept in *Mangystau, Karatau, and Central Kazakhstan*. The development of symbols can be origin of Turkic runic writings. Pictured writings and traditions are closely related to each other. They are classified as ornament ideographic writings and *ru* symbol signs like moon and sun. Eventually symbolic images became Kazakhs' *ru* symbols and had a property meaning. Writing alphabets and ornaments appeared with the help of symbols. There are classified such ornaments associated with animals, cosmogony and zoomorphism used by Kazakh people nowadays. The calendar is cognitive basis of symbolic artistic nature, beginning of people's spiritual life, the substantivized view of space and time of Kazakh applied art.

Images of three-structured world, four corners of the universe, the sky, the soil, under the ground or images of eagle, wolf, poplar, trivet, snake and ears can be pictured on the ornaments. The meaning of space and time of Kazakh applied art divides the world into three (sky, soil, underground) and a slope into four. It is a way, defining the space of nature. It means far, near, up and down. For example, you can see three structures on *Scythian* prince's cloth and dagger. The image of eagle on the dagger means the world of sky, animals the world of soil and snake, the world of underground. According to ancient Turkic opinion, a bird was symbol of sky, fish was symbol of water and tree was symbol of soil. In addition, gold mountain-son headdress consist of three heights: high, middle and small. Such treasures of people's art have been developing for centuries and has come to our generation. The scientist O. Zhanibekov asserted that Kazakh people have rich ornaments and patterns with peculiar cognitive meaning. Three-cornered structure, spoken above corresponds to all substantivized monuments of nomadic culture. It consists of infinity and boundless. Three, four and other numbers became holy. Three *zhus*, three powers, three eyes and other common words connecting with the relations between human and nature and have philosophical meaning.

The names of birds like swan, crane, owl, and eagle have cognitive meaning and manifested symbols of the sky in Kazakh people's lifestyle. That is why they made musical instrument *kobuz* similar to a swan. According to the concept of ancient *Huns*, they considered the swan a protector of the happiness of home and having kept this custom Kazakhs warned their generation «Not to shoot a swan». They believed that a swan educates up men to be respectful, conscientious, and beautiful and keeps calmness and happiness of the family. In addition, they used to hang a paw of the eagle on the wall and tied a leg of the owl on the cradle of child to take after their special features to keep from danger. Traditions and customs of Turk people had been kept with definite meaning to guess some concepts in Kazakh daily life.

One group of applied art products consists of furniture of the house; second group consists of equipment for movement, hike and weapons. In spite of crocheting carpet, felt carpet, *syрма* and sewing clothes, people were engaged in engraving woods, bones, horns and making ornaments and patterns. It required a master to be talented in designing ornaments and have high aesthetic understanding, great taste and ability.

Results of research and their discussion. S.V. Dudin and E. Sheider wrote historical works about ornaments of Kazakh people. T.K. Basenov wrote about architectural monuments of East Kazakhstan and M.M. Mendikulov wrote about Mangyshlak and East Plateau, I.V. Zakharov, V.V. Vostov and R.D. Khodjyev wrote books about culture and lifestyle of Kazakh people.

There are many types and names of Kazakh ornaments. Nowadays researchers gave scientific definition to more than two hundred of Kazakh ornaments [1; 23]. The world outlook of nomads, their aesthetic understanding and secrets of natural colors are pictured on the ornaments. Unity of space and time is depicted in plant and geometrical ornaments.

Space – zoomorphic ornaments where images of animals, depicting the life on the earth can be pictured abstractly. Such ornaments have special names like *tulparbas*, *taituyak*, *koshkarmuyiz* etc. People imaged their understanding about domestic animals connecting with their daily life, through ornaments. *Tulparbas* – an ornament pictured on the leather thing. Ancient nomads worshiped the paw of horse, pictured on the stones. These pictures are in *Central Kazakhstan*, *Karatau*, *Mangystau* etc. People named them «*Tulpartas*». The ornament *taituyak* similar to *tulpartas* has appeared because people treated with respect a horse very much. In addition, you can meet ancient ornaments in *Kelin Tam* mausoleum, built in XVIII century, which situated along the river *Kengir*.

