

**The Strategies  
of Modern Science  
Development**

**XXI International  
Scientific–practical conference**

**Proceedings**

**Morrisville, USA  
October 12-13, 2021**

Lulu Press  
Morrisville, NC, USA  
2021

Scientific Publishing Center «Discovery»  
otkritieinfo.ru

The Strategies of Modern Science Development: Proceedings of the XXI International scientific–practical conference. Morrisville, USA, October 12-13, 2021. - Morrisville: Lulu Press, 2021. - 82 p.

The materials of the conference have presented the results of the latest research in various fields of science. The collection is of interest to researchers, graduate students, doctoral candidates, teachers, students - for anyone interested in the latest trends of the world of science.

ISBN 978-1-7948-3598-6

@ Authors, 2021

@ Scientific Publishing Center «Discovery», 2021

# Content

## *SECTION I. Physical sciences*

Nikitina E.P.

Two poles of digital humanity .....5

## *SECTION II. Biological sciences*

Novikov M.A.

Expression of apoptosis protein bcl-2 in nerve cells induced by silver nanoparticles encapsulated in polymer matrix .....16

## *SECTION III. Earth Science*

Afandiyeva Z.J.

Investigation of key factors affecting ore extraction indicators in Gadir deposit.....19

Kapitonova I.L., Schuster V.L., Tyukavkina O.V.

Basement geodynamics and conditions for the formation of jurassic deposits in Western Siberia as a search criterion for promising traps for oil and gas .....23

## *SECTION IV. Engineering*

Bulov A.O

Alfa Laval heat exchange equipment .....28

Loginova A.O., Aleynikova D.V.

Class allocation of events in an automated information system as the basis for increasing organization's cyber resilience.....32

Mukolyants A.A., Ergasheva D.K., Shadibekova F.T., Taubaldiev A.A.

Prospects of the application of expander generator sets in the gas transportation system of the Republic of Uzbekistan.....40

## *SECTION V. Agricultural science*

Gulnyashkin A.V., Lemeshev N.A., Zemtsev A.A., Lyulyuk I.R., Chkarbutko E.V.

Evaluation of new self-dustered corn lines for dray resistance.....43

Maslennikova V.S., Bedareva E.V.

The effect of *Bacillus thuringiensis* spp. *aizawai* tuber treatment on the potato yield.....53

*SECTION VI. Economics*

Verenikina A.O., Voronina E.V., Nosyreva A.V., Rechapova R.R.,  
Sobirov B.S.

About the functioning and development of the economic systems  
in the context of digitalization .....55

*SECTION VII. Philosophy of Science*

Ermakova L.I., Sukhovskaya D.N.

The prospects of the development of creative industries and clusters  
as a sector of Culture and Arts (Regional aspect) .....63

*SECTION VIII. Philology*

Davydova M.M.

Realization of the gender aspect in literary translation (based on the  
translations of O. Wilde's fairy tale “The Happy Prince”) .....65

Faizullina R.A.

Interference with human nature in a clockwork orange *by* A. Burgess .69

*SECTION IX. Educational Sciences*

Sergeyeva L.D.

Inclusive education: history of development, state and prospects  
in Kazakhstan.....72

*SECTION X. Social sciences*

Chirkin D.Yu.

The analysis of the implementation of digital technologies  
in the context of their effect on the society .....76

## SECTION I. Physical sciences

**Nikitina E.P.**

Candidate of Physical and Mathematical Sciences,  
Doctor of Astrology, Moscow

### TWO POLES OF DIGITAL HUMANITY

**Abstract.** The article suggests and statistically proves the new division of the humanity in two classes and its patterns. We used the astrological method of digitalization of the male (and female) characteristics in a particular man (or woman) that allowed us to measure the *distance* between them in the relationship and give them recommendations on the good choice of a marriage partner based only on the person's date of birth.

**Key words:** evaluation of a man and a woman, perfect marriages, the patterns of the division of the humanity in two classes, statistically proved data.

*“I think, you are better as a man, than I am as a woman”*,  
Julia (Vija Artmane) saying to her husband Michael  
(Gunārs Cilinskis) in Jānis Streičs's movie based  
on the novel *Theatre* by Somerset Maugham

This is an accurately predicted question-answer of Vija Artmane (with a value of 100 [1,2]) to her partner Gunārs Cilinskis (138).

Our article [1] tells us how to digitalize a person on the topic “How much masculine is there in a particular man, and how much feminine is there in a particular woman?” Let me remind you:

- it is enough to know the person's date of birth,
- based on the astronomical almanac or the website of the Swiss astrologists [3] we need to define whether the Sun, Moon, Venus and Mars fall in the male (m) or female (f) Zodiac sign, and to get a 4-dimensional vector (for example, mmfm) as a result,
- using the astrological formula [4] we obtain the M or F value.

Thus, every person from birth has their own value of “male-female” which may be expressed as one of the 10 values from the chain: 37, 50, 62, 75, 88, 100, 112, 125, 138, 150.

In work [2] we proposed a model of a *perfect* union as the match of the partners' values in a couple and introduced the term *step* (degree) in the chain above. For instance, a man with a value  $M = 75$  and his female partner with a value  $F = 100$  are two steps apart (to the right)

75→ 88→ 100,  $\Delta = M - F = -2$ , and three steps apart (to the left)  $\Delta = 3$ , 37→ 50→ 62→ 75 in case of another female partner with a value 37. The number of steps  $\Delta$  may take on the values  $-9, -8, \dots, -1, 0, 1, \dots, 8, 9$ .

In work [2] using the the 1190x10 matrix (where the row gives the couple, and the column gives its initial characteristics) we statistically proved the reasonableness of the model of the quality of the union of a man and a woman, suggested by the author (the match of the partners' values meaning a *perfect* contact, a couple) and the workability of the astrological evaluation of the masculine and feminine characteristics.

The depth of the current topic has required a sudden increase of the database volume of contacts and male and female stories. As earlier, by a contact we shall understand the interest of any format, showed to another person in a female-male couple: from a de jure or a de facto marriage to the type when, for example, Bolotova Zhanna (37-62) adores the actor Robert Hossein (63), and she has never met him. And by male (female) stories we shall mean the stories when a person has had more than one contact.

The database has been expanded almost twice:

Table 1

The numerical characteristics in the two research works:  
in article [2] and in total:

	Year 2020 [2]	The whole DB
Number of women	826	1231
Number of female stories	176	350
Number of perfect matches	133	297
Number of men	604	1208
Number of male stories	217	492
Number of contacts	1040	2148
Number of long-lasting marriages	210	350

In Figure 1 «20» expresses the data of the previous DB for the year 2020 in the work [2], «21» gives new data for the year 2021, « $\Sigma$ » is the whole DB.

Table 2

Number of contacts depending on  $\Delta$ 

$\Delta$	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
20	4	10	15	39	49	53	62	102	94	114	102	103	81	85	53	40	22	12	0
21	2	8	19	27	44	51	106	110	120	153	100	92	98	54	45	33	31	11	4
$\Sigma$	6	18	34	66	93	104	168	212	214	267	202	195	179	139	98	73	53	23	4

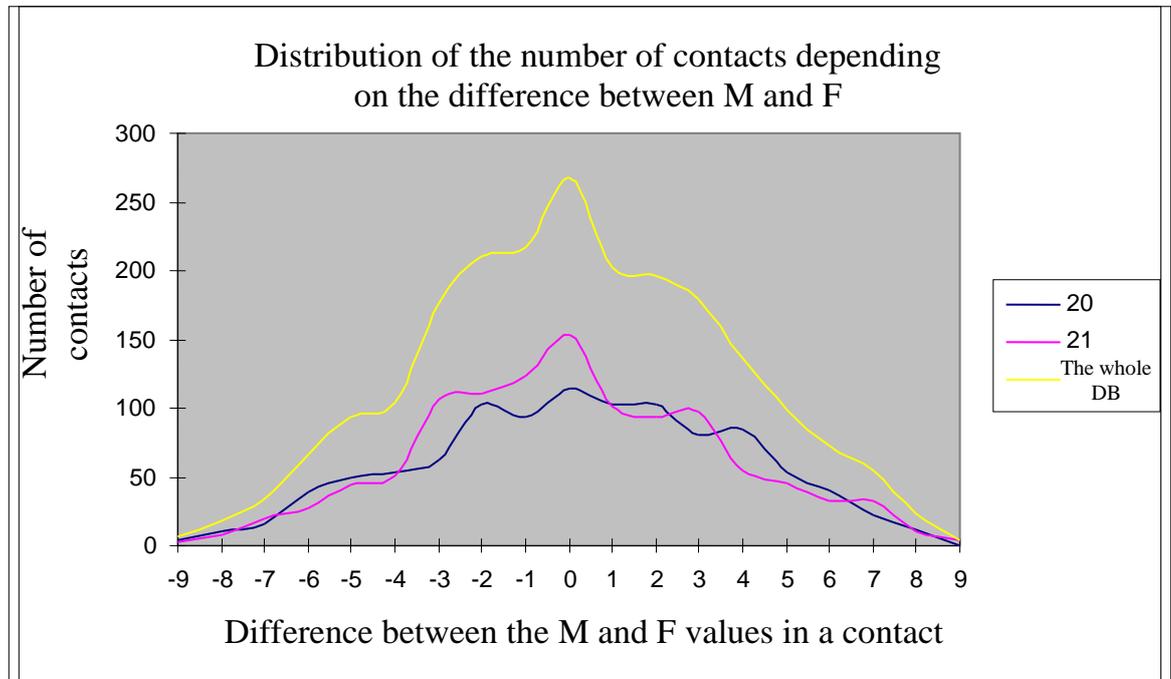


Figure 1. Distribution of the number of contacts depending on  $\Delta$ , that expresses the difference between the men's and women's values

As a result, firstly, the curve expressing the distribution of a number of contacts depending on  $\Delta$  (Figure 3 in [2]) has been smoothed. The curve was rough since the data volume was not enough. And now we can observe the rapidly decreasing number of contacts (to one unit) with the increasing difference in the couple's values. Secondly, the additional data «21» as the second independent sample repeated the intriguing data result of «20» (Figure 1 in [2]). Here we generalize the result in Figure 2.

The initial data of Figure 2

Value	37	50	62	75	88	100	112	125	138	150
Number of couples in [2]	6	7	12	24	14	16	25	19	6	4
Number of couples in 2021	1	10	27	24	21	13	37	16	9	7
The whole DB	7	17	39	48	35	29	62	35	15	11

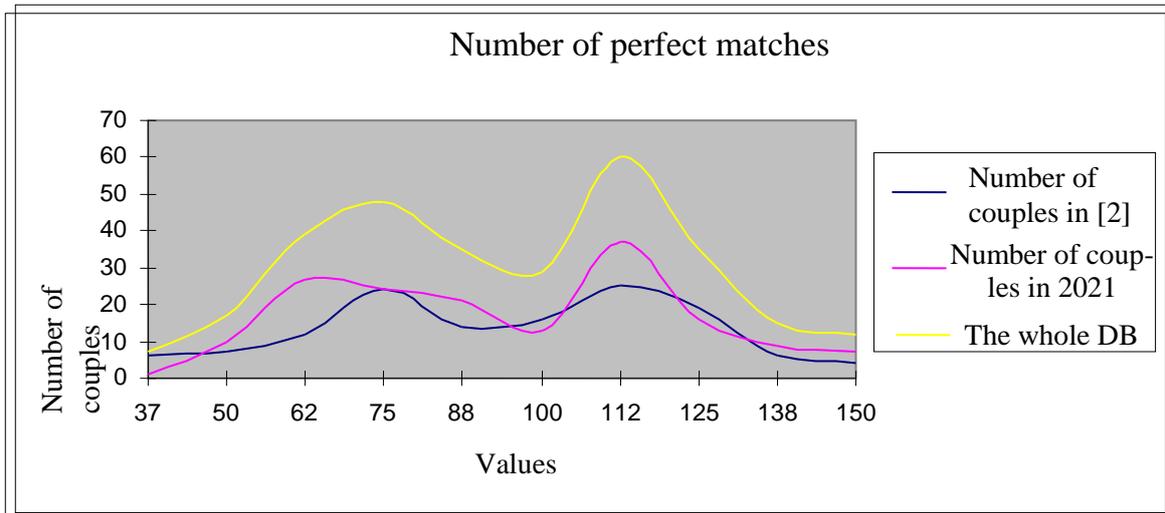


Figure 2. Distribution of the number of perfect matches depending on the values given in three sources of data

Now it seems to be completely justified to say that the distribution actually represents the sum of two distributions and that humanity is divided into two classes: class I, with the centre at the value 75, and class II, with the centre at the value 112. And how does the division work? How do people feel about the belonging to a certain class? The following sets from the DB are subjected to the analysis:

- 1) The whole DB, consisting of a) male stories and b) single contacts between a man and a woman, since they are long-lasting marriages, or due to the time limitation for the DB (meaning that a man here is registered only as a participant of a certain female story);
- 2) The new part of the DB, obtained after the article [2] in 2021;
- 3) The data set, involving relationships 20 and more years long;
- 4) Separately collected female stories, all the participants of which are present in the DB.

Long-lasting marriages (the beginning of the subbase in the Appendix, Table 11)

The DB includes 350 long-lasting marriages (this part of the whole DB is given in the Appendix). Each of the parties belongs to one of the classes, I or II. We shall call CIm (CIIm) a man of class I (II), and likewise, CIf (CIIf) – a woman of class I (II). There are 4 variants in total: a man of class I (II) is involved in a contact with a woman of class I (II). If we calculate the number of each of the 4 variants in the data bulk of long-lasting marriages, we will get the results given in Table 4.

Table 4

The combinations of the classes in the long-lasting marriages data bulk

	CIf	CIIf	$\Sigma$
CIm	<b>96</b>	74	170
CIIm	76	<b>104</b>	180
$\Sigma$	172	178	<b>350</b>

The numbers, situated diagonally, attract attention. Let us test the hypothesis on the equality of distributions in a 2x2 table. The sample value of  $\chi^2$  test is 7.1 with  $\alpha < 0.01$  [5], that statistically proves the significant difference in the columns (rows) of the table. In other words, it is not accidental but statistically significant, with a high significance level, that the prevailing number of cases is when a person chooses the marriage partner of his/her class! There are 100 of them in class I and 106 – in class II. They have an intuitive idea that this is the person for them. Moreover, the choices of the partner of another class (the off-diagonal elements in Table 4) are almost the same. We get a feeling that here we deal with some earthborn law: in the esthetically beautiful Table 4 we have 100 for a cell diagonally, and 150 for both and 75 for each of the off-diagonal cells. It is high time to recall that a person in our research is represented not by the common characteristics, such as character, appearance, temperament, etc, but by the lettered vector defining his/her 4 main personal planets, the Sun, Moon, Venus and Mars, determined on the person's birth date!

The whole DB

Similar tables are given for the new data of the DB, obtained in 2021 (Table 5) and for the whole DB (Table 6).

Table 5 – Class combinations based on the new data for 2021

	CIf	CIIf
CIm	465	510
CIIIm	519	553

Table 6 – Class combinations based on the whole DB

	CIf	CIIf
CIm	680	734
CIIIm	780	805

Let us note that in the first row of Table 5 men of I class choose the women of II class more often. The same is with the second row of Table 5 and with both rows of Table 6. Then, according to the first column of Table 5 women of I and II classes also prefer to choose the men of II class. The same situation is with Table 6, i.e. the partners of II class are more preferable than those of I class. We will use the results later on. This is an example from the DB – a male story of Marcello Mastroianni:

Table 7  
Marcello Mastroianni's women

Full name	Date of birth	mf	M	$\Delta$	F	Full name	Date of birth	mf
Marcello Mastroianni	28.09.1924	mfmm	125	1	113	Flora Carabella*	26.02.1926	fmmf
				1	112	Marina Vlady	10.05.1938	ffmm
				2	100	Sophia Loren	20.09.1934	fmfm
				0	125	Catherine Deneuve	25.10.1943	fffm
				3	100	Claudia Cardinale	15.04.1938	mfff
				2	100	Faye Dunaway	14.01.1941	fmfm
				2	100	Nastassja Kinski	24.01.1961	mfff

\*) marriage period:1950-1996.

Each of the seven times Mastroianni (M=125) chose the woman of his class II, while such situation in a random choice of the partner is hardly probable and the probability equals to 0.01. The person has a feeling about the unseen division of humanity into two groups and prefers to choose the people of his own group.

## Female stories in article [2]

Table 8 – data from article [2]

	CIf	CIIf
CIm	112	134
CIIm	117	137

The same situation here.