Sun, lights of the Sun, Moon, and Stars etc. associating with the world of sky are connected with beliefs. For example, the door of the *yurt* is sewed to the direction of sunset. «According to ancient tradition the host of the house went out in the early morning, prayed at sunrise and wished all the best». People believed that if there are many stars at night, there will be clear sky and predicted weather

forecast, ecological space and time with the help of Moon and Stars and this method is still used. We know that blue sky is moving forever. The image of the Sun is the everlasting way of life for generation. It rotates for many times and turns to weeks, months, years and centuries. The life continues its way, gathering all generations. Nowadays we can see on the cover of invitation card of new married couples crossing two wedding rings, joint together to live with happiness and in spite of life difficulties. However, the life of a man is limited.

The happiest time of a man is period of life from his birthday until his death. Measure is time. Time is forever everlasting the way of life. According to scientists image of the Sun has been changed with the organs of animals. For example, «sheep and goat in solar – cosmic mythology are closely connected with the Sun and essentially identified» [2; 152] or in the works of academician A. Margulan V.I. Petri wrote the following: «The horn of sheep is depicted in spite of lights of the Sun image. Obviously, it is cosmic symbol, an image of the Sun and universe». The image of sheep, horse, camel, wolf, eagle are grouped in ornaments associating with head, horn, ear, paw and leg of animals. The name of ornaments such as *at bas*, *koshkarmuyiz*, *tort kulak*, *kazmoyin* and *tuyetaban* are considered the main ornaments.

The ornament *koshkarmuyiz* is often used in applied art products. For example, people depict this ornament in the middle of the carpet, wishing about flock of sheep in their motherland. One of the type of this ornament is *koltuk* showing hospitality means you are welcome and make yourself at home and have a rest. The ornament *omyrta* associates with the organs of animals too. It is given to young fellow as horse harness and a defender of a horse and himself. Other ornaments' groups, symbolizing the world of animals, like *tuyetaban*, *omyrta*, *it kuyryk*, *kuskanat*, *karga* and *tuyak* were often used. These ornaments have special meaning. For example, ornament *koshkarmuyiz* made on the *kiyiz* (felt carpet) associated with wealth and ornament *kyrykmuyiz* means the growth of cattle.

Conclusions. So nomadic people understood the importance of nature and environment owing to animals and discovered the secret of space and time. National heritage like wood fashioning, knitting business, twisting a rope, wrapping a cord, rolling cloth, weaving a carpet with and without pile made of wool, making ornaments have fabulous big experience of life. Consequently, Kazakh applied art is materialized outlook that appreciate beauty of nature, conceive nature and environment.

The naturalness and saturation of the colors appear in people's mind with cognitive and educative meaning and define the truth and nature of space and time. For example, the sign of the sky and creator is associated with blue color; welfare, truth, honesty with white color; fire and happy life with red color; sun with yellow color. From the colors of space and time one can understand natural dialect, system of national thoughts, ethno cultural development, beliefs and dreams of people, the image of the world.

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**SOME ETHNOGRAPHICAL FEATURES
OF THE FAMILY LIFE OF GANJABASAR
REGION (XIX-BEGINNING
OF XX CENTURY)**

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Ganja is one of the oldest cities and has the rich historical past. This consideration is proved on the basis of indisputable scientific arguments and facts. Among the problems to be solved in the ethnography of economic life, material and spiritual culture and that of the family and family life is one of the leading places, remains a hot topic of study for all historical periods. Because of the complicated social event in the family history category, the core of society, he was an integral part, is constantly evolving, and reflects the level of cultural development of society. Each socio-economic structure is seen more clearly in the life of the family and family values. And civil society in its primitive form of higher progresses, the family is also the primary forms of unethical (based on group family, polygamy family, etc.) based on equality of the sexes full of monogamy improved up to the family. Social justice, democracy, human rights victory for equality in the family, he played the modern era, including the ethnography of the swelling appears in all of the family, their social nature, functions, family and life in customs, beliefs and rituals, moral-ethical, cultural and educational conformed to the requirements of shades. Ganja in Azerbaijan's historical-ethnographic regions, or in the suburb area of abundance of material and spiritual culture, business and family life in local-local specificity, the century-old empirical knowledge, practical skills and practices based on culture, heritage craft the perfect constant selected and are currently preferred. Travel in the ethnographic region of Ganjabasar results consistently show that, from time to time to the various social, political, geographical, cultural, technical and economic factors as a result of the active effect, suburb of creativity, imagination and intelligence capabilities, aesthetic and artistic taste, thinking, sound – shot mode, the national moral and material values reflecting not only the region, the whole of the national – spiritual and material resources, nationwide, ultimately enriching the culture of the Turkic world and has been a valuable ethnographic resources.

So, today the independent Republic of Azerbaijan, national and moral and financial criteria drawn

more attention to the center of the national and state level appreciation for spiritual values, national and moral consciousness and realized as a confirmation of existence of the modern return of the Azerbaijani national ideology in the history of the formation process period of time in its history against each ethnographer, scientist, more carefully and honestly approach the material and spiritual values, special skills they bring to the task to future generations. National Leader Heydar Aliyev's national ideology is a key ingredient in our national and moral values. We should be proud of our national values. Our national and moral values in our nation for centuries formed the lives of our people formed activity. Moral values of a people who are not real people, a nation cannot be true [1, p. 244].

We Ganjabasar this article one of the region's population, which is an integral part of life and culture, family life and the light to illuminate various aspects of the national Azerbaijani ideology, the analogy to other ethnographic regions, ethnogenetic have to try to keep their relationship. Each household in the area of culture and the formation of many socio-economic, geographical, ethno-cultural, and historical and political factors have an important influence, and we would say, perhaps directing the political orientation of its formation. Therefore, the geographical location of the region while working on the article, the natural and cultural riches, historically formed the material and cultural values of national, ethnic and cultural history of the region, as well as the historically formed knowledge and experience of the people, customs and traditions have a major focus. Wild – collected ethnographic materials, Ganja and surrounding regions (Samukh, Dashkasan the regions of collecting) funds of museum exhibits and specimens preserved in the material and spiritual culture, art exhibits that reflect the heritage, as well as various professional owners say məlumatçıların Ganjabasar in the ethnography of the population, especially in the life of the family and family – specific local features are selected, the spiritual world, the richness of the material demonstrates the creative possibilities. Date of settlement of lands in the center, located at the intersection of East – West trade routes caravan and a favorable geo-political and geo-strategic position, the share of the surplus population (for the record I would like to learn academic Z.M. Bunyadov, his «state of the Atabeys» monograph Atabeys-Eldanizids state period of up to half a million people were living in Ganja wrote [2, p. 188], the formation of the spiritual world of Ganja, the city's art and urban position as a trading center, as well as in the field of family and family life, which is important to preserve the traditions and the creation of ever-conditioned. For many centuries, the population of the various peoples and countries of the region Ganjabasar relations in ancient times carried out through the caravan trade routes, the roads are the most prevalent forms of economic relations between the two nations through the exchange of goods carried from

one cultural relations have been established, further enriched the spirit of the people. The first trans-continental trade and diplomacy in the history of mankind is regarded as the path of the Great Silk Road (as well as Ganja) crossed the international trade, which has existed since ancient times in the world widened and strengthened the cultural and political relations. Passing through the main caravan trade routes of the ancient East, Europe, Central Asia, Mesopotamia, India, China and Front Asia combined. Indeed, Tabriz, Ardabil, Nakhchivan, Barda, Derbent, Shamakha the regions of Qabala, Sarab, Barzand, Salmas and others. Along with the cities, suburb of the city of Ganja, which is an important commercial and cultural center located on the caravan trade routes, of international trade, crafts, played an important role in the development of material and spiritual culture. All this confirms that the population of the suburb in the spiritual world, material culture, craft, power, family life has been the formation of norms, mutual – enrichment at the expense of the new values of the joint relationship, is attracting attention as the basis for the establishment of common values, here local – local specificity, but also nationwide, based on common values and a Turkic ethnic specificity is obvious. Ethnographic – rural suburb of a large portion of collected materials in different areas that make up the life of a family wedding, engagement, wedding and burial traditions, as well as the material is devoted to bringing up children. Economic and social science experts who deal with families and family life, the majority of families in the process of formation of the end of the Neolithic period – that is, private property, such as a specific social event in connection with the establishment of the house of the father followed by maternal generation coincided with the note [6, p. 297–298]. The main features characterizing the family, marriage, kinship, household consists of a system of relations between the Union and their family members. Q. Rajably, ethnographer and we have to agree that «a certain stage of historical development of marriage and family as the foundation of the community formed the basis of kinship, combined with the general interest, the unity of life and living conditions of the people who are connected to each other with the smallest natural collective. Family and moral values, traditions and rituals, including the implementation of the core. Of course, the family, which is typical for mankind since ancient times has been built on these grounds» [6, p. 297]. It is known that the main characteristic features of the family, marriage, kinship, household consists of a system of relations between the Union and their family members. Family and moral values, traditions and rituals, including the implementation of the hearth, core. Family and marriage customs of family relations is one of the leading places in the system. It should be noted that the nineteenth – twentieth century ethnographer Q.Ə. Qeybullayev classification