Now, let us use the results from Tables 5, 6, 8. We suggest a statistical hypothesis, stating that a person prefers to choose a member of class II as his/her marriage partner. We actually tested the hypothesis using different tests. 4 tests in each Table, 12 tests in total. First row of Table 5 was the first test: what class of women does a man of class I choose in the data of the year 2021? The result was 465 women of I class and 510 women of II class. The second column of Table 6 gives the second test: what class of men does a woman of class II choose throughout the whole DB? The result was 734 men of I class and 805 men of II class, etc. We had the total of 12 tests with the same positive results: the numbers of II class were greater than those of I class. Let us use the sign test for testing the hypothesis. Our research includes 12 experiments. According to the sign test table in [5], there may be one negative result out of 12 so that we could talk about the significance level  $\alpha=0,01$ . And we have all positive results in our experiment. Thus, our data (in Tables 5, 6, 8) allow to consider the hypothesis, stating that a person prefers to choose a member of class II as his/her marriage partner, statistically significant with a significance level less than  $\alpha=0,01$ . A person strives to have a marriage partner of a higher level. One more argument in favor of this fact: in the distribution of steps in Figure 1 the number of contacts with  $\Delta>0$  is 966 (the number of women, choosing a man with a value to the right of her own value in the chain). It is greater than that with  $\Delta<0$ , there are 915 of them (those with a value to the left). In other words, women prefer contacts with men having values to the right of their own value in the chain.

### Classes I and II

The classes have nothing to do with good-looking (the surface beauty). In accordance with our classification a true woman (ffff) and a true man (mmmm) have a value 150. Let us look at the values that belong

to the *Miss World* titleholders throughout the history of the beauty pageant. The first event took place in the USA in 1854. It was organized by a circus showman legend Phineas Taylor Barnum. At that time the public did not support Barnum's idea; it even caused street protests. The first *Miss World* beauty pageant was held in London on April 15, 1951. The founder of the pageant is the commercial agent of Mecca company Eric Morley.

Table 9

Initial data Figure 3

Values	37	50	62	75	88	100	112	125	138	150	$\Sigma$
Number of <i>Miss World</i> winners	2	6	10	14	9	8	9	9	5	1	73

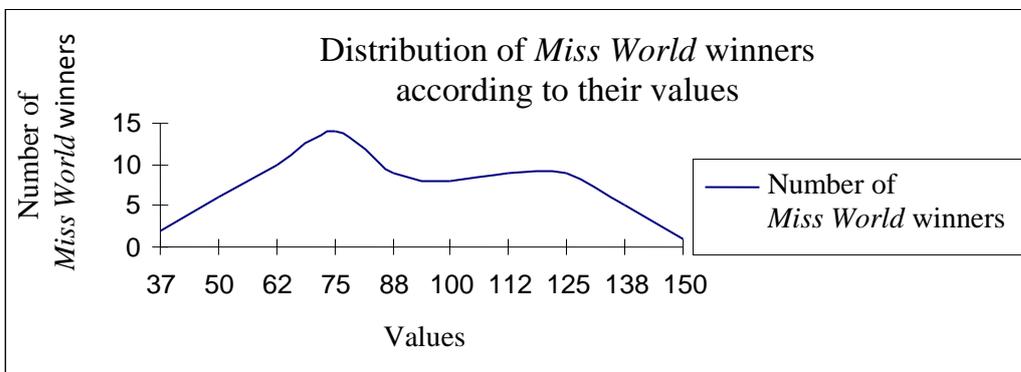


Figure 3. Distribution of the *Miss World* winners' values

We can observe all the values here: class I includes 41 women, and class II includes 32 women. The superiority of high values is out the question. The same thing is with men: muscle mass and masculine face are not the features of class II. For example, Mel Gibson, a very impressive man, was born on January 3, 1956, fmf, with a value 50.

All the four classes have equal number of members, since our four planets rhythmically move along their orbits. Technically, the classes differ in the number of *alien* letters in the m-f quad. We can observe the difference in Table 10.

Table 10

	Number of <i>alien</i> letters in the quads											
	<i>C</i>	<i>L</i>	<i>A</i>	<i>S</i>	<i>S I</i>		<i>C</i>	<i>L</i>	<i>A</i>	<i>S</i>	<i>S II</i>	
Values	37	50	62	75	88		100	112	125	138	150	
Number of alien letters	4	3	3	2	1-2	$\Sigma=12.5$	1-2	2	2-1	1	0	$\Sigma=6$

The more m's a woman has in her quad, the more she sees the world from the men's point of view. She somewhat plays a man's role in the m-position of the planets: she is active in a contact, she wants to dominate, that naturally causes a conflict with her partner. The same is with a man having alien f's in his quad. It is more difficult for class I to see eye to eye with the partner due to a greater number of alien letters. There are twice as many of them as in class II. In this regard, it is easier for the couples of class II to see eye to eye. Moreover, their worldviews are pretty much the same. Thus, all of us are students, who permanently polish their skill of understanding a partner in a contact. Those, who begin, who finish, and those, who have already learnt to see the world in the right (for their sex) way and who have got the truthful understanding of the woman's and man's true missions in life.

### **Conclusions**

1. A person's private life is based exactly on knowing of the lettered vector defining the planets of the Solar System, the Sun, Moon, Venus and Mars, determined on his/her birth date. It was the information taken from Astronomy and Astrology that made it possible for us to find obvious patterns in the seemingly random 2148 man-woman contacts throughout the DB.
2. We have suggested a new division of humanity into two classes (I and II), that reflect and remind us of the woman's and man's true life missions on Earth. It is confirmed by Figure 2, showing a double-humped distribution of perfect marriages (we have already given the distribution in Figure 1 in work [2], and now the distribution is based on the double-size data).
3. Based on the long-lasting marriages data bulk we have statistically proved with a high possibility  $\alpha < 0.01$  the proneness to choosing the marriage partner out of the person's own class (Table 4). A person has a feeling about the right and wrong people for him/her, even though he/she has not known anything about the classes before the publication of the article.
4. Based on the big database, with a high possibility  $\alpha < 0.01$  we have statistically proved a person's striving for the contact with a partner of class II (Tables 5, 6, 8) for the purpose of self evolution.

5. It would be reasonable to record the feminine-masculine value in the Birth Certificate of a person; it would make it easier for him/her to find the partner for a long-lasting marriage and (or) self evolution.

6. The results of the research are a further confirmation of the assumptions that are frequently used in the aphorisms of the world's great scientists, regarding the existence of God. We do not choose our marriage partners by chance – someone conducts the process. Who and how?

## Appendix

Table 11  
The beginning of the long-lasting marriage DB  
(350 couples in total)

Abashkin Vladimir	24.01.1966	mm-fmm	125-150	1	125	Guseva Ekaterina Piletskaya	09.07.1976	fmff
Ageshin Boris	16.02.1940	mfmm	125	0	125	Tatyana	02.07.1928	fmff
Agutin Leonid	16.07.1968	fmmf	75	2	62	Varum Anzhelika	26.05.1969	mf-mmm
Akeshkovskiy Yuz	21.09.1929	fmmm	100	-3	150	Irina Feliksovna	06.05.1905	ff-mff
Aliev Alik	07.06.1971	mffm	113	0	113	Lyudmila	27.06.1978	ff-mmf
Allen Woody	01.12.1935	mmmf	125	2	100	Previn Soon-Yi Galina	08.10.1970	mfff
Andreev Boris	09.02.1915	mmfm	138	4	87	Vasilyevna Selezneva	22.07.1925	fmmm
Andreev Vlad. Aleks.	27.08.1930	fmmm	100	2	75	Natalya Senchina	19.06.1945	mmff
Andreev Vlad. Petr.	30.09.1954	mfff	87	2	63	Lyudmila	13.12.1950	mmmf
Upton Andrew	01.02.1966	mmmf	125	3	87	Blanchet Cate	14.05.1969	fmmm
Aragon Louis	03.10.1897	mffm	113	0	112	Triolet Elsa	12.09.1896	ffmm
Afanasyev Aleksandr	23.10.1948	mffm	113	3	75	Shevchuk Irina	06.10.1951	mmff
Biden Joe	20.11.1942	fmff	62	0	75	Jill	03.06.1951	mf-mfm
Banderas Antonio	10.08.1960	mf-mfm	113-138	4	75	Griffith Melanie	09.08.1957	mmff
BI	27.10.1974	fffm	63	-2	87	BYu	15.05.1953	fmmm
Basilashvili Oleg	26.09.1934	mffm	113	-1	125	Mshanskaya Galina	20.02.1935	fffm
Batalov Aleksey	20.11.1928	fmff	62	-1	75	Leontenko Gitana	18.08.1935	mmff
Bezos Jeff	12.01.1964	fmmf	75	0	75	MacKenzie	07.04.1970	mmff
Bacon Kevin	08.07.1958	fmmm	100	2	75	Sedgwick Kyra	19.08.1965	mffm
Belov Yuriy	31.07.1930	mmfm	138	7	50	Shvayko Svetlana	13.06.1939	mmfm

Beroyev Yegor	09.10.1977	mm-fff	87- 112	2	63- 88	Alferova Ksenia Giatsintova	24.05.1974	mm-fmf
Bersenev Ivan	23.04.1889	fmff	62	-3	100	Sophya	04.08.1895	mfff
Böhm Karlheinz	16.03.1928	ffmm	75	-1	87	Almaz	22.09.1964	fmmm
Bill Andrey	20.07.1960	fmmf	75	-3	112	Quint Laura Bestemyanova	09.07.1953	ffmm
Bobrin Igor	14.11.1953	fmfm	88	0	87	Nat.	06.01.1960	fmmm
Bondarchuk Sergey	25.09.1920	mffff	150	6	75	Skobtseva Irina Rudskaya	22.08.1927	mmff
Bondarchuk Fyodor	09.05.1967	ffmm	75	3	37	Svetlana	17.12.1968	mffff
Bortsov Viktor	14.06.1934	mffm	113	-1	113- 138	Stella (Tsiala)	08.03.1932	ff-mmff
Bowie David	08.01.1947	fmmf	75	2	50	Iman	25.07.1955	mmfm
Boyarsky Mikhail	26.12.1949	ffmf	50	-2	75	Luppian Larissa Smith Keely	26.01.1953	mmff
Brosnan Pierce	16.05.1953	ffmm	75	1	63	Shaye Muromtseva	25.09.1963	mmmf
Bunin Ivan	22.10.1870	mfmm	125	2	100	Vera	14.10.1881	mfff
Burkov Georgy	31.05.1933	mmmf	125	3	75- 100	Ukharova Tatyana	19.04.1946	mf-mff
Burlyaev Nikolay	03.08.1946	mmfm	138	2	125	Shatova Inga	13.07.1967	ff-mfm
Beckham David	05.05.1975	ffmf	50	0	50	Victoria	17.04.1974	mmfm
Bykov Rolan	12.10.1929	ffmf	50	-1	62	Sanayeva Elena Zachvatovich	21.10.1942	mfmm
Wajda Andrzej	06.03.1926	ff-mmff	75	-5	112	Krystyna	16.05.1930	ffmm
Valutsky Vladimir	25.09.1936	mfmm	125	2	100	Demidova Alla Maksimova	29.09.1936	mfff
Vasilyev Vladimir	18.04.1940	fmm	150	8	37	Ekaterina	01.02.1939	mffff
Viardot Louis	31.07.1800	mmmf	125	1	112	Viardot Polina Michurina	18.07.1821	ffmm
Vitsin Georgy	18.04.1917	mfmm	125	3	87	Tamara	07.01.1925	fmmm
Vladimirov Igor	01.01.1919	fmfm	88	1	63- 88	Freindlich Alisa Boguslavskaya	08.12.1934	mm-fmf
Voznesensky Andrey	12.05.1933	fmff	62	-2	88	Zoya Protsenko	16.04.1924	mfmf
Voytyuk Aleksey	14.04.1965	mmmf	125	4	75	Tatyana du Châtelet	08.04.1968	mmff
Voltaire François	21.11.1694	fffm	63	-2	88	Émilie Fournier	17.12.1706	mfmf
Gabin Jean	17.05.1904	fmff	62	-4	113	Dominique	01.01.1918	fmmf
Gazmanov Oleg	22.07.1951	ffff	37	-6	112	Gazmanova Irina	08.03.1951	ffmm

## References

1. Nikitina E.P. Numeralization of person on the topic of “male – female”, *The Strategies of Modern Science Development. Proceedings XVIII International scientific–practical conference*. Morrisville, USA, 15-16 October 2019, Morrisville: Lulu press, p. 6-10.
2. Nikitina E.P. 176 stories of “Winter cherry” and 217 alike. *The latest research in modern science: experience, traditions and innovations: Collected scientific conference*, Section I. Physical sciences, February 18-19, Morrisville, NC, USA, 2020, Lulu Press, p. 6-17.
3. Website of the Swiss astrologists proving the astronomical longitudes of the Solar system planets given for every day of the nine millennia. URL: [www.astro.com/swisseph/swephe\\_e.htm](http://www.astro.com/swisseph/swephe_e.htm).
4. Bezborodniy S.D. The program of lecture course on Astrology at the School of Scientific Astrology, from 1994. (in Russian)
5. Gubler E.V., Genkin A.A. Application of non-parametric statistical tests. Moscow, 1973 (in Russian)

## SECTION II. Biological sciences

**Mikhail A. Novikov**

East-Siberian Institute of Medical and Ecological Research,  
Angarsk, Russia

### **EXPRESSION OF APOPTOSIS PROTEIN BSL-2 IN NERVE CELLS INDUCED BY SILVER NANOPARTICLES ENCAPSULATED IN POLYMER MATRIX**

#### **Introduction:**

Currently, the world has been an increased interest in development of preparations containing inorganic nanoparticles and organic nature, especially with the use of natural or synthetic polymers as nanostabilizing matrices. One of such polymer is poly-1-vinyl-1,2,4-triazole (PVT), which has managed a complex of properties such as high hydrophilicity and chemical stability, biocompatibility, heat resistance, and can be used in the development of new forms of medical synthetic drugs. Earlier histological studies of synthesized in the Favorski Irkutsk Institute of Chemistry ISC SB RAS nanocomposites with silver nanoparticles (Ag NP's) (AgPVT, size of 2-10 nm, stabilized by PVT) are pointed to

damaging effect of Ag NP's contained in this nanocomposite in subacute introduction of there in the brain tissue of white rats. In particular, There are marked a perivascular edema of brain vessels, and swelling of conductive fibers in subcortical structures. Administration of PVT without Ag NP's addition revealed no deviations from control animals, except for a small vascular stasis. In this regard, it was necessary to evaluate the intracellular effect of Ag NP's on the nervous tissue. As one of parameters, we used the expression bcl-2 protein as a nonspecific inhibitor of apoptosis, whose synthesis is induced by the tumor suppressor protein p53, which will assess the activity of apoptotic process in a cell.

### **Materials and methods:**

A total of 32 healthy male outbred rats obtained from the Laboratory Animal Center (Eastern-Siberian Scientific Center, Angarsk). The rats nearly of the same age (12 weeks old) and weighing 220-240 gm. Animals were randomly divided into 4 groups, 2 AgPVT – treated groups, 1 PVT – treated group and control group. Test substances were administered orally in rats for periods 9 days as shown in Table 1.

Table 1. The oral administration of test substances in rats for periods of 9 days

Groups	Phase-in substance	Dose of substance	Number of animals
Control (C)	saline solution	0,5 ml	N=8
G1	PVT	100 µg	N=8
G2	AgPVT	100 µg/kg*	N=8
G3	AgPVT	500 µg/kg*	N=8

\*Administration of 100 and 500 µg silver per kilogram of rat's body weight in a volume of 0.5 ml

The rats were maintained on standard laboratory rodent diet pellets and were housed in humidity and temperature-controlled ventilated cages on a 12 h day/ night cycle. All animals were killed by dislocation of the next day after the end of treatment. The studies were conducted in accordance with the rules adopted by the European Convention for the Protection of Vertebrate Animals used for Experimental and other purposes (Strasbourg, 1986). Working with laboratory animals was carried out according to the study protocol in accordance with the Geneva Convention of 1985 on international principles of biomedical research using animals and the Helsinki Declaration of 2000 on humane treatment of animals. Fresh portions of the brain from each rat were cut rapidly, fixed in neutral buffered formalin (10%), then dehydrated, with

grades of ethanol (70, 80, 90, 95 and 100%). Dehydration was then followed by clearing the samples in 2 changes of xylene. Samples were then impregnated with 2 changes of molten paraffin wax, then embedded and blocked out. Paraffin sections (4-5  $\mu\text{m}$ ) were placed on polizin glasses (Menzel, Germany) and stained for antibody to bcl-2 apoptosis protein (Monosan, Netherlands) according to manufacturer's suggested protocol. Then they were stained with tione colourant. Stained sections were controls and treated rats were examined by the number of nerve cells and cells overexpressing bcl-2 protein.

### Results and discussion:

According to the study of brain sections using the above system analysis revealed that the introduction of studied doses of nanocomposite was not significantly affected by total number of nerve cells. We assume that this is due to insufficient exposure time of injected substance on brain cells. However, the results of counting the number of nerve cells overexpressing bcl-2 compared to total number of nerve cells in 60 fields of view revealed a significant increase in the number of cells with increased expression of a group of animals exposed to various doses of nanocomposite (G1,G2). Also showed an increase compared to the control cells by overexpression in brain sections of G1 group PVT without Ag NP's adding) which, in our opinion, associated with the response of neurons to administration of the foreign agent (Table 2).