issues related to marriage, while forms tekkebinlilik marriage (monogamy) and ikiarvadlılığı, exogamous marriage rules and endogamy marriages, marriage traditions kobəkkəsmə (besikkərtmə), levirat, sororat and cousin marriages [3, p. 120–121]. N.M. Quliyeva, ethnographer writes that «in case of non – Muslim nations of the elders, with the advice of her daughters to marry girls under the mullahs word-witness». However, turning to the girl, «Muslim» was considered. To note that the beginning of the 90s, returning to their homes has completed his military service in different regions of Russia, or other nations in terms of education and work with the families of the girls who marry these girls were adopted [5, p. 179]. Mixed-national marriages, one spouse, usually the husband breaks, ethnic origin, language and culture to attain results. The impact of national and ethnic mixed marriages are felt particularly strongly in the second generation [7, p. 12]. People think that the preference making tradition that, from generation to generation, forms and approaches. But the answer is that the relations of production and social systems changes, changes in traditions, the old ones are forgotten, new ones arise. To a more comprehensive understanding of the history, the people the right way to evaluate the occurrence of the evolution and development of the material and spiritual resources to collect, record, systematize ethnographic research, analysis, and interpretation requires special skills to give the rest of us. Indeed, in an article to give attention to all the details of these issues is beyond the study. We tried here for the family and family life in Ganjabasar to thrust some ethnographic characteristics. Ethnographic research on family life conducted in the region in the future, this historical-ethnographic region-specific aspects of the local culture as a complex with the selected household should be involved in scientific research. In the future we will continue our scientific investigations in this field.

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Materials of Conferences

MODEL AND ANALYSIS OF FACULTY STAFF AGE STRUCTURE DYNAMICS AT UNIVERSITIES

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Age dynamics of faculty staff at universities on the basis of cellular automata model was investigated. Quality analysis of number of professors according to their age was performed, the most active age groups were detected.

In the article the social system (faculty staff) is investigated with nonlinear dynamics methods. Research objective is to analyze and forecast the state of the system. Faculty staff current state and progress trends, as well as development of universities scientific potential is analyzed by applying mathematical modeling.

Let us consider mathematical model of the one-dimensional cellular automata class, which allows analyzing age structure dynamics of faculty staff. We are going to model each faculty staff age category of the same kind with one element of the cellular automata, value of which characterizes number in this category. Model, which was the basis for staff analysis, was designed for age groups with 10 years gap: 25–29 years, 30–39 years, ..., above 60 years.

Transition from one age group to another takes one discrete time step corresponding to time interval $\Delta t = 1$ year. This transition goes with shift along the space of cellular automata. The element, whose age is at the boundary of the group 29, 39, 49, 59 years, should be transferred to the next age group.

The following factors were taking into account in modeling:

- ageing of each professor with the course of time (transition into next age group of each element of the model);
- retirement of professors who reached corresponding age;
- change of activity by ambitious employees;
- employment of newcomers recently graduated from the university;
- defense of Ph.D. and doctoral thesis with the succeeding professors' transition to the new category.

Let us describe these factors using cellular automata rule.

Cell dynamics (one year ageing of the employees in one group and of the same age) in each step at a time is computed using the following formula

$$X_j^{i+1} = X_{j-1}^i \quad (j = 2, \dots, N-1), \quad (1)$$

with using at the boundary of the cellular automata space ($j = 0$) the boundary condition

$$X_0^{i+1} = X^0, \quad (2)$$

where the value X^0 characterizes the number of young employees annually joining the faculty staff.

Change of activity by ambitious employees is described by the formula

$$X_j^{i+1} = X_{j-1}^i - G(i, j) \quad (j = 2, \dots, N-1). \quad (3)$$

In the simplest variant the function G is as follows

$$G(i, j) = kX_j^{i+1}, \quad (4)$$

where the coefficient $0 < k \leq 1$.

Equation corresponding to one-dimensional cellular automata is the equation of continuity – conservation law of staff number taking into account their leave of university system:

$$\frac{\partial x}{\partial v} + \frac{\partial x}{\partial t} - G(x, v) = 0, \quad (5)$$

where $x(v, t)$ is the university staff number aged v at a time t . G is the function of skilled workers drain, it is characterized by staff number aged v , who leave the university system for other activities. In the simplest variant the function G can be described by the linear relationship

$$G(x) = kx, \quad (6)$$

where $0 < k \leq 1$.

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UNIVERSITY OPERATION MODEL

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Findings obtained in the article prove the need of maintaining the high level of faculty staff activity at the universities.

The problem of loss of universities operating effect is associated with the level decline of scientific research conducted by the employees, and with decline of high skilled staff training quality through postgraduate and doctoral training systems.

To provide further insight into existing tendencies of level dynamics of human resources at the university a phenomenological model was worked out which allows to analyze tendencies and influence at the potential of development of different factors typical to the modern university system [1–2].

Let us develop and research a mathematical model which allows studying at qualitative level possible variants of university development taking into account its operating effect and change in accumulated academic and faculty staff.

Assume each faculty staff age category $N(T)$ is characterized by some functions $\varphi(T, t)$ and $a(T)$, where T is an age value of a considered faculty staff category, $N(T)$ is a number in this category. Write $a(T)$ for activity of this age category. Assume activity is a value ranging from 0 to 1. Zero means that a given age category is out of university activities, one means that a given category works with total efficiency. Activity can be assessed by holding faculty staff ranking at the university. Write $\varphi(T, t)$ for potential of the faculty staff age category. Potenti-

$$\varphi(T, t) = \varphi(N-1, t-1) + ka(T-1)\Phi(t-1) - r\varphi(N-1, t-1), \quad (3)$$

where k and r are constants of proportionality. Value $N(T)$ is determined from the formula

$$N(T, t) = N(T-1, t-1), \quad (4)$$

with neglect of staff flow from the university.

When reaching the maximum age T_{\max} the employees are no more considered, and the new vacancies are occupied by newcomers aged T_{\min} :

$$N(T_{\min}, t) = N_0. \quad (5)$$

Flow of faculty staff from each age group happens constantly, but at a first approximation this fact can be neglected, it does not affect quality results. Graduates join faculty staff, their initial potential is $\varphi(T_{\min}, t)$ determined by general condition of the university $\Phi(t)$. University graduates potential is determined by the following expression

$$\varphi(T_{\min}, t) = c\Phi(t), \quad (6)$$

where the coefficient $c < 1$.

After performing certain calculations we need to use the formulas of dynamics potential (3), of number in each age group (4), graduates potential (6) and university general level (2).

Studies showed that the value $\Phi(t)$ characterizing university condition rises in time. This corresponds to normal university development, growth of its scientific, methodical and teaching potentials. At the same time university graduates potential also grows, some of which later become university employees.

tial shall be understood to mean a combination of knowledge, skills and abilities which are possessed by representatives of the corresponding age group at a time t . Contribution of a given age category to the university work is

$$\Phi(T, t) = a(T) \varphi(T, t). \quad (1)$$

Measuring of value $\Phi(T, t)$ concerns quantity and quality of scientific paper issued by employees in a given age category, their training development papers, study guides, contribution to conference management, number of grants. System of faculty staff ranking introduced at the universities in some way reflects scope of their contribution.

Integral result of university activity at a time t is determined from the formula

$$\Phi(t) = \sum_T N(t) a(T) \varphi(T, t). \quad (2)$$

Potential $\varphi(T, t)$ of each age group changes with time. In a year age group potential will be defined by the formula

Assume what happens if faculty staff activity coefficient $a(T)$ is less than 1. Analyze how half decrease in faculty staff activity coefficient will result. Calculations performed within the model present that in 25 years after half decrease in activity coefficient, university development level will decrease five times.

The developed model of university operating efficiency and quality analysis proved that it is important to consider in estimating state of university such factors as activity and accumulated potential of faculty staff.

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*Short Reports***THE CONCEPT
OF NEGATIVE MENTAL STATE**

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Special consideration must be given to the concept of «negative mental state», which is allocated on the basis of the polarity, the symbol of the described conditions, impacts on human activities. Polarity is emotional characteristic of mental States. Emotions are a critical component of mental States, «reflecting in the form of direct biased experiences the importance of acting on human phenomena in their connection with actual needs associated with the physiological processes of the body and is one of the main mechanisms of internal regulation of mental activity» [1].