Table 2. Expression bcl-2 protein in the brain tissue under the influence of test substances. Med (Q25 - Q75) n = 60

Groups	Total number of nerve cells	Number of overexpressing bcl-2 protein cells	% number of overexpressing cells to total number
C	287,5 (264-306)	11,6 (2-18)	1,02
G1	232,3 (196-271)	10 (4-11)*	2,8*
G2	281 (275-308)	17,9 (4-22)*	4,3*#
G3	313,6 (276-350)	7 (5-9)*	6,9*#●

Note: \* - the difference is statistically significant when compared with the control group ( $p < 0.05$ ); # - differences are statistically significant when compared to group G1 ( $p \leq 0,05$ ); ● - differences are statistically significant when compared to group G2 ( $p \leq 0,05$ ). Statistical value calculated by Statistica 6.1 Mann-Whitney test.

Thus, the percentage of cells with high expression was significantly increased with introduction of Ag NP's, which is connected with the

development of apoptotic cells in the process, in our opinion. In brain slices animals exposed PVT without Ag NP's addition was observed minimum number of cells with high expression, indicating that the polymer matrix HTP has no significant effect on brain cells. Conversely, in sections of the brain of animals exposed nanobiocomposites with Ag NP's was revealed significant increase in number of overexpressing bcl-2 protein cells compared with the control and detected a direct correlation between the dose of Ag NP's and change in the number overexpressing cells. All this suggests that the 9-day administration of nanocomposites is run apoptotic process, which leads to activation of apoptosis inhibitor protein Bcl-2. To minimize the effects of the impact of the test substance should be further study of the effect on the functional systems of the body.

### **SECTION III. Earth Science**

**Afandiyeva Z. J.**

candidate of technical sciences, associated professor  
Azerbaijan State University of Oil and Industry

#### **INVESTIGATION OF KEY FACTORS AFFECTING ORE EXTRACTION INDICATORS IN GADIR DEPOSIT**

**Abstract.** The main factors affecting ore extraction indicators in Gadir field have been in the article. Studies have shown that the main actors affecting ore extraction indicators are deposit thickness, the number of open surfaces, hardness and fracture of ore.

**Key words:** Gadir deposit, ore extraction, deposit thickness, ore mass

Studies show that many ores of non-ferrous, precious and rare metals are analyzed to be extracted in difficult conditions where the use of high-productive equipment is not possible. The selection of production option for such ore bodies is performed as a result of coordination between mining productivity and the quality of the extracted ore [1].

In order to perform underground exploitation of Gadir deposit, the field was opened with an inclined mining shaft, a spiral mining shaft,

crossbars and pits. The length of the inclined tunnel is 600 m. The inclination of the spiral mining shaft is 10 degrees. The ore mass is divided into floors by means of pits and crossbars.

The deposit depth of the ore mass forming Gadir deposit is located at an altitude of 1400 m above sea level. Gadir field was inaugurated in October 2015 and put into operation in 2016. The density of the rocks forming Gadir deposit is  $2.67 \text{ g/m}^3$  and is slightly fractured. The upper part of the ore is 1570 m above sea level, and the lower part is 1370 m above sea level. The hardness coefficient of rocks is  $f = 12 \div 14$ .

Two development systems are used to exploit Gadir deposit.

1. Mapping system with extraction of sewers drilled in the ceiling step;

2. The development system of destroying with half-floor.

The half-floor is divided on the horizon, where the angle of the ore varies from 30 degrees to 10 degrees. The 1427–1437 horizon is divided into half-floors. During the drilling, explosion is carried out using sewers, which are 45 mm in diameter and 3 m in length. Boomer T1D drilling machine is used to drill the sewers with these length.

Sewers are drilled using AtlasCopco Boomer T1D single-head drilling machine and pneumatic piston perforator of BBC-16 brand during drilling. AtlasCopco Boomer T1D drilling machine drills the sewers with a length of  $2.2 \div 4.4 \text{ m}$  and a diameter of  $32 \div 64 \text{ mm}$ . Pneumatic piston perforator of BBC-16 brand drills the sewers with a length of  $1.2 \div 2.4 \text{ m}$  and a diameter of  $27 \div 38 \text{ mm}$ . BBC-16 perforator is used to drill the sewers on the ceiling step, mounted on the magazined ore. The ore mass is divided into floors by means of crossbars and pits. The length of crossbars is  $100 \div 150 \text{ m}$  varying from floor to floor.

The distance between the floors is 10 m. After the ore body was separated into floors by means of crossbars, drifts were crossed at the intersections of crossbars with the ore body and pits were crossed on the thickness of the ore body. In the development of the floors, a crack occurs when it reaches the flank areas, at which point the required ore is exploited by maintaining protective inlays along the drills from the bottom back.

When extracting ore, 200-400 grams of dinomax, carpex, nitrogen, etc. are used as PM feeder. It is used. The amount of PM feeder in the sewer is  $50 \div 100 \text{ gr/kg}$ . In ore extraction, sewers are drilled at an angle of 60-800 degrees to the ceiling. The size of the block used in the extraction is  $10 \times 10 \times 5 \text{ m}$ . The average thickness of the ore mass is 6 m. The sewers are drilled parallel to the open surface. 0.82 kg of PM is used to crush  $1 \text{ m}^3$  of ore during ore extraction. The sewer of 270-300 m

is drilled in one cycle. A fan-shaped explosion network is used in destroying with floors.

Many factors affect the extraction of ore, including the thickness of the deposit, the fracture of the ore, etc. [2]. These factors can be grouped as follows for Gadir deposit.

**Deposit thickness:** When the deposit thickness is small, less ore mass falls on the side of the sewer drilled in the sewer line flank. In such cases, the sewers drilled in the central parts are involved in the extraction of ore twice as much as flank sewers. The average thickness of Gadir deposit is 6 m.

**The number of open surfaces:** Unlike drilling, the number of open surfaces in ore extraction can be one, two, three, etc. The number of open surfaces for Gadir deposit is two. Preparatory works are carried out to extract the ore by exploding it. In the system of development with half-floors, pits are passed through the thickness of the ore from the outer lines, which separate the ore body into half-floors. The width of the bottom for drilling sewers during ore extraction is 4 m. After drilling the pit reaching the hanging side of the ore body, drilling with small cross-section is carried out in the contact zone of the ore with the empty rocks. This drilling provides an open surface, and this open surface can be called the first open one.

The second open surface is the bottom where the sewers are drilled. Fan-shaped sewer lines drilled at an angle of 80 degrees from the ceiling are exploded after being filled with PM. The sewer line closest to the hanging side of the ore body is exploded first, and then other sewer lines are exploded with a certain delay. Explosion of the sewers in the first line creates an open surface for the second lines of sewers.

The number of open surfaces is two when explosion is carried out with ceiling step in a mapping system. One of these open surfaces is the ceiling where the sewers are drilled, and the other one is the open surface parallel to the drilled sewer lines, and the angle formed by this surface with the horizontal plane is  $60 \div 80$  degrees.

**Ore fracture:** When the block being exploded is fractured, the gases produced by the explosion cause energy loss as they escape from those fractures. As a result of the explosion in the fractured massif, it was observed that the torn ore pieces were the blocks of different sizes located between the fractures. This happens if sewers are not drilled in the blocks between the fractures. Otherwise, in order to increase the yield of conditioned pieces in the fractured massif, sewers should be drilled in the blocks between the fractures, and in this case the number of sewers will increase.

A network of fractures plays an effective role if the distance between the fractures is equal to the size of the conditioned pieces or less than the size of the those pieces. Under such conditions, it is possible to obtain conditioning crush of the ore mass without increasing the number of sewers [3]. The rocks forming Gadir deposit are less fractured.

In practice, the number of sewers in the line was 7, 8, 9 or 10 in the explosion process with fan-shaped sewers drilled in the extraction with half-floors. The reason for drilling different numbers of sewers in lines is to ensure good crushing. For example, when 9 sewers are drilled in the first line, 8 sewers are drilled in the second one and 9 in the third one. The main positive indicator of this is that the crushing is optimal. Thus, when the sewers are placed as shown above, the sewers in the adjacent lines will not be in a straight line but will be arranged in a checkerboard pattern, which will allow for better crushing of the massif.

**Ore hardness:** The specific consumption of PM and drilling, which are one of the main parameters in drilling and explosion, is approximately directly proportional to the hardness of the ore. [4-6]. The specific consumption of PM in Gadir deposit is  $0.82 \text{ kg/m}^3$ . Excessive hardness increases the cost of drilling of 1 m sewer or well. In Gadir deposit, the hardness of the ore varies in the range  $f=12\div 14$ .

Drilling and explosion operations are used to perform drilling and extraction of the ore in Gadir field. The sewers drilled at a certain inclination in the ceiling is used to extract the ore.

### *References*

- [1] Lukyanov V.G. et.al 2019. Efficiency of explosion of ore in shallow deposits. Bulletin of Tomsk Polytechnic University. Georesource engineering. 330. № 4. 188–193.
- [2] Boguslavsky E.I. et.al. 2007. The main factors affecting the flight length of the fractured ore during its explosive delivery//Fundamental research. № 12-3. pp. 472-475.
- [3] Gorinov S.A.1985. Efficiency of application of plane charge systems for exploding strongly fractured ores in underground conditions//Izv. universities. Mining journal. № 7. pp. 68 – 73.
- [4] Akande J. M. et.al 2013. Optimization of blasting parameters using regression models in Ratcon and NSCE Granite Quarries, Ibadan, Oyo State, Nigeria, Geomaterials, Vol. 3, №. 1. - p. 28 – 37.  
DOI <https://doi.org/10.18799/24131830/2019/4/228>
- [5] Duranović M.et.al 2018. Optimization of ring blasting in sublevel stoping gold mine. (*Podzemni Radovi*) DOI:10.5937/PodRad1833061D
- [6] Say, James. (2017). The application of wireless blasting in sublevel caving mines. Bachelor's Thesis, School of Mechanical and Mining Engineering, The University of Queensland.

**Irina L. Kapitonova<sup>1</sup>, Vladimir L. Schuster<sup>2</sup>,  
Olga V. Tyukavkina<sup>3</sup>**

<sup>1</sup>Peoples' Friendship University of Russia (RUDN University)

<sup>2</sup>Doctor of Geol.-Min., Professor, Oil and Gas Research Institute RAS

<sup>3</sup>Candidate of Geol.-Min., Sergo Ordzhonikidze Russian State University for Geo-logical Prospecting

**BASEMENT GEODYNAMICS AND CONDITIONS  
FOR THE FORMATION OF JURASSIC DEPOSITS  
IN WESTERN SIBERIA AS A SEARCH CRITERION  
FOR PROMISING TRAPS FOR OIL AND GAS**

The issues of the basement geodynamics and the regularities of oil and gas distribution in the fields of Western Siberia were addressed at different times by the researchers: Baibakova G.A., Brekhuntsov A.M., Devyatov V.P., Druzhinin V.S., Egorov V.A., Ervie Yu.G., Fedorov Yu.N., Filippovich Yu.V., Gogonenkov G.N., Gurari F.G., Kashik A.S., Kolmogorova V.V., Kontorovich A.E., Krinochkin V.G., Myasnikova G.P., Nesterov I.I., Nikonov V.F., Osipov V.Yu., Russky V.I., Salmanov F.K., Sokolov B.A., Surkov V.S., Trofimuk A.A., Tyukavkina O.V. For example, in the works of V.F. Nikonov there was noted: "the number of tectonic schemes of the basement of Western Siberia has long exceeded 50. However, there is no connection between these schemes and the structure of the basement, including its oil and gas content." This statement is due to the fact, that the basis of tectonic schemes, as a rule, are the results of seismic exploration and physical fields, which reflect the elements of the deep structure. Therefore, at the present stage, the relevance of scientific works on the study of the basement geodynamics and the conditions for the formation of the Jurassic sediments, as the most promising for oil production, as a search criterion for oil traps, remains quite high.

Let us analyse some aspects and structural features of the pre-Jurassic basement within the central part of the West Siberian plate in order to identify patterns and features that will allow us to identify the main search criteria for promising traps.

Deposits of pre-Jurassic complex-structured complexes of effusive-sedimentary, metamorphosed rocks within the central part of the West Siberian plate are exposed at a depth of 3000-3300 m, and in most cases belong to continental rift zones, where, according to modern data on the degassing of the Earth, dense flows can appear and localize deep juvenile gases, including hydrocarbons [2,8,11,16]. At present, it is possible to discuss only the proportion of abiogenic hydrocarbons in

known accumulations, however, the very fact of their inflow in the rift together with other endogenous fluids cannot be disputed [2]. Deep faults, delineating and cutting graben rifts, play an important role in the inflow of deep hydrocarbons [2,3,8,11,12].

It can also be noted, that "... oil accumulations in the ancient strata of Eastern Siberia are associated with rift structures" [13]. It should be emphasized that in any case ancient rift structures, even if they do not contain accumulations of hydrocarbons, have a certain effect on the oil and gas content of the overlying sedimentary deposits of the basin over rift [2].

Studies of the material composition of the basement and weathering crust rocks have been of interest since the 40s of the twentieth century, for example, academician M.K. Korovin was the first to suggest the presence of an ancient platform in the central part of Western Siberia. Back in the mid-60s, it was noted that almost the entire inner part of the West Siberian Platform is occupied by an area of anomalously high values of the basement density, and in the mantle the seismic wave velocities are reduced. These density values are comparable with the density of the basite series rocks.

Major scientists of our time: Muratov M.V., Pushcharovsky Yu.M., Shatsky N.S., Spizharsky G.I., Yanshin A.L. and many other well-known geologists: Afanasyev Yu.G., Dedeev V.A., Garetsky R.G., Gatinsky Yu.G., Kulikov P.C., Nalivkin V.D., Natapov L.M., Schlesinger A.E., Symonenko T.I., Witte L.V., Zonenschein L.P. - within certain boundaries precambrian massifs are distinguished in the central part of the region in the basement of Western Siberia. Dickenstein G.Kh. and Maximov S.L. consider the West Siberian Plate as the Epibaikal platform. V.S. Surkov with his coauthors believe that the basement is Hercynian, but in the western part of the central region there is the Uvat-Khanty-Mansiysk residual Precambrian massif [14].

Based on the previously obtained results of studying the tectonic structure and genesis of rocks in the central part of the West Siberian plate [2,5,8,11,12,14], the following types of basement protrusions can be classified:

- 1) related to the inherited movement at the stage of the young platform of the anticlinor zones of the folded basement systems;
- 2) related to the block movement of the basement in the areas of the Early Paleozoic and Pre-Paleozoic folding;
- 3) related to the block movements within the synclinal zones and intermontane basement deflections inherited during the formation of the cover.

The protrusions of the first type are characterized by the presence of metamorphic complexes that form relatively thin weathering crusts,

and the material of their destruction composes the basal horizons of the cover. The protrusions are generally characterized by a large amplitude and a slight gradient on the wings. This leads to a decrease in the thickness of the cover layers on the arch compared to the wings of the protrusions, and not to their pinching out.

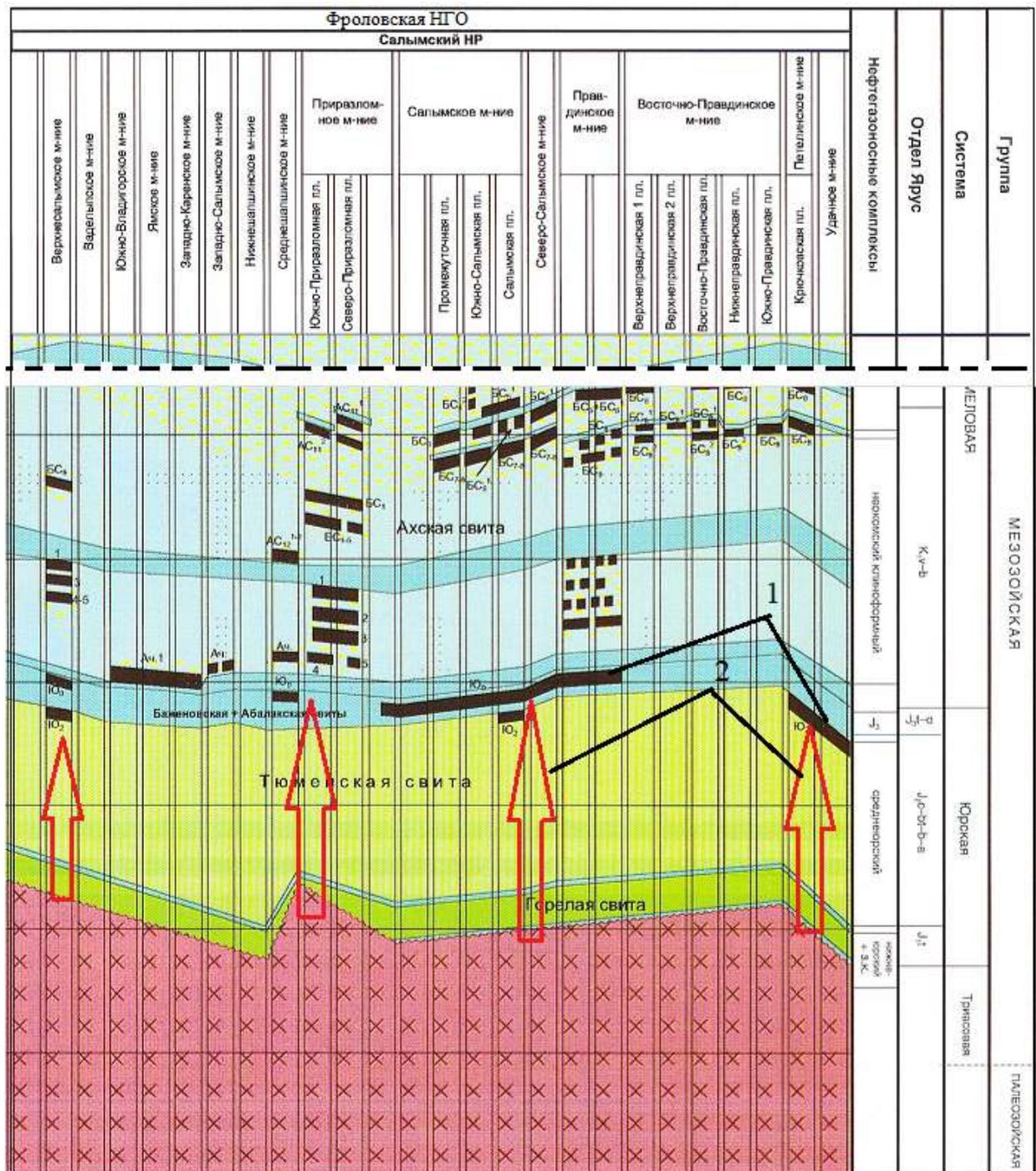


Figure 1. Fragment of the reservoir distribution scheme within the Frolov oil and gas bearing region. Compiled by: Belousov S.L., Lebedeva N.A., Vakhrusheva V.N., Myasnikova G.P., Mukher A.G., Marinenkova N.L., Mamykina L.I. 2000, with the additions of the authors: 1 – oil deposits of the Lower Jurassic deposits, 2 – possible ways of hydrocarbon migration.

The second type of protrusions of horsts is associated with block movements and the weathering crust is characterized by the presence of mineralized water (the protrusions of the horsts of the Uvat-Khanty-Mansiysk and Yenisei-Khatanga regions).

The third type of protrusions is horst protrusions within the intermontane troughs, depressions of the median massifs and synclinoria (Fig. 1), the frames of horsts (disjunctive dislocations) can be pathways for the migration of liquid and gaseous hydrocarbons into the overlying deposits. They are composed most often of sedimentary rocks, to one degree or another metamorphosed, dislocated and volcanogenic formations [3, 5, 6, 10].

The prospects for oil of the third type protrusions (Fig. 1) are due to: a) an increase in the thickness of the cover section in the zones of large troughs (and this increase occurs practically due to the Tyumen Formation, in the section of which a member of rocks with a high content of scattered bituminous components appears); b) the inflow of oil into the protrusions from the Paleozoic formations proper. It is possible that among the deposits there may be large ones, stretching along the faults. Apparently, deposits within the protrusions can also occur at a certain depth from its surface, when the rocks with the best reservoir-filtration properties do not directly come to the surface.

Thus, the regions where the oil and gas bearing layer of the Mesozoic platform cover directly adjoins or overlaps the complexes of the pre-Jurassic basement, which have better reservoir properties than the oil-generated horizons of the cover, are of the greatest interest for prospecting work. Formation affiliation and composition of reservoir rocks of volcanogenic - sedimentary and intrusive formations must be studied in detail to understand the issue of possible intensification and introduction of hydrocarbons from deeper horizons (basement, weathering crust) into the overlying Lower Jurassic sediments.

### *References*

[1] Akhpatelov E A *et al* 2004 *Atlas. Geology and oil and gas potential of the Khanty-Mansiysk Autonomous Okrug // Scientific-Analytical Center for Rational Subsoil Management named after Spielman V I. (Ekb. - "IzdatNaukaService")* 409 p.

[2] Baybakova G A 1991 *Deep degassing and the problem of oil and gas content of ancient rifts. Degassing of the Earth and geotectonics* (Tes. report III All-Union meeting, Moscow).

[3] Gogonenkov G N *et al* 2007 *Horizontal shifts of the basement of Western Siberia* (Geology of oil and gas. No 3) P. 3–11.

- [4] Gurari F G *et al* 2005 *Geological structure and oil and gas content of the Lower – Middle Jurassic of the West Siberian province* (Novosibirsk: Nauka) 156 p.
- [5] Druzhinin V S *et al* 2009 *Parts of the West Siberian Plain on the basis of a volumetric model of the Earth's crust* (Otechestvennaya geologiya. No 1) P. 104-112.
- [6] Egorov A S, Chistyakov D N 2003 *The structure of the consolidated basement of the West Siberian platform and adjacent folded areas* (Geology and Geophysics. T. 44, No 1-2)
- [7] Kontorovich A E *et al* 1975 *Geology of oil and gas of Western Siberia* (Moscow: Nedra) 690 p.
- [8] Krinochkin V G *et al* 2005 *Prospects for oil and gas potential of pre-Jurassic deposits in the central part of the Khanty-Mansi Autonomous Okrug-Yugra* (Ways of realizing the oil and gas potential of the Khanty-Mansi Autonomous Okrug (Eighth scientific-practical conference) Khanty-Mansiysk, T. 1) P. 112-119.
- [9] Kucheruk. E V, Alieva E R 1991 *Rifting and oil and gas content // Results of science and technology* (Moscow: All-Union Institute of Scientific and Technical Information).
- [10] Mukher A G *et al* 2009 *Jurassic type sections – the basis of stratigraphy, regional correlation and indexation of layers of the West Siberian basin* (Jurassic system of Russia: problems of stratigraphy and paleogeography. Saratov: Publishing Center "Science") P. 149-152.
- [11] Nikonov V F 2004 *Regional zoning in the distribution of deposits of different material composition as a result of the geodynamics of the foundations of sedimentary basins* (Abstracts of the Second International Conference "Geodynamics of Oil and Gas Basins". M.: GEOS) 100 p.
- [12] Russkiy V I *et al* 2007 *Geology of fossil fuels: interuniversity scientific thematic collection* (Ekaterinburg: Publishing house of USMU) Issue 1(17) P. 104-117.
- [13] Sokolov B A, Egorov V A 1989 *Riphean rifts-generators of oil* (Priroda, No 6) P. 73-78.
- [14] Surkov V S, Zheraud O G 1981 *Foundation and development of the platform cover of the West Siberian plate* (M.: "Nedra").
- [15] Tyukavkina O V, Eshimov G K 2012 *Zoning and oil and gas content of Jurassic material complexes within the Surgut arch* (Journal "Bulletin of the Institute of Geology of the Komi Scientific Center of the Ural Branch of the Russian Academy of Sciences", section of geological and mineralogical sciences, No 4) P. 6-9.
- [16] Filippovich Yu V 2001 *A new concept of the tectonic structure of the basement and sedimentary cover of the West Siberian plate* (Geology of oil and gas. No 5) P. 50-52.

## SECTION IV. Engineering

**Bulov A.O**

Graduate student

Reshetnev Siberian State University of Science and Technology,  
Institute of Mechanical Engineering and Mechatronics,  
Department of Refrigeration Cryogenic Engineering and Air Conditioning,  
Krasnoyarsk, Russia

### ALFA LAVAL HEAT EXCHANGE EQUIPMENT

Producing artificial cold is the basis for many industrial and commercial enterprises. The use of highly efficient equipment in refrigeration plants is one of the topical areas of research in the field of artificial cold.

Alfa Laval is one of the world leaders in production of such equipment. The company offers energy-efficient solutions for various tasks from freezing and cooling of cold rooms in production facilities to ensuring operation of ice rinks. For the food industry, the company produces highly efficient air coolers that can be used together with plate heat exchangers [1].

Alfa Laval equipment and technologies are designed to increase the efficiency of production processes. The company produces a full range of heat exchange equipment that provides a real opportunity to consumers to optimize refrigeration plants and air conditioning systems [2].

Let us have a look at the main equipment manufactured by Alfa Laval.

Alfa Cubic series air coolers, Figure 1, are designed for cold rooms with a volume from 10 to 400 m<sup>3</sup>. The units are designed to ensure easy maintenance and quick access to all parts of the construction.



Figure 1. Alfa Cubic air cooler

### General specifications:

- the heat exchanger is made of copper tubes with internal fins with a nominal diameter of 12 mm;
- tubes have corrugated aluminum fins;
- the housing is made of prepainted aluminum panels with a special coating to enable operation in severe conditions;
- low power consumption;
- built-in thermal protection with thermal contacts, providing reliable protection against overheating of the electric motor.

Air condensers, Figure 2, are widely used in the refrigeration industry, technological processes and central air conditioning systems. The company produces condensers with capacities from 8 to 260 kW [2].



Figure 2. Alfa Laval air condenser

### General indicators:

- high efficiency;
- low refrigerant consumption;
- low power consumption;
- low noise level;
- performance confirmed by Eurovent [3].

The Alfa Laval brazed plate heat exchanger, Figure 3 is a package of thin corrugated steel plates with different patterns, connected by soldering with copper solder. Two channels are formed between the plates, which conduct the fluid of different temperatures. Fluids flow in the counter-flow on both sides of the plate.

Heat exchangers can be single pass, double pass, multiple pass, and can have different connecting pipes for specific technical applications. Brazed plate heat exchangers are widely used in refrigeration plants. They are typically used to provide heat transfer from the primary fluid refrigerant to the secondary fluid — water or ethylene glycol solution.



Figure 3. Alfa Laval plate heat exchanger

Brazed heat exchangers have numerous advantages over traditional heat exchangers, both when used in industrial applications and in heating, ventilation, air conditioning and refrigeration plants:

- they are very compact due to their heat transfer efficiency;
- the brazed construction eliminates the need for gaskets, making them ideal for high temperatures and pressures, e.g. in district heating systems [2].

Alfa Laval shell and tube evaporators, Figure 4, are designed for air conditioning and industrial refrigeration systems and are used for cooling water or brine. For maximum efficiency, the evaporator range includes different models designed for using HCFC and HFC refrigerants. PED/CE, ASME, EAC, SELO, and DNV compliance certificates and the main marine approval certificates are available [4].



Figure 4. Alfa Laval shell and tube evaporator

Shell and tube evaporators are produced according to ISO9002. Evaporators can be used in refrigeration plants with one to four refrigeration circuits and refrigeration capacities from 18 to 1,200 kW.

Basic features:

- to be applied with all refrigerants;
- they operate at high compressor discharge temperatures;
- possibility of water connection on top and on the side of the evaporator;
- possibility of operation at a high temperature gradient between the refrigeration circuits [2].

Heat-exchange equipment considered within the framework of this article allows solving the issue of using high-efficiency equipment in the processes of artificial cold production. Application of such equipment creates an opportunity to design new, efficient, safe and modern refrigeration plants.

### *References*

[1] Industrial cooling [Electronic resource]. URL: <https://www.alfalaval.ru/industries/refrigeration/industrial-refrigeration/> (accessed 16.10.2020).

[2] Alfa Laval heat exchange equipment [Electronic resource]. URL: <http://www.fholod.ru/teploobmenniki%20Alfa%20Laval.htm> (accessed 5.10.2021).

[3] Air heat exchangers [Electronic resource]. URL: [http://www.greentec.ru/images/stories/book/teploobmennik/Cat\\_Alfalaval/v\\_ozd\\_to.pdf](http://www.greentec.ru/images/stories/book/teploobmennik/Cat_Alfalaval/v_ozd_to.pdf) (accessed 5.10.2021).

[4] Shell-and-tube evaporator [Electronic resource]. URL: <https://www.alfalaval.ru/products/heat-transfer/tubular-heat-exchangers/shell-and-tube-evaporator/> (accessed 5.10.2021).

**<sup>1</sup>Loginova A.O., <sup>2</sup>Aleynikova D.V.**

<sup>1</sup> Postgraduate student of the Department of International Information Security of the Institute of Information Sciences of Moscow State Linguistic University, expert of the Department of Science Management and Scientometric of Moscow State Linguistic University;

<sup>2</sup>PhD (Pedagogy), Senior Lecturer of the Department of Linguistics and Professional Communication in the field of Law of the Institute of International Law and Justice

## **CLASS ALLOCATION OF EVENTS IN AN AUTOMATED INFORMATION SYSTEM AS THE BASIS FOR INCREASING ORGANIZATION'S CYBER RESILIENCE**

**Abstract.** The successful functioning of an organization in conditions of permanently existing threats depends, in particular, on their timely detection, correct processing of the incident, time spent on the recovery from the implementation of the incident, as well as on taking measures to prevent possible incidents. The authors of the article suppose that determining a rational set of actions for stopping an incident belonging to a particular class in an automated information system will increase the organization's cyber resilience.

**Key words:** cyber resilience, threat, cybersecurity event, cybersecurity incident, types of cyber security incidents.

### **Introduction**

Information security experts note remarkable changes in its methodology. The initial objective of information security was to protect applying preventive measures when nowadays it is regarded as to detect attacks or their consequences as early as possible [1].

Having analyzed the current situation, it is possible to define the leading causes of such a shift:

- the rapid development of technologies,
- the impossibility of identifying hidden vulnerabilities of any software without putting it into operation,
- required time for the elimination of vulnerabilities and the elimination of consequences of cyberattacks.

Subsequently, to predict the occurrence of an incident, it is necessary to monitor the occurrence of adverse events. The concepts of information security events and cybersecurity events occurring in automated information systems are similar.

In table 1 below, we highlighted common indicators of information security events and incidents (Table 1), based on the

definitions of these terms presented in the following information security standards and guidelines:

- BS 7799 Part 1 – Code of Practice for Information Security Management;
- ISMS Family of Standards (ISO/IEC 27000);
- NIST SP 800 – 61 Revision 2;
- Information Technology Infrastructure Library.

Table 1 – Characteristics of an information security incident and an information security event

№	Information security event	Information security incident
1.	Previously unknown system/environment state change	One or more consecutive events
2.	Potential business disruption	High risks of business disruption
3.	Related to information security	A threat to information

It respectively brings up the whole interesting idea that creating a cybersecurity event management system is not possible without identifying the indicators of cybersecurity event and its potential impact on the business processes. Presenting an accurate picture of what is happening in the emerging security events of an automated information system will allow us to assess the current situation, predict its further development, and take timely measures to protect information or mitigate damage from its loss.

The analysis of different cybersecurity events leads us to rationalize the cybersecurity event management process dividing such events into several groups: unauthorized access events, events predicting a denial of service, malware attacks, and network data collection events [2, 3]. In this respect, we are going to explore the abovementioned types of events.

#### **Network data collection events**

InfoWatch, in the article dedicated to the International Day for the Protection of Personal Data, revealed the data provided on the leaks over the past 12 years in the public and commercial sectors. The number of registered leaks of confidential information amounted to 14.3 thousand units, of which more than 11 thousand units accounted for cases of compromise of personal data. [4]. As we know, in the calculation, a group of persons/companies whose classified information was compromised as a result of one attack was taken as a unit, not a specific owner. A data leak can have a significant impact on an organization. It

may lead to reputational damage and, subsequently, a decrease in the trust of partners and customers, sanctions from regulators, and lawsuits/

The initial stage of a network attack is network data collection. It includes the study of the environment: network topology, identification of nodes, ports and services.

Kimberly Graves in “Certified Ethical Hacker: study guide” lists three types of scanning:

- “network scanning (identifies IP addresses on a given network or subnet);
- port scanning (determines open ports and services);
- vulnerability scanning (discovers presence of known weaknesses on target systems” [5].

The first stage of the reconnaissance procedure is network scanning to identify responding hosts on a network with the help of their IP addresses. Such a process allows revealing live hosts with their IP addresses. The second stage is port scanning that determines open ports and services. Here TCP/IP is applied. Such scanning is based on establishing a TCP connection where port numbers are divided into three ranges.

In table 2 below, we specified the indicators of dangerous events in automated information system associated with network data collection.

Table 2 – Indicators of dangerous events in an automated information system associated with network data collection

Indicators	Potential dangerous events
suspicious network traffic	<ul style="list-style-type: none"> <li>– scanning DNS server</li> <li>– requests to IP addresses</li> <li>– network scanning</li> <li>– port scanning</li> <li>– service scanning</li> </ul>
intrusion detection messages	
high traffic to the host	
large volume of packets forwarded to different hosts on the network and directed to the same port	

Thus, we obtained the ratio of the primary manifestations of network data collection with a possible dangerous event.

### **Unauthorized access events**

According to the research conducted from 2013 to 2015 by Positive Technologies, unauthorized access is usually implemented through vulnerabilities in outdated software versions and open data transfer protocols [6]. The issues of accessibility of management interfaces to all Internet users, the use of "standard" credentials of users

of a corporate network, and unprotected storage of essential data are still relevant.

The objectives of implementing unauthorized access are the following:

- gaining access to confidential information: compromising corporate e-mail; obtaining credentials; information about developments, etc.
- discrediting the company;
- gaining control over the corporate network;
- use of resources of computing systems;
- software management (installation / removal / modification), etc.

When unauthorized access is implemented, cybersecurity events recorded by analysts are very similar to the events occurring during day-to-day user activity on the network or AIS. Users delete files, change their names, forget the login credentials, re-enter the wrong password. In addition, users quite frequently disregarding the rules, download software not related to professional activities. It is evident that to determine the nature of such an activity (malicious / non-malicious) in the network or AIS, it is necessary to regulate the processes of changing the information environment in the company by developing and implementing an information security policy monitoring its compliance.

It is necessary to analyze a situation in which a company has already established a procedure for changing the information environment, and notification of planned work is carried out in order to avoid false alarms of the security system. In the table below, we singled out the indicators of dangerous events in automated information system before the incident of unauthorized access (Table 3).

Generally, the implementation of unauthorized access passes three stages: the first stage is data collection about the object, the second is the operation, the third is removing the traces of their actions. After collecting the necessary data, including data network/system vulnerabilities, an attacker has two ways to implement an attack. The first way is to gain access to the resource as an administrator, which seems more difficult. The second one is to access at the user level and already "in the mask" of the user to look for ways to increase access.

### **Malware attack events**

In the report of the Information Security Monitoring Center of the company "Perspective Monitoring" for the first half of 2018, the number of security events related to the infection with malicious software amounted to 2% of the total number of registered cybersecurity events [7]. Nevertheless, the number of incidents of introducing malicious software into AIS was 41% and surpassed all other incidents (attacks,

password guessing, violation of information security policy). Furthermore, it points our attention to the fact that the time gap between the occurrence of an event and the occurrence of an incident is minimal. In table 4, we accentuated the indicators of dangerous events connected to the malicious software download.

Table 3 – Indicators of unauthorized access

Indicators	Potential dangerous events
suspicious traffic	<ul style="list-style-type: none"> <li>– using a host for an attack</li> <li>– violation of the availability of the service</li> <li>– node failure</li> <li>– obtaining privileged access to the node</li> <li>– the attacker downloads and installs auxiliary programs</li> <li>– unauthorized modification of files</li> <li>– blocking of accounts</li> <li>– changing web / ftp server configurations</li> <li>– changing account data</li> </ul>
changing the system configuration: <ul style="list-style-type: none"> <li>– changing the work of the ports;</li> <li>– changing user privileges;</li> <li>– restart open programs;</li> <li>– change of registration rules in event logs</li> </ul>	
suspicious network activity	
increased use of system resources	
atypical messages in event logs	
intrusion detection messages	
the appearance of new files with atypical names, messages about the disappearance of previously saved files	
unregulated use of accounts (the account of an employee on vacation is used; registration of the simultaneous launch of several sessions of the same account)	
user messages about service unavailability	
user messages about the facts of data changes (names, design, etc.)	

Table 4 – Indicators of malware attack events

Indicators	Potential dangerous events
Messages from antivirus software about file infection	<ul style="list-style-type: none"> <li>- inaccessibility of files</li> <li>- unauthorized modification / deletion of files</li> <li>- unregulated use of system resources</li> <li>- disruption of the operating system, software</li> <li>- node failure</li> <li>- using a node to attack</li> <li>- violation of service availability</li> </ul>
Network traffic growth	
The appearance of dialog box / pop-ups, banners	
The Appearance of unknown connections to the node, open ports	
Event log entries for unknown operations	
User messages about a decrease in the performance of the operating system / applications / their unregulated work	

Table 4 – Indicators of malware attack events

Indicators	Potential dangerous events
User messages about unauthorized deletion / modification or unavailability of files	

Nowadays, among the most widespread malicious programs are those for mining cryptocurrencies and ad viruses.

**Events predicting a denial of service attack**

A denial of service attack (hereinafter referred to as DoS / DDoS attacks) is supposed to make a network resource unavailable. The attacked application, system, or network could no longer cope with the incoming requests. A DoS / DDoS attack is considered successful if it resulted in the unavailability of a resource. Experts use several methods to classify DoS / DDoS attacks: by protocols, relative to the OSI model levels, and by the mechanism of action [8,9].

The protocol classification is based on the main protocols for transmitting data on the Internet. These protocols are most frequently used to implement DoS / DDoS attacks. The scientists underline three types of attacks: via UDP (User Datagram Protocol), TCP (Transmission Control Protocol), and other protocols (ICMP, HTTP, IPP, EP, AM, SCTP, GRE, etc.). Therefore, distinguishing a protocol from the available set and examining its operation for statistics will reveal the tendencies of DoS / DDoS attacks. Furthermore, such an approach will show which protocol has the most significant impact on security. Subsequently, such data allow adjustment to the protection measures.

DoS / DDoS attacks could be classified by their method and divided into three groups: distributed DoS – attacks aimed at overflowing the allocated traffic with requests (data streams); attacks using vulnerabilities in network protocol stacks; application layer attacks.

In the table below, we singled out the indicators of dangerous events connected to denial-of-service attacks (Table 5).

According to the statistics of the DDoS Intelligence system from KasperskyLab [10] for the third quarter of 2018, attacks using the SYN protocol accounted for 58.2% of all DDoS attacks, UDP flood accounted for 31.1%, TCP flood accounted for 8.4%, on HTTP - 2.2% and the share of attacks via ICMP was 0.1%.

Table 5 – Indicators of dangerous events connected to denial-of-service attacks

Indicators	Potential dangerous events
A sudden loss of connectivity	– inaccessibility of the node / network / application / OS of the node – loss of connection on the host / network / application / host OS
Intrusion detection messages	
Increased use of system resources	
High traffic to the node and low traffic from the node	
Atypical messages in event logs	
Receiving data packets from spoofed source addresses	
User messages about unauthorized deletion / modification or unavailability of files	

### Conclusions

The analysis of the cybersecurity events let us accentuate four main groups of such events: network data collection events, unauthorized access events, malware attack events, events predicting a denial of service attack. According to the recent data provided by leading analytical centers, there is an annual deterioration in statistics on the implementation of these violations. Detection of a cybersecurity incident at the stages of manifestation of undesirable events foreshadowing it will increase the efficiency of incident management, hence the organization's cyber resilience.

Consequently, we support the idea of detecting incidents on the scale of an entire state. Such an approach of developing countermeasures for cyber attacks by identifying classes of cybersecurity events will allow taking the necessary and sufficient measures to stop the related incidents, thereby increasing the cyber resilience of the state from both external and internal destabilizing influences.

### Acknowledgements

The reported study was funded by the Ministry of Science and Higher Education of the Russian Federation according to the research project No. FSFU-2020-0020.

### References

1. Finansovaya sfera. Bankovskoe obozrenie (16 October 2018). Kiberustojchivost' — chto eto takoe i kak ee dostich'? Retrieved from <https://bosfera.ru/bo/kiberustoychivost-chto-eto-takoe-i-kak-ee-dostich>;
2. Zefirov, S.L., SHCHerbakova, A.YU. (2012). Upravlenie

incidentami kiberbezopasnosti: uchebnoe posobie. Penza: PGU;

3. Habr (11 October 2012). Rabota s incidentami informacionnoj bezopasnosti. Retrieved from <http://habr.com/ru/post/154405/>;

4. INFOWATCH (28 January 2019) Za 12 let uteklo bolee mlrd personal'nyh dannyh. Retrieved from <https://www.infowatch.ru/analytics/digest/15281>;

5. Kimberly Graves Certified Ethical Hacker: Study Guide – Sybex. – 2010.

6. Positive Technologies (2016). Statistika uyazvimostej korporativnyh informacionnyh sistem. Retrieved from <https://www.ptsecurity.com/upload/corporate/ru-ru/analytics/Corporate-Vulnerability-2016-rus.pdf>;

7. Perspektivnyj monitoring (2019) Otchyot Centra monitoringa za pervoe polugodie 2018 goda. Retrieved from [https://amonitoring.ru/service/security-operation-center1/mssp/quarterly-reports/2018-1\\_amonitoring\\_halfyear\\_report.pdf](https://amonitoring.ru/service/security-operation-center1/mssp/quarterly-reports/2018-1_amonitoring_halfyear_report.pdf);

8. HyperHost (2017) Chto takoe DDoS-ataka i eyo vidy. Retrieved from <http://hyperhost.ua/info/chto-takoe-ddos-ataka-i-we-vidyi/>;

9. DDOS-Guard (11 September 2017) Klassifikaciya DDoS-atak: kratkij obzor sovremennyh podhodov. Retrieved from <https://ddos-guard.net/ru/info/blog-detail/classification-of-ddos-attacks-a-short-overview-of-modern-approaches>;

10. Securelist by Kaspersky (31 October 2018) DDoS-ataki v tret'em kvartale 2018 goda. Retrieved from <https://securelist.ru/ddos-report-in-q3-2018/92512/>.

**Mukolyants A.A.**

Associate professor, Tashkent State Technical University

**Ergasheva D.K.**

Associate professor, Tashkent State Technical University

**Shadibekova F.T.**

Teaching assistant, Tashkent State Technical University

**Taubaldiev A.A.**

Student, Tashkent State Technical University

## **PROSPECTS OF THE APPLICATION OF EXPANDER GENERATOR SETS IN THE GAS TRANSPORTATION SYSTEM OF THE REPUBLIC OF UZBEKISTAN**

According to the forecast, up to 2030 the annual increase in the electricity consumption in the Republic of Uzbekistan will amount to approximately 6 - 7%, therefore the main purposes of the Concept of electricity supply for the years 2020-2030 are: satisfaction of the growing need for electric energy at competitive prices; dynamic development of the electric power industry; development of new generating capacities based on the enabling energy production technologies; improvement of the electricity metering system; diversification of fuel and energy resources along with development of the use of secondary energy resources [1].

One of the main sectors of electricity consumption involves application of expander generator sets (EGS) in the natural gas production and transportation system using the technological pressure drop for natural gas flow. An expander generator set is a system, where the heat content of the natural gas flow is first converted into mechanical energy and then – into electric energy in the generator [2,3].

Figure 1 gives the schematic EGS connection diagram. An expander is connected in parallel to the throttling device, substituting it in part or in whole. When gas expands in the expander, the flow temperature falls a lot lower, than during throttling. Without previous heating before the expander, the gas temperature may be lower than that, when gas line operation is not possible. Due to this reason, along with the expander and the electrical generator an EGS includes an exchanger that heats the gas before the expander [4,5].

Before the application of an EG it is necessary to calculate the possible natural gas flow rate as well as the device payback period.

The turbo expander generating capacity is calculated, considering that the expansion goes along with the adiabatic process.

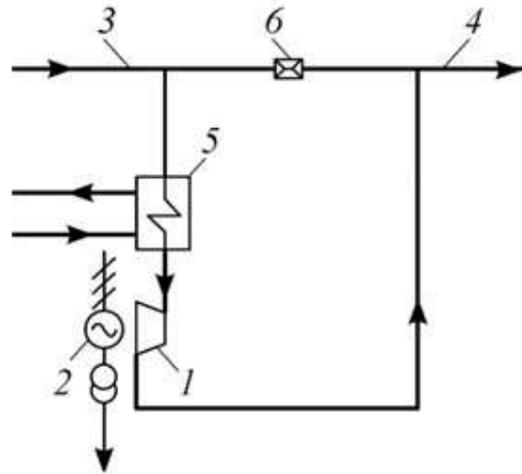


Figure 1. Scheme, describing the gas expansion complex of the GDP (GDS) with an EGS. 1– expander, 2– electrical generator, 3 and 4–high-pressure and low-pressure gas pipelines correspondingly 5–gas heat exchanger before the expander, 6– GDP (GDS)

The enthalpy drop, that occurs during the adiabatic process of the gas expansion,  $H_{AD}$ , kJ, in the expander generator, is calculated using the formula:

$$H_{AD} = \frac{k}{k-1} \cdot z \cdot R \cdot T \cdot \left( 1 - \left( \frac{P_{output}}{P_{input}} \right)^{\frac{k-1}{k}} \right),$$

where  $z$  – gas deviation factor;

$k$  – adiabatic index;

$R$  – individual gas constant, J/kg·K;

$T$  – EGS input gas temperature, 0K.

Natural gas mass flow rate  $G$ , through a GDS, kg/s:

$$G = \frac{Q \cdot \rho_{CM}}{3600}$$

Nominal capacity of the EGS  $N_{EGS}$ , kW:

$$N_{EGS} = G \cdot H_{AD} \cdot \eta,$$

where the efficiency of the expander generator set  $\eta$ .

During the analysis of the gas transportation system operation in the Republic of Uzbekistan we studied the operation of gas distribution stations (GDS) during the summer and winter period. It was found that 42 out of 396 GDS showed the highest gas consumption and pressure drops, and their electric energy output using an EGS ranged from 350 kW up to 1500 kW. For the economic efficiency determination we performed the calculation of the payback periods depending on the capacity of the expander generator sets (EGS), provided that the EGS operates at the constant capacity all year round (Figure 2).

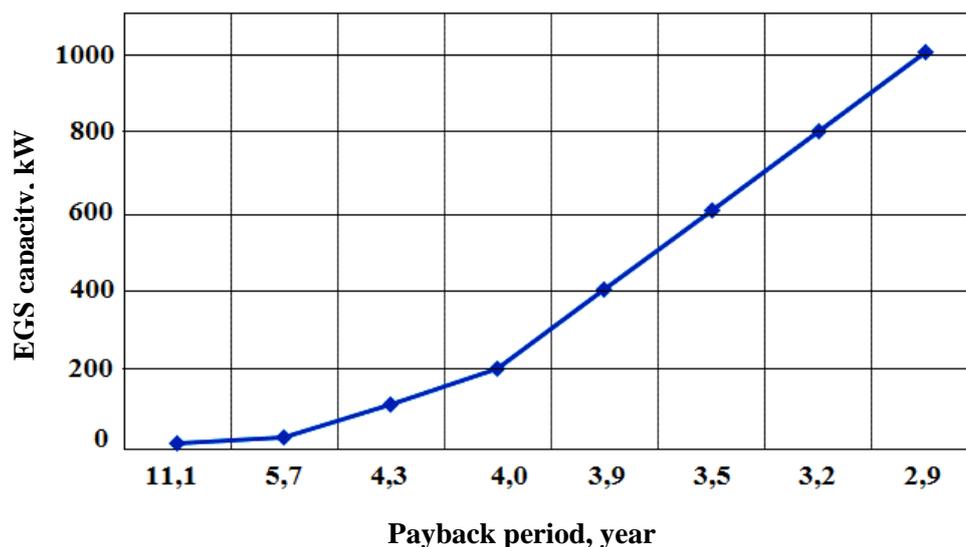


Figure 2. Payback period dependence on the EGS capacity

Thus, the payback period decrease with increasing EGS capacity. The application of EGS with the capacity lower than 30 kW does not give the desired economic result, and the most economically efficient is the application of EGS with a higher capacity.

This suggests that the investment project on the application of an EGS in the production of the electric power industry enterprises shows high economic efficiency. Nowadays, the EGS application projects demonstrate the shortest capital investment recoupment period comparing to any other types of power-generating equipment either in the conventional big-scale power industry, or in the small-scale and non-conventional energy facilities.

### References

1. The Concepts for the Electricity Supply in the Republic of Uzbekistan for the years 2020-2030 [Electronic resource]: <http://www.minenergy.uz>.
2. Zatsepin S.S., Kuptsov S.M. Application of turbo expander units at gas distribution stations, *Territory "NEFTEGAZ"*, 2016, No. 12, pp. 50-53.
3. Klimenko A.V., Agababov V.S., Borisova P.N., Petin S.N. Thermodynamic efficiency of using expander-generator units at stations for technological pressure reduction of transported natural gas, *Thermal physics and aeromechanics*, 2017, Vol. 24, No. 6, pp. 964 – 968.
4. Mukolyants A.A., Sotnikova I.V., Ergasheva D.K., Taubaldiev A.A. Expander-generator set for utilization of natural gas overpressure energy, *E3S Web of Conferences*, 2021, Vol. 289, pp. 07034.
5. Agababov V.S. The main features of the use of expander-generator units at TPPs, *Energy saving and water treatment*, 2002, No. 3, pp. 27–28.

## SECTION V. Agricultural science

УДК 633.15: 631.671

**Gulnyashkin A.V.**

Head of the Maize Breeding Laboratory, Department of selection and seed production of corn, Candidate of Agricultural Sciences

**Lemeshev N.A.**

Scientist of Corn Department, Candidate of Agricultural Sciences

**Zemtsev A.A., Lyulyuk I.R., Chkarbutko E.V.**

Junior scientist of corn department

FSBSI SCG P.P. Lukyanenko, Krasnodar, Russia

### EVALUATION OF NEW SELF-DUSTERED CORN LINES FOR DRY RESISTANCE

**Abstract:** A significant part of the corn-growing zone of the Russian Federation lies in areas suffering from drought. The reasons are very diverse, from low rainfall to abnormally high temperatures during the development of corn.

Corn is a tropical plant by its origin, but as a result of its cultivation in arid regions for a long time, the corn plant has developed adaptive properties that allow it to withstand high temperatures and lack of moisture.

Throughout the entire corn belt of the country, in most regions there is a problem of disturbance in the water balance of plants, the result of which is a shortage of grain during the growing season, even with a sufficient amount of nutrients in the soil.

Drought control is one of the most important areas in agriculture, since a significant amount of crops is lost every year. One of the areas of struggle is the creation of drought-resistant varieties and hybrids.

Success in the creation of hybrids adapted to arid environmental conditions depends on careful assessment and selection of a linear starting material for drought tolerance.

There are a limited number of sources of drought tolerance. Therefore, one of the most important tasks facing breeders is the search for a new sustainable source material and the expansion of its genetic diversity.

**Key words:** self-pollinated line, drought tolerance, yield depression, depression level, relative deviation, resistance level

#### **Introduction**

Drought is one of the most significant extreme environmental factors affecting the formation of the yield of grain and green mass of corn. At present, the vast territories of the Russian Federation, where corn is historically cultivated for grain, are subject to it.

The issues of combating drought were raised by agricultural scientists before, so N.I. Vavilov (1966) [1] believed that plant breeding would be of decisive importance in resolving this problem.

Global climate changes around the world require a radical revision of breeding programs to create new corn hybrids adapted to more severe environmental conditions. So, in the conditions of the Krasnodar Territory in recent years, the amount of precipitation falling during the growing season of maize has sharply decreased, especially during its critical periods of development - flowering of panicles and ears, filling of ears. There is a decrease in the relative humidity of the air and an increase in air temperature, especially its maximum values. All this indicates the timeliness and importance of breeding for drought resistance [3, 5, 6].

Drought tolerance of plants is the hereditary ability to tolerate moisture deficiency without significant consequences for growth, development and productivity. Drought resistance due to physiological mechanisms is the main component of the general field drought resistance, the criterion of which is the degree of productivity decline under drought conditions compared to that under favorable conditions [2].

To obtain drought-tolerant commercial hybrids, a new drought-tolerant starting material is required, which requires careful drought tolerance evaluation of new corn lines.

The selection of new material depends on the correctness of the selection of certain techniques, the completeness of the sample of lines and the conditions of the experiment. Upon reaching all these components, a complete picture will be obtained about the reaction of the lines to high temperatures and lack of moisture during the growing season.

### **The purpose of the research**

Assess new self-pollinated maize lines for drought tolerance using various existing techniques and select a sustainable starting material.

### **Materials and methods**

In total, over the years of study, all the presented source material was evaluated - 45 new lines. The years of study were contrasting in terms of weather conditions. An important point was the significant difference in the amount of precipitation and average air temperatures for 2017 and 2018. So, in 2017, during the period from April to August, 336.8 mm of precipitation fell, and for the same period of 2018 - only 143.8 mm. The average temperature for the same period in 2017 was 20.5 ° C, and in 2018 - 22.2 ° C.

For a more complete characterization of new lines in terms of drought tolerance, their assessment was carried out using several methods: the field method, the level of depression in grain yield, the size of the gap in the flowering of male and female inflorescences, the method of visual assessment. The methodology of G.V. Udovenko [9], based on the physiological assessment of the material, was taken as a basis, and also, the assessment was carried out according to the scale proposed by V.G. Ivashchenko and Yu.V. Sotchenko [4].

### **Results and discussion**

As noted above, the most complete indicator of direct field assessment of drought resistance is the degree of grain yield decline [10].

Taking into account the sharp contrast of weather conditions in 2017 and 2018, we have successfully assessed drought resistance in terms of the degree of decrease in grain yield when comparing the more favorable weather conditions in 2017 with the dry year in 2018.

The decrease in yield (depression) was calculated using the following formula:

$$100 - \frac{A1}{A2} \times 100, \text{ where:}$$

In our experience, the depression rate ranged from 6.29% to 48.63%. To assess the resistance of lines to drought, we used a scale that conditionally divided this material into 5 groups.

- 1 - highly resistant, depression of grain yield below 21%;
- 2 - with resistance above average, depression of grain yield 21-40%;
- 3 - medium-resistant, depression of grain yield 41-60%;
- 4 - with resistance below average, grain yield depression 61-80%;
- 5 - poorly stable, depression of grain yield is above 80%.

According to this scale, no lines with resistance below average and weak were found among our samples.

In the remaining groups, the breeding material was distributed as follows - the group of drought-resistant lines included 15 new lines with a depression level of up to 20.42% (Table 1).

The grain yield of these lines on average for two years varied from 9.7 c / ha to 29.32 c / ha - this is the maximum average yield among all lines.

The second group with above average drought resistance included the largest number of lines - 23. The maximum depression in this group was 40.73%, which certainly affected the grain yield on average for two years. The maximum yield in this group was 26.36 c / ha.

The third group (moderately resistant) included only seven new lines, with a depression level of up to 48.63%. The maximum yield of the lines averaged over two years was 19.46 c / ha.

Table 1 - Distribution of new lines by groups of drought resistance, " FSBSI SCG P.P. Lukyanenko," 2017-2018.

Index	Field Assessment Resilience Groups		
	1	2	3
Number of lines	15	23	7
Depression, min., %	6,30	21,18	42,10
Depression, max., %	20,42	40,73	48,63
Average grain yield in a group, lim., C / ha	9,70÷29,32	12,04÷26,36	12,25÷19,46

Table 2 shows the characteristics of the best self-pollinated lines that showed the maximum drought resistance in the field experiment. As can be seen from the table, the minimum level of depression was shown by the LL0682 line (6.29%).

Table 2 - Characteristics of the best self-pollinated lines by the level of depression of grain yield, «FSBSI SCG P.P. Lukyanenko», 2017-2018.

Line	Grain yield, c / ha			Depression rate,%
	2017, no stress	2018, under stress	The average	
ЛЛ0682	10,01	9,38	9,70	6,29
ЛЛ004	17,63	16,38	17,01	7,10
ЛЛ0731	28,61	26,21	28,61	8,40
ЛЛ0631	24,34	21,80	23,07	10,50
ЛЛ0681	22,85	19,82	21,34	13,30
ЛЛ0647	11,76	10,12	10,94	14,00
ЛЛ0730	23,52	20,16	23,52	14,30
ЛЛ0622	17,26	14,40	15,83	16,57
The average	17,19	14,74	17,81	27,57
LSD 0,5	2,1	2,3	2,5	

It is known from the literature that drought-resistant maize lines are mostly unproductive, since there is a negative correlation between these two characters. Therefore, the most valuable are drought-resistant

lines that have formed a high grain yield. So, the lines LL0731, LL0631, LL0730 had an average grain yield of more than 20 c / ha for two years.

From our observations, in support of the literature, it was found that with an increase in air temperature and a lack of moisture in most maize lines, the height of plants decreases, a smaller number of cobs is laid on the plants, the weight of 1000 grains and the grain size of the cob itself decreases [7].

Another criterion for the ratio of corn plants to drought is the gap between the flowering of corn cobs (female inflorescences) and panicles (male inflorescences). It has been confirmed that the difference in the flowering of male and female inflorescences leads to poor grain size on the cobs and, as a consequence, a sharp decrease in grain yield [8, 9]. In maize lines that are weakly resistant to drought, with a lack of moisture and an increase in air temperature, the flowering of female inflorescences (ears) is delayed, as a result of which male inflorescences (panicles) fade earlier than female ones and pollination does not occur. In turn, drought-resistant lines are distinguished by a small gap in the flowering of male and female inflorescences. It is known that natural short stature and compact arrangement of leaves on the stem can serve as a sign of increased drought resistance. The indices characterizing the compactness of plants of self-pollinated maize lines are the absolute values of the plant height, the height of the stem above the attachment point of the productive ear, and the average length of internodes. These signs show a correlative relationship with the degree of decrease in plant productivity during drought: the more compact the plant, the less the decrease in productivity.

The way to express the overall result of the assessment according to the recommended morphological characteristics and physiological indicators of the resistance of corn in a certain phase of the growing season can be the sum of relative deviations, the relative deviation is determined by the formula:

$$A = \frac{X - \bar{X}}{\bar{X}}$$

where A is the relative deviation of the value of the physiological or morphological sign of resistance;

X - The average value of the indicator for a given sample under the specified conditions of the experiment;

- The overall average value of the indicator for the studied group of samples.

Table 3 shows the results of the assessment of new lines for drought resistance according to their morpho-biological characteristics and physiological parameters. Analyzing the results obtained in evaluating the morphological characteristics of the studied lines, it should be noted that a number of lines were identified that showed resistance to drought manifestation in field experiments.

Particular attention is drawn to lines LL0622 and LL0730, which were included in the first group of resistant lines in terms of the depression level of the first experiment and showed the best result out of a set of 45 lines in terms of the sum of deviations of the morpho-biological characteristics of the second experiment. These lines, distinguished on the basis of drought tolerance using different techniques, are a valuable source material for the creation of new hybrids adapted for cultivation in the arid zone. In addition, for a complete assessment of the entire linear material for drought resistance in 2018, an unfavorable year in terms of moisture supply, we carried out a visual assessment of the state of linear plants directly in the field.

The assessment was carried out according to the scale proposed by V.G. Ivaschenko. and Sotchenko Yu.V. [4]. This scale differs from the scale used in most experiments, created by N.L. Udolskaya. that covers a wider degree of plant damage from drought (Table 4).

The results of a visual assessment of new lines for drought tolerance in an unfavorable 2018 were as follows: the average score on the drought tolerance scale was 3.13. Among the evaluated lines, there were no very susceptible ones, there were only 6 susceptible lines. The largest number of lines (18) were included in the group of moderately resistant. Drought-resistant lines were identified - 15.

Thus, analyzing the data of assessing lines for drought tolerance using various methods, we obtained similar results. For example, when evaluating the lines by the yield depression method and the visual method, using the rating scale, 15 resistant lines were identified, the results were very similar for other groups. These circumstances indicate a close relationship between these indicators.

Having selected drought tolerant lines as a result of the assessments, a great deal of work has been done to create the starting material. Having the results of assessing new lines for drought resistance, it became possible to assess the drought resistance of the entire set of hybrids obtained from testing this initial material. We did not carry out a special assessment of hybrids in the field, we will give an indirect estimate according to the level of depression in grain yield of hybrids in different years of study (Table 5).

Table 3– Characteristics of the morpho-biological characters of the lines with the highest indicator of drought resistance according to the field method, "FSBSI SCG P.P. Lukyanenko", Krasnodar, 2017-2018.

Line	Grain yield, c / ha	Height plants, cm	Plant height after the first ear, cm	Length internodes, cm	Number of internodes	Gap in flowering panicle and cob, days.	The sum of the deviations
LL0622	15,8	130,5	89,0	10,1	10,5	0	-1,67
LL0730	23,5	133,3	95,0	10,7	10,8	0	-1,53
LL0677	13,1	124,8	80,8	10,7	10,4	1	-1,41
LL0600	14,3	148,0	100,5	10,3	11,0	0	-1,40
LL0694	12,4	132,3	91,5	9,9	10,0	1	-1,36
LL0619	14,5	133,8	84,5	10,0	10,6	1	-1,36
LL0608	16,7	142,0	95,8	10,3	11,3	1	-1,13
LL0713	16,6	136,0	96,5	10,6	10,6	2	-0,85
Experience Average	17,8	155,9	103,6	11,9	13,5	2,2	0,3
LSD 0,5	2,2	2,5	3,1	0,3	0,5		

Table 4 - Evaluation scale for drought resistance of new lines of maize in the field, «FSBSI SCG P.P. Lukyanenko», Krasnodar, 2018

Resilience level	Scale score	The main signs that appeared during the period of panicle release - wax ripeness
Stable	1	Yellowing and dying off of basal leaves, a drop in turgor at the lower leaves
Moderately stable	3	Drying of 2-3 lower leaves, partial death of leaves below the cob
Moderately susceptible	5	Dying off of leaves below the cob, delaying the appearance of the cob
Susceptible	7	Death of leaves below the ear, death of panicle and delay in appearance of stigmas
Very susceptible	9	Death of 75% of leaves, severe underdevelopment, late appearance of ears or their absence

The table 5 shows the best test crosses that showed the minimum level of depression in grain yield when tested in a favorable moisture supply in 2017 and in a dry year in 2018. With the level of depression on average for the experience of 46.40%, the noted hybrids showed a level of depression from 2.77% to 24.17%, which corresponded to groups 1 and 2 of drought tolerance according to the field assessment. These groups include - highly resistant hybrids (group 1) and hybrids with above average resistance (group 2). It should be noted that in the composition of the separated hybrids, adapted to arid conditions, there are lines selected by us during the assessment for drought resistance. These are the lines: LL0730, LL0731, LL0681, LL0619, LL004, which indicates a high heritability of the drought tolerance trait, which is transmitted from self-pollinated lines to hybrids. Evaluation of new self-pollinated lines using several techniques: the field method, the level of grain yield depression, the size of the gap in the flowering of male and female inflorescences, the method of visual assessment made it possible to identify drought-resistant lines: LL0730, LL0622, LL0619, LL0677, LL0713, LL0608, LL0682694, LL LL004, LL0731, LL0631, LL0681, LL0647, LL0600, characterized by high indicators of drought tolerance criteria. It is advisable to use these self-pollinated lines to create corn hybrids adapted to water stress.

Table 5 - Characteristics of the best test crosses by the level of depression in grain yield, «FSBSI SCG P.P. Lukyanenko», 2017-2018.

Line	Grain yield, c / ha			Depression rate,%	Drought Resilience Group, Field Assessment
	2017, no stress	2018, under stress	Average		
LL0906 x LL0731	43,80	42,59	43,19	2,77	1
LL0906 x LL0730	45,70	44,37	45,04	2,91	1
LL0906 x LL0701	39,68	38,16	38,92	3,84	1
(Kr714m x LL0913) x LL0671	30,50	29,18	29,84	4,33	1
LL0920 x LL0730	31,54	30,17	30,85	4,35	1
LL0906 x LL0691	47,60	45,28	46,44	4,88	1
(Kr742m x LL0985) x LL0681	40,18	34,44	37,31	14,27	1
LL0906 x LL0660	35,31	27,96	31,64	20,80	1
(Kr714m x LL0913) x LL0696	31,48	24,56	28,02	21,98	2
(Kr742m x LL0985) x LL0693	28,28	21,73	25,01	23,16	2
(Kr714m x LL0913) x LL0619	29,56	22,41	25,99	24,17	2
(LL0979 x LL0959) x LL004	43,61	29,31	36,46	32,79	2
(LL0979 x LL0959) x LL0681	49,79	31,85	40,82	36,02	2
Experience Average	52,66	23,96	38,31	46,40	
LSD 0,5	5,3	3,8	5,2		

A comparative study of various methods for determining drought tolerance allows us to conclude that there is a significant coincidence of the assessment results. Such lines as LL0730, LL0622, LL0731, LL0713 were distinguished as a result of the application of various methods for assessing drought resistance.

It should be noted that a complete coincidence of the estimates of drought tolerance by different methods has not been obtained, therefore, the simultaneous use of several criteria for determining the degree of drought tolerance will increase the accuracy of the estimates.

The fact that in the pedigree of drought-resistant hybrids there is a large number of already identified drought-resistant lines indicates a high level of heritability of this trait.

### **Conclusions**

As a result of the assessment for drought resistance, the following material was identified: LL0730, LL0622, LL0619, LL0677, LL0713, LL0608, LL0694

### *References*

1. Vavilov N.I., Selected Works. Genetics and breeding. Moscow: Kolos, 1966. 559s.
2. Goncharova E.A., Strategy of diagnostics and forecast of resistance of agricultural plants to weather and climatic anomalies // Agricultural biology. - 2011. - No. 1. - P. 24 - 31.
3. Ivaschenko, I.V., Productivity of corn, resistance to drought and stem rot // Corn and sorghum. 2000. No. 2. P. 17.
4. Ivaschenko, V.G., Sotchenko, E.F., Sotchenko, Yu.V. Improvement of systems for assessing corn resistance to drought and fusarium on the cob // Bulletin of plant protection, 2006. No. 1. P. 16-20.
5. Krivosheev, G. Ya. Breeding value and adaptability of samples of starchy corn subspecies / G. Ya. Krivosheev, AS Ignatiev, NG Ignatieva // Corn and sorghum. -2014. -№4. -FROM. 12-18.
6. Krivosheev, G. Ya., Gorbacheva, AG, Vetoshkina, IF Reaction of parental forms of corn hybrids to arid and moisture-secure growing conditions // Corn and sorghum. 2013. No. 3. S. 1-7.
7. Kursanov A.L. Physiological bases of plant drought resistance // Problems of drought control and growth of agricultural production. M., 1974. S. 80-86.
8. Guidelines for a comprehensive assessment of drought resistance of self-pollinated lines and maize hybrids / VASKHNIL, All-Russian Research Institute of Plant Industry. N.I. Vavilova; [compiled by T. V. Oleinikova, Yu. V. Sklyar]. - Leningrad: VIR, 1985. 17 p.

9. Methods for assessing plant resistance to adverse environmental conditions // Ed. G.V. Udovenko. L., 1976.318 p.
10. Udovenko G.V., The use of physiological evaluation criteria in breeding varieties for resistance to unfavorable environmental conditions // Variety Physiology and Biochemistry. 1969.S. 122-127.

**Maslennikova V.S., Bedareva E.V.**

Federal State Budgetary Educational Institution of Higher Professional Education «Novosibirsk State Agrarian University»

### **THE EFFECT OF *BACILLUS THURINGIENSIS* spp. *AIZAWAI* TUBER TREATMENT ON THE POTATO YIELD**

The research [1] confirmed the insecticidal activity and gave comparative assessment of *B. thuringiensis* ssp. *Aizawai* strain. The utmost susceptibility to the pathogen was shown by the diamondback moth and cabbage white butterfly larvae. The cabbage looper, thorn butterfly and greater wax moth caterpillars were more strain-resistant. However, further study of the strain, including its growth promoting activity, appears relevant.

The purpose of the research was the assessment of the effect that the pre-plant tuber treatment with the insecticidal *Bacillus thuringiensis* spp. *aizawa* strain had on the potato yield.

The objects of the research were: *Bacillus thuringiensis* spp. *aizawai* strain, provided by the Siberian Federal Scientific Centre of Agro-BioTechnologies of the Russian Academy of Sciences and the middle-early potato variety Tuleevsky.

The field experiments were conducted in the fields of the UPH “Michurintsev garden” (Russian, the Novosibirsk region, Novosibirsk) in 2021 in accordance with the research methods of Dospekhov B.A. [2]. Before planting (May 18, 2021) the potato tubers were soaked in the strain suspension (in the concentration of  $1 \times 10^6$  cfu/ml) for 1 hour; the tubers, soaked in the water, acted as the check. The biological yield recording was carried out by weighing the yield from one plot and calculating it in relation to one ha (August 18, 2021).

The result of the microbial agent treatment was the yield gain (Table 1), achieved by the reduction of fine tubers by 1.7. The weight per potato plant increased from 917.7 to 1052.3 g.

Table 1. The effect of *Bacillus thuringiensis* spp. *aizawai* strain on the potato yield

Experiment type	Weight of fractions, %			Weight per plant, g	Yield, t/ha
	fine (up to 35 g)	medium (36-129 g)	coarse (more than 130 g)		
Check	3.76	30.55	65.69	917.7	22.0
<i>Bacillus thuringiensis</i> spp. <i>aizawai</i>	2.27	42.09	55.64	1052.3	25.3
HCP <sub>05</sub>				56.52	1.74

With the *Bacillus thuringiensis* spp. *aizawai* tuber treatment the yield increased by 13% in relation to the check.

Thus, application of *Bacillus thuringiensis* spp. *aizawai* insecticidal strain to potato tubers allowed to achieve a high yield of better quality comparing to the check, which can be used for the development of a multifunctional biological in the future.

#### References

1. Andreeva I.V., Shatalova E.I., Kalmykova G.V., Akulova N.I., Ulyanova E.G. Susceptibility of different types of lepidopterans to *Bacillus thuringiensis* spp. *aizawai* strain, *Siberian Journal of Agricultural Science*, 2019, Book 49, No.6, pp. 44-52. DOI: 10.26898/0370-8799-2019-6-5 (in Russian)
2. Dospekhov B.A. Field experiment methods (including the statistical processing of the study outcome). Moscow, Alyans, 2014, 350 p. (in Russian)

## **SECTION VII. Economics**

**Verenikina A.O., <sup>1</sup>Voronina E.V., Nosyreva A.V.,  
Rechapova R.R., Sobirov B.S.**

<sup>1</sup>Associate professor, Candidate of Economic Sciences

Surgut State University

### **ABOUT THE FUNCTIONING AND DEVELOPMENT OF THE ECONOMIC SYSTEMS IN THE CONTEXT OF DIGITALIZATION**

Economic systems have been interpreted differently by various scientific schools. Thus, neoclassical paradigm defined the term using the micro and macroeconomic concepts. Moreover, the subject of the research was the behavior of people, who maximized their contribution to the environment of limited resources and unlimited needs.

Institutionalists pay attention to the specific nature of the economic systems by studying the coordination method, the ownership type system, transaction costs, and the contract system.

Marxism focuses on the system methodology based on the dialectical system approach.

According to the researchers of the modern postindustrial society, a system is born as a specific technological paradigm that significantly transforms the entire economic and social systems.

In comparison with the predominant concepts of neoclassical economics and neo-institutionalism, the historical school emphasizes the historically developed differences in the national economic systems.

We shall consider the approaches of different authors to the definition of the term “economic system”.

The economic system definition analysis emphasizes several common features:

- 1) interrelation of the system elements;
- 2) multifunctional connections between the elements [Goyher, 2013];
- 3) certain territory;
- 4) redeployment of resources by the complex of production, allocation, exchange, and consumption;
- 5) presence of social and economic relations;
- 6) system of incentives and motivation for the participants;
- 7) various cooperation mechanisms.

Table 1

## Approaches to the definition of “an economic system”

Author	Definition of an economic system
Abalkin L.I.	A form of production relations in the context of corresponding conditions for the organization of production within a certain region and at a certain stage of social development [Abalkin, 1981].
Lampert H.	A summary of all the rules regarding the organization structure of the national economy and the related processes, as well as the complex of institutions, responsible for the economical management and establishing certain economic organization [Lampert, 1993].
Nureev R.M.	A total of interrelated economical elements that compound the integrated economic structure [Nureev, 2013]
Poddergina L.I.	A relatively independent human society living life as a whole [Poddergina, 2007].

Based on the above-mentioned, it may be concluded that an economic system is a complex and interrelation of various economic elements, oriented at the development of conditions required for maintaining and growth of the viability and living-sustaining activity of the entire society.

An economic system has certain special features:

- integrity, i.e. the change of one element determines the condition of the other;
- comprehensiveness – supposes interdependence between material production and the system of social relations;
- complexity – each component can be both, a part of the whole and a system of a lower level.

Among the purposes of the economic system functioning there are: preserving its structure, gaining new qualitative peculiarities, maintaining its vital activity, performing its mission, stabilization of the society from the economic perspective (resource allocation is carried out with the help of the economic system), citizen employment regulation, development of the free efficient economy (the efficiency in this case is expressed by the easiness of the satisfaction of the needs), and fixing stable prices.

Examining a country as the economic system, we shall emphasize modern promising directions of its functioning:

1. support and development of innovation enterprises as well as the developments of young scientists;
2. promotion of the economically efficient types of activities by the means of the taxation system;
3. development and protection of information resources;
4. establishment and development of science-based companies, able to compete in the global market;
5. service industry development in the domestic and global market.

Nowadays, economic systems are digitally affected; there takes place the economic transformation, which supposes the enhancement of the efficiency of the economic activity and the creation of the conditions for the qualitative increase in productivity. Digital transformation of economic systems provides for the development of the country, regions, and territories as well as for the change of the technological paradigm.

The transformation of economic systems is driven by the economy digitalization. The huge role in the digitalization process is played by the innovative activity development, intellectual capital management, information technology development, and knowledge management.

In our opinion, a digital economy is a type of an economic activity; the mutual effect of various economical, social, political, and other relations, which are based on the use and development of information and digital technologies.

We cannot deny the growing influence of the digitalization on all the spheres of social life. We shall agree with Sakhanevich D.J. on the fact that the economic space and the socio-economic systems, functioning in it, are going through significant changes, connected with the digitalization process. Digitalization plays a considerable part in the development of the elements of the socio-economic system of a region. The main tasks include the enhancement of the competitive ability of the regions, their welfare and economic growth, which is supposed to be reached by the implementation of information technology in the processes of the socio-economic systems improvement.

Acting as the transition to the digital information of all the aspects of the socio-economic life, digitalization transforms from a simple method of improvement of various life spheres to the driver of the global social development, providing for the economic efficiency increase and the life quality improvement [Khalin, 2018].

We suppose that the digital economy causes changes in the economic systems functioning and involves such characteristics as:

- growth of the dependence of efficient development on the level of social digitalization (the modern needs for information technology dictate their terms);
- growth of the need for the scientific and innovative (technological) development (innovations provide the quality of the information technology development);
- increase in the significance of the intellectual capital, “ the economics of knowledge”, and the entrepreneurial skills;
- support of the economic systems integrity;
- focus of an economic system on a certain goal, dictated by the digital environment;
- focus of an economic system on the development and application of all the benefits of the digital economy;
- intention of the economic system subjects to implement information technology in their activities and expand the technologies, being used, for the development of digitalization;
- the level of development of the economic systems depends on the interconnection of the systems’ subjects and their ambition for the digital economy development (integration of all the resources, synchronization of all the economic sectors, etc., globalization process);
- development of the human resources becomes more significant (the focus on the innovation and information activities);
- economic systems should have their own philosophy of development and technology of development in the context of the digital economy;
- institutional nature of economic systems;
- creation of conditions that are more favorable for the development of the competitive capacity and mutually beneficial collaborations;
- growth of cognitive needs, i.e. the improvement of personal, production and national competitive capacity due to the skill of gaining and using knowledge based on the efficient navigation in the information field [Zemlely, 2015].

Economic systems transform and change under the influence of information technology. Among the main functions of economic systems in the context of economic digitalization we may name:

- the analysis and support of the socio-economic development and technological progress, carried out by the means of cooperation and application of all the elements of the digital economy (“the Internet of things”, smart society, technical services, artificial intelligence, etc.);

- ensuring the growth of the level of human living and life support. Under the conditions of the growth of significance of information technology we should not forget, that there is a human behind every informational breakthrough;

- creation of conditions, necessary for the functioning of all the subjects of an economic system and support of the system activity;

- continuous reproduction of the human resources (for the provision of innovation and information development);

- ensuring necessary crisis bailout plan: the economy digitalization has both, positive and negative effects, which can trigger a crisis (information leak, hacking attacks, etc.);

- acceleration of technological and socio-economic development. Under the conditions of severe competition there is constant race for resources, technologies, investments, and human resources;

- ensuring the economic safety in the context of the vulnerable digital economy (ensuring human rights in the context of social digitalization, information integrity, lack of human resources in the information field);

- development of the business activity as one of the main economic development indicators. It helps to monitor and diagnose the management issues in the digital economy as well as to take measures for their solution at the appropriate times;

- maximizing profit and ensuring the competitive environment for the functioning of the economic systems subjects;

- management of the technical and information development of the digital economy systems, i.e. exercising influence on the innovation and information development as the management object in order to carry out the most comprehensive development;

- risk management. The economic system activity bears risks, therefore a solution to any situation shall be chosen considering the evaluation of the risk level;

- implementation of different technologies in the life activities by the subjects of economic systems for the digitalization development.

The transformation of the economic systems is affected not only by the digitalization of all the spheres of human life, but also by other factors, such as:

- the economic development level;

- natural and economic geographical location;

- socio-cultural factors (culture, religion, national consciousness, and mentality);

- international relations.

The factors may be divided into two groups: exogenous and endogenous.

Among the exogenous factors, that determine the transformation of the economic system, there are:

- economy collectivization in the form of vertically integrated production, the rise to the knowledge-intensive production;
- predominance of the corporate form of ownership;
- development of the public and corporate paradigm;
- economy informatization development;
- development of globalization processes.

The endogenous factors, that determine the transformation of an economic system, include technical and technological, functional, structural and institutional peculiarities of Russia's economy [Dyulmanova, 2006].

The change of the economic systems has been heavily influenced by COVID-19 pandemic that caused negative trends, such as the unemployment increase, collapse in oil prices, stock market crash, etc.

The pandemic has initiated changes in production. In particular, the increase and improvement of control allowed to enhance the production rate by reducing the human influence and to speed up the restoration of broken supply chains. The pandemic, being a force majeure, allowed to reduce the burden on business, which simplified the activities of some enterprises.

At the current stage of the development of the economic systems “the society 5.0” is the predominant one, and it acts as a factor, that influences the development of the economic systems. This is a society that actively uses digital and information technologies, the Internet, and other IT technologies in all the spheres of activity and in everyday life. Using these things is not just cost-efficient, but also beneficial and convenient for people. Furthermore, “the society 5.0” tries to find a compromise and benefit for the solution of various socio-economic issues for the purpose of the efficient development of the economic systems. And the interconnection between the virtual (the Internet) and the real world is what helps with that.

The pandemic has also helped to pay special attention to the economy digitalization. The economy digitalization is a modern stage of scientific and technological progress, involving implementation of certain type of innovations in the actual business practices [Vorontsovsky, 2020].

In our opinion, further development of the economical systems is inspired by the movement towards the socially responsible economy with a focus on the human development. The tendency is expressed in the policy documents, adopted by the world community. Thus, in 1990 the first “report on the human development” was introduced by the United Nations Development Programme (UNDP), which says that people are the real wealth of nations. In this regard, the main purpose of the development consists in the creation of conditions allowing people to live a long, healthy and creative life. However, it is essential that such standard of treating people would not be considered as a declaration, but as the basis for choosing the social and political course of the economic systems.

Regarding the prospects of the development of the economical systems, special attention should be paid currently to the prospective strategy for low-carbon development of Russia. Low-carbon development of economy “is a possible concept of sustainable development, aimed at prevention of the disastrous consequences of the global climate change in the present century [Gritsevich, 2011].

This strategy can be a stimulus for the creation of new global markets, the transition to a new technological paradigm, the increase of the significance of the development of ecological economy, the decrease of “popularity”, or the dependence on the low-carbon raw material.

### *References*

1. Abalkin L.I. Socialist economy dialectic. Moscow, Mysl, 1981, 352 p. (in Russian)
2. Vorontsovsky A.V. Economy digitalization and its effect on the economic development and social welfare, *Bulletin of Saint Petersburg State University. Economics*, 2020, No.2, pp. 189-216. (in Russian)
3. Goyher O.L., Laryushkina A.A. Economic system: definition, types, characteristics, *Bulletin of the University*, 2013, No.16, pp. 246-250 (in Russian)
4. Gritsevich I.G. Prospects and scenarios of low-carbon development: EU, China, and the USA in the global context. Moscow, Skorost tsveta, 2011, 36 p. (in Russian)
5. Dyulmanova T.M. Context and factors of the transformation of the economic systems, *Bulletin of Orenburg State University*, 2006, No.8, pp. 16-21. (in Russian)
6. Zemlely A.Y. Transformation of economic systems: from labor to entrepreneurial economics, *Bulletin of Tver State University, “Economics and management” series*, 2015, No.1, book 1, pp. 20-26. (in Russian)
7. Digital economy indicators [Electronic resource]. URL: <https://www.hse.ru/data/2019/06/25/1490054019/ice2019.pdf>

8. Lampert H. Social market economy. German way. Moscow, Delo, 1993, 224 p. (in Russian)
9. Nureev R.M. Criticism of economic determinism: Karl Polanyi' methodology, *Bulletin of the new economic association*, 2013, book 17, No.1, pp. 169-173. (in Russian)
10. Podderegina L.I. Essence and structure of the socio-economic system of society, *Journal of Belarusian National State University*, 2007, No.4 [Electronic resource]. URL: <https://cyberleninka.ru/article/n/suschnost-i-struktura-sotsialno-ekonomicheskoy-sistemy-obschestva>.
11. "Digital economy of the Russian Federation" Programme [Electronic resource]. URL: <http://static.government.ru/media/files/9gFM4FHj4PsB79I5v7yLVuPgu4bvR7M0.pdf>
12. Sakhanevich D.Y. Role of digitalization in the socio-economic system development, *Transactions of the Tambov Department of the Russian Union of Young Scientists*, 2020, No.20, pp. 63-73 (in Russian)
13. Solozhentsev E.D. Socio-economic system and innovation system management – the country's development strategy, *Risk analysis issues*. 2014, book 11, No.3, pp. 32-46. (in Russian)
14. Porphiryev B., Shirov A., Kolpakov A. Low-carbon development strategy: prospects for the Russian economy, *Global economy and international relations*, 2020, No.9, book 64, pp. 15-25. (in Russian)
15. Khalin B.G., Chernova G.V. Digitalization and its effect on the Russian economy and society: advantages, challenges, threats and risks, *Management consulting*, 2018, No.10 (118), pp. 46-63. (in Russian)
16. Digitalization in the Russian production [Electronic resource]. URL: [https://www.tadviser.ru/index.php/%D0%A1%D1%82%D0%B0%D1%82%D1%8C%D1%8F:%D0%A6%D0%B8%D1%84%D1%80%D0%BE%D0%B2%D0%B8%D0%B7%D0%B0%D1%86%D0%B8%D1%8F\\_%D0%B2\\_%D0%BF%D1%80%D0%BE%D0%BC%D1%8B%D1%88%D0%BB%D0%B5%D0%BD%D0%BD%D0%BE%D1%81%D1%82%D0%B8\\_%D0%A0%D0%BE%D1%81%D1%81%D0%B8%D0%B8#.2A\\_.D0.92.D1.8B.D1.8F.D0.B2.D0.BB.D0.B5.D0.BD.D1.8B\\_.D0.BD.D0.B0.D0.B8.D0.B1.D0.BE.D0.BB.D0.B5.D0.B5\\_.D0.B0.D0.BA.D1.82.D1.83.D0.B0.D0.BB.D1.8C.D0.BD.D1.8B.D0.B5\\_.D0.BF.D1.80.D0.BE.D0.B1.D0.BB.D0.B5.D0.BC.D1.8B\\_.D0.B8\\_.D0.BF.D0.BE.D1.81.D0.BB.D0.B5.D0.B4.D1.81.D1.82.D0.B2.D0.B8.D1.8F\\_.D0.BF.D0.B0.D0.BD.D0.B4.D0.B5.D0.BC.D0.B8.D0.B8\\_COVID-19\\_.D0.B4.D0.BB.D1.8F\\_.D1.80.D0.BE.D1.81.D1.81.D0.B8.D0.B9.D1.81.D0.BA.D0.BE.D0.B9\\_.D0.BF.D1.80.D0.BE.D0.BC.D1.8B.D1.88.D0.BB.D0.B5.D0.BD.D0.BD.D0.BE.D1.81.D1.82.D0.B8](https://www.tadviser.ru/index.php/%D0%A1%D1%82%D0%B0%D1%82%D1%8C%D1%8F:%D0%A6%D0%B8%D1%84%D1%80%D0%BE%D0%B2%D0%B8%D0%B7%D0%B0%D1%86%D0%B8%D1%8F_%D0%B2_%D0%BF%D1%80%D0%BE%D0%BC%D1%8B%D1%88%D0%BB%D0%B5%D0%BD%D0%BD%D0%BE%D1%81%D1%82%D0%B8_%D0%A0%D0%BE%D1%81%D1%81%D0%B8%D0%B8#.2A_.D0.92.D1.8B.D1.8F.D0.B2.D0.BB.D0.B5.D0.BD.D1.8B_.D0.BD.D0.B0.D0.B8.D0.B1.D0.BE.D0.BB.D0.B5.D0.B5_.D0.B0.D0.BA.D1.82.D1.83.D0.B0.D0.BB.D1.8C.D0.BD.D1.8B.D0.B5_.D0.BF.D1.80.D0.BE.D0.B1.D0.BB.D0.B5.D0.BC.D1.8B_.D0.B8_.D0.BF.D0.BE.D1.81.D0.BB.D0.B5.D0.B4.D1.81.D1.82.D0.B2.D0.B8.D1.8F_.D0.BF.D0.B0.D0.BD.D0.B4.D0.B5.D0.BC.D0.B8.D0.B8_COVID-19_.D0.B4.D0.BB.D1.8F_.D1.80.D0.BE.D1.81.D1.81.D0.B8.D0.B9.D1.81.D0.BA.D0.BE.D0.B9_.D0.BF.D1.80.D0.BE.D0.BC.D1.8B.D1.88.D0.BB.D0.B5.D0.BD.D0.BD.D0.BE.D1.81.D1.82.D0.B8)

## **SECTION VII. Philosophy of Science**

**Ermakova L.I.**

Professor, Doctor of Philosophy

**Sukhovskaya D.N.**

Associate professor, Candidate of Philosophical Sciences

Federal State Budgetary Educational Institution of Higher Education  
“Pyatigorsk State University”

### **THE PROSPECTS OF THE DEVELOPMENT OF CREATIVE INDUSTRIES AND CLUSTERS AS A SECTOR OF CULTURE AND ARTS (REGIONAL ASPECT)**

Recent years have been marked by the generation of mass-market demand for all the forms of modern culture and art. This is due to the community demands as well as to the speed of spreading information in the modern world. Private and state museums, publications, prizes and other platforms are created for the promotion of modern art. This sets new tasks for the field such as finding new ways of communication with the wide audience and new economic approaches.

Nowadays, Russia invests heavily in the export of creative field services.

According to the expert analysis the export of creative industries has increased by 1.5 for the last three years. In the view of the Russian expert centre creative industries well deserve to be called the innovative driver of the national economy [1].

The economic growth of creative fields depends on people making up the creative class. Production of creative products, services and content in Russia is challenged for some reasons, and the main reason is the lack of the structure of education, professional retraining, and advanced training for a job in a new creative economy.

It goes together with the lack of the interpretation of creative industries as a particular type of economic activities. Consequently, there is no initiative for the coordinated work of the education policy and the interagency activities.

Based on the mapping performed and the obtained statistics we may point out the following recommendations and main courses of the development of Culture and Arts of the Stavropol territory:

1. Implementation of the terms “creative industries” and “creative economy” in the regional and federal state policy of cultural

development;

2. Consideration of creative industries as the essential strategic tool of enhancing social and economic welfare of the territory, and including such industries in the strategic policy of the social and economic development of the territory;

3. Provision of support and development of creativity of the population by the creation and enforcement of special plans regarding the development of creativity and talents via schools, universities, educational clubs, by holding training workshops, creating art clusters in the towns of the Stavropol territory, meaning the unclaimed areas of the industrial and another infrastructure;

4. Formation of professional communities in all areas of the creative industry;

5. Provision of support for the development projects of the clusters;

6. Digitalization of the elements in the activities of the institutions of Culture and Arts (digitization of books, giving concerts and theatrical performances online, and the development of interactive museums in the historical, artistic, educational, and cultural courses);

7. Development and launching of the courses on the educational support for small businesses in the field;

8. Development of programs providing the financial support for the organizations and institutions in the creative field, as well as provision of tax preferences;

9. Promotion of the creative product market by the provision of the quick entry to the local, national, and international markets;

10. Provision of the unclaimed areas for the formation of creative clusters.

The performance of these activities will allow to enshrine creative industries at the statutory regional and federal levels. Their further development will entail the increase of the gross regional product, and consequently, the increase of the gross domestic product of Russia. This situation will have a positive impact on the economic development of the territory and of the whole country.

Thus, based on the aforesaid, it may be concluded that creative industries have high potential for the development of the areas of the Stavropol territory, provided that the cultural policy as well as the strategic development programs are professionally formulated. The additional advantage of the implementation and development of creative industries and clusters lies in the improvement of the employment rate, increasing the production output, and reducing the unemployment level

and the social strain. By forming new activity areas creative industries steer the development of the economy on a new course.

### *References*

1. Education and creative industry within the framework of the international and domestic practice, *The official site of the Analytical Center for the Government of the Russian Federation*. URL: <https://ac.gov.ru/news/page/kreativnaa-industria-v-rossii-imeet-ogromnyj-potencial-dla-rosta-14526> (Date of reference: 18.05.2021)

## **SECTION VIII. Philology**

**M. M. Davydova**

Candidate of Philological Sciences, Assistant Professor  
of the Department of Translation and Cross-cultural Communication  
of Tula State Lev Tolstoy Pedagogical University

### **REALIZATION OF THE GENDER ASPECT IN LITERARY TRANSLATION (BASED ON THE TRANSLATIONS OF O. WILDE'S FAIRY TALE "THE HAPPY PRINCE")**

The concept of gender entered the linguistic paradigm in the second half of the XX century. One of the first studies in the field of gender linguistics was carried out by the American professor Robin Lakoff. The author described the differences between masculine and feminine communication styles in the book "Language and Woman's Place" (1975).

Within the framework of this article it seems important to consider the concept of gender through the analysis of linguistic structures that play an important role in the cultural manifestation of gender. Gender characteristics in the language are expressed through the speech behavior of men and women and the gender marking of the language. The gender marking of the language is primarily manifested at the lexical level. I.V. Denisova identifies four categories of gender-marked vocabulary: personal pronouns; words associated with men or women due to their internal form; words and phrases containing units with a

gender component indicating the gender of the referent; words associated with the concepts of “man” and “woman” [1, p. 7].

Taking into account the gender factor and identifying the means of its reflection in the language contributes to a better understanding of the text and to taking a fresh look at famous works of fiction. The texts of fiction are the most difficult to translate since each author, having an individual style, strives to use a variety of linguistic means in the work. Cultural and language contexts, connotations and cultural meanings, cultural frameworks, sociocultural indicators accepted in society become an obstacle to the translation of texts where any gender aspects or gender issues are touched upon.

The peculiarities of the language directly or indirectly caused by the culture of native speakers are of great interest in the study of the laws of translation activity. Similar features can be found at different levels of the linguistic structure, in the rules of verbal communication, in the ways of describing extra-linguistic reality, and their study is of particular interest for translation studies in view of the fact that translation activity means not only the interaction of two languages but also contact between two structures.

It is a common fact that any text is created to obtain a certain communicative effect. The factor of the adequacy of the aesthetic impact of the original and the translation is one of the most important criteria for evaluating literary translation. It is necessary to comprehend the author's intentions to achieve a high degree of aesthetic impact of literary translation on the recipient.

An equivalent and appropriate translation of the gender aspect of the work assumes that a text created in the target language has the same gender characteristics as the original text and is perceived by the recipients of the target language in the same way as by the recipients of the original language. The gender factor in literary translation can act as a structure-forming element of the original and the translated text, and influence the embodiment of artistic images and storylines.

Unfortunately, translators do not pay due attention to the role of gender in the literary context. This is especially true for works written for children. Russian translators of children's literature often do not think about what gender a character belongs to and literally translate his or her name into Russian attributing gender according to the grammatical gender of the Russian word. A translator of literature intended for an adult reader can still pay attention to the gender characteristics of the characters and make an effort to preserve them in translation.

We selected O. Wilde's fairy tale "The Happy Prince" and two of its translations into Russian made by P.V. Sergeev, G.A. Nuzhdin and K.I. Chukovsky as the research material. In this fairy tale gender specificity is an important component of its artistic structure and determines the plot lines – the relationship of a man with a woman and a man with a man.

O. Wilde's fairy tale "The Happy Prince" was published in 1888. It is believed that O. Wilde wrote fairy tales for his sons, as he himself mentioned that a father's duty is to compose fairy tales for his children. However, the author himself did not agree with this interpretation and called them "short stories" or "sketches in prose" for "children from 18 to 80" and recommended them to adults who "have not lost the gift of joy and amazement".

When studying the speech behavior of characters, gender plays an important role along with such parameters as culture, nationality, social status and age. Gender relations are recorded in the language as culturally determined stereotypes and affect the speech behavior of characters.

It is well known that in English all nouns that do not indicate the gender of human beings formally belong to the neuter gender, and the absence of flections opens up great spaces for translators to attribute gender properties to characters.

There are three main characters in the fairy tale "The Happy Prince": *the Happy Prince*, *Swallow* and *Reed*. The translation of the name *the Happy Prince* («Счастливый принц») into Russian is not difficult; the male seme is preserved in translation. However, difficulties arise with the names of two other characters. For O. Wilde, *Swallow* is a male character, and *Reed* is a female character, as indicated by the masculine (*he, his*) and feminine (*her*) pronouns:

*One night there flew over the city a little Swallow. His friends had gone away to Egypt six weeks before, but he had stayed behind, for he was in love with the most beautiful Reed. He had met her early in the spring as he was flying down the river after a big yellow moth, and had been so attracted by her slender waist that he had stopped to talk to her* [4].

P.V. Sergeev and G.A. Nuzhdin were able to achieve gender-correct perception of these characters by choosing the translations «Скворец» for *Swallow* (modulation) and «Тростинка» for *Reed* (transformation) [2].

K.I. Chukovsky literally translates the names of the characters changing their gender, so *Swallow* as «Ласточка» becomes a female character and *Reed* as «Тростник» – a male character [3].

The gender-related content of the characters expressed by their names should not go unnoticed. There are various associations and implications based on the gender aspect in any language. The translator must be able to recognize these associations in order to make an adequate translation. Gender shifts can distort the meaning of the text.

*Reed's* character indicates the presence of feminine traits. When describing this character, the author uses the adjective *beautiful* which characterizes the appearance of women and emphasizes the slimness of the character's figure: “*her slender waist*”. Also, this character reflects a gender stereotype of female coquetry:

*After they had gone he felt lonely, and began to tire of his lady-love.*

“*She has no conversation,*” he said, “*and I am afraid that she is a coquette, for she is always flirting with the wind.*” [4].

P.V. Sergeev and G.A. Nuzhdin use literal translation «возлюбленная» that contains a feminine characteristic [3]. Male and female characters in their translation do not contradict the gender characteristics attributed to them.

K.I. Chukovsky ascribes coquetry to a male character thereby distorting the gender stereotype [2].

So, the use of the technique of loan translation of proper names by K.I. Chukovsky led to gender shifts and distortion of gender stereotypes, as a result of which the author's intention and the artistic structure of the fairy tale were disrupted.

The analysis of the specifics of the translation of the fairy tale “The Happy Prince” showed that the difficulty of transmitting the gender aspect lies in the fact that the linguistic units of the literary text have simultaneous actualization of several meanings. Therefore, it is important for the translator to recognize and correctly convey gender-oriented associations which can be a significant component of the artistic style of the original.

### References

1. Денисова И.В. Особенности передачи гендерного аспекта в переводе художественного произведения: автореф. дис. ... канд. филол. наук. – Челябинск, 2011. – 20 с.
2. Уайльд О. Счастливый принц: пер. с англ. П.В. Сергеев, Г.А. Нуждин. – М.: Росмэн, 2014. – 64 с.

3. Уайльд О. Счастливый принц: пер. с англ. К.И. Чуковский. – М.: Мартин, 2019. – 192 с.

4. Wilde O. The Happy Prince and Other Tales. – М.: Rugram, 2017. – 56 p.

**Faizullina R.A.**

Master of Arts (M.A.), assistant, Institute of International Relations,  
Kazan Federal University, Russia

**INTERFERENCE WITH HUMAN NATURE  
IN A *CLOCKWORK ORANGE* BY A. BURGESS**

In the novel *A Clockwork Orange* (1962) the English writer A. Burgess raises the topic of the impact on human nature for social purposes. In the novel the writer also talks about bioethical problems: the problem of informed voluntary consent of the patient, respect of autonomy, anti-psychiatry, as well as the problem of freedom of choice and interference with human nature. The novel focuses on political satire and social criticism, depicting a futuristic hypothetical society in which radical manipulations are used to “fix” criminals. Burgess discusses the theories of Pelagianism, which suggest that a person, a criminal by nature, can be improved with the help of science.

The main character of the novel, Alex, becomes a victim of an experiment on medical correction and finds himself deprived of his own human freedom. The well-intentioned purpose of this experiment is to prevent criminals from committing acts of violence. The experiment turns Alex from an arrogant and self-confident young man into a weak-willed creature, causing the reader both complete disgust and sincere sympathy. Alex’s life is divided into before and after. *A Clockwork Orange* shows a terrifying scenario, depicting how the government benefits from a person only, if necessary, by conducting medical experiments. Alex’s dehumanization has been brought to such an extent that it completely depersonalizes the character and completely deprives him of free will: his release from prison is only a formality, since Alex is no longer able to make his own decisions. In this novel Burgess portrays the dark, violent side of youth subcultures: at the beginning of the novel, Alex talks about violence and crime with admiration, he has no compassion for his victims, but only pleasure.

Despite the fact that Alex is an antihero, Burgess shows by his example “how dangerous and unacceptable is violence against the human nature” [2, p. 67]. The writer shows the confrontation between a negative personality and a “respectable” society, revealing in the third part of the novel the monstrous essence of the same society: at the beginning of the novel Alex is cruel to people, and at the end of the novel these same people respond to him with the same cruelty. In the finale of the novel, the main character comes to the conclusion that there should be reached a compromise. Alex is a victim of a dubious society: the state allows the distribution of drinks with hallucinogens, which allows the state to control the masses and leads to violence. It can be argued that Alex and his friends are conditioned by their culturally acquired tastes and desires. In addition, Burgess highlights the influence of the media and their stories of violence and strikes. Thus, Alex’s cruelty is a protest against the limitations of society – this idea becomes especially important in the third part of the novel, when the character himself suffers from cruelty from his victims and former gang mates. The main character Alex, convicted of murder, is offered early release if he is subjected to a fictional “The Ludovico Technique” – an experiment to treat a person from violence. The hero is injected with a certain drug and forced to watch scenes of violence to classical music. Alex himself believes that he was able to deceive the authorities, and soon he will be released after a couple of “vitamin” injections and watching several films. Nevertheless, he becomes more and more sluggish and painful, and injections turn out to be a form of therapy for aversion to violence. The next point of state control is the medical manipulation of Alex in order to subordinate his personality, Burgess shows that the state, instead of eliminating the causes that push the hero to violence and strengthen his morality, turns him into an automaton that artificially fits into the framework of a socially acceptable good. Burgess emphasizes that Alex’s “voluntary” consent to treatment was manipulation on the part of the state, since the free choice of the hero was only a formality