We can assume that the negative mental state is a consequence of the disruption of regulatory processes and its cause: the factor undermine the process of the negative state, and this state, in turn, stops and disrupt the actions that led to collision with the given factor; in some cases can be manifested only the tendency to lapse and disorganization. Thus, the negative state is called factor, disorganizing the course of the regulatory activity, and this process has a disruptive effect on the behavior. However, this characterization of the negative state does not take into account one important condition, namely, that it not only leads to the disruption, but it may also encourage the establishment of specific actions: under the influence of negative emotions are formed acts escape, attack or eliminate the negative factor. Negative mental state is a complex phenomenon: it will disrupt those activities, which leads to its occurrence, but organizes the activities aimed at reduction or elimination of harmful impacts. Thus, the negative process contains elements as disorganization and organizations [4].

Physiological explanation for the negative impact of emotions on human activities gave I.P. Pavlov. He believed that in the basis of negative influence of different emotional States lies «...the same physiological mechanism... braking bark from overexcited subcortical center [3].

In General, it can be considered a widespread point of view that mental state is a complex unity of opposite feelings. Laughter can be the laughter through tears, joy is accompanied by sorrow, and anger is to be accompanied by joy. To denote the duality experiences there is a special term – «ambivalence». He interpreted as contradictory feelings and emotional experiences associated with the dual attitude to man or phenomenon. For example – the acceptance and rejection, pleasure and displeasure, sympathy and antipathy. In these cases, only the identification of the leading, dominant emotions al-

lows to attribute them to the group of positive or negative mental States.

The study of the structure of the affective sphere with the use of factor analysis and other mathematical-statistical methods of processing of empirical data has led researchers to the conclusion of a certain independence pleasant and unpleasant emotions. The positive factor of *effektivnosti*, including the scale of social dominance, motivation to achieve, is associated with positive mental States, while the negative factor of *effektivnosti* uniting scale aggression and alienation, is associated with negative mental States. The experimental data confirmed the close connection between the two-dimensional state space and the two-dimensional space of a personality in the measurement of extroversion and neuroticism.

In many cases, it is easy to carry emotional state to «pleasant» or «bad», including the experience of pleasure or displeasure, but not always. The ability to clearly assess the polarity of the state is a contentious issue, with more than century history. But the existence of the medium, neutral States may not be an obstacle to that to use this feature, as polarity, i.e. the prevalence pleasant (positive) or negative (negative) emotions. It is necessary theoretical discussion and a useful tool for solving practical problems (diagnosis, prediction, impact assessment).

Very important to describe the mental state has the intensity of the experience emotions – their power, the brightness. Quantitative differences emotions largely determine the qualitative specificity of mental status.

Thus, the description of the mental state can not be complete without reference to its emotional characteristics, the basic can be attributed to the wide range experienced by the individual's emotions, the dominant emotion, intensity of emotions, polarity – prevalence pleasant (positive) or negative (negative) emotions.

General emotional background should not be regarded as some statistical balance or mathematical integral separate influences of different sign of emotions and feelings. This picture would have been impossible to imagine, even if we analyze the emotions from their biological sense. Biological significance of negative emotions that accompany any unmet needs, is that they encourage the body to overcome the obstacles to the satisfaction of the current needs. Satisfaction of needs leads to another extreme States of organism – positive emotions. Subjectively, it is accompanied by feelings of satisfaction, pleasure, joy.

Background affective sphere of the human being is a synthesis of many emotions and feelings experienced by man. Their appearance and flow due to many needs and motives, their complex re-

lationship. Naturally, in most cases, responding to the different needs in each moment of time is in various stages. Moreover, many human needs, by its very nature cannot be exhausted at the stage of satisfaction (saturation), like the basic vital needs. Therefore, for a man of mixed characteristic gamma of feelings and emotions, far from the dynamics of the algebraic summation, in which positive emotions and feelings extinguish (or weaken) negative, and Vice versa. It so happens that through my tears breaks through laughter, joy mixed with sadness.

This is confirmed by the results of studies using the factor analysis. Two-factor structure affective space is constructed in such a way that one orthogonal axis is positive and the other negative affect. Many terms related to mood, are mixed expressions for these parameters. So, pleasant mood is determined by a combination of high positive and negative affect; unpleasant combination of high and

negative low positive affect. The factors of positive and negative affects are highlighted when the factor analysis of the data obtained in numerous studies on self-assessment mood [2].

Thus, we can identify negative mental States as a kind of mental States of a person with a dominance of negative emotional valence, subjectively, accompanied by the experience of dissatisfaction and increase the probability of disruption of its work.

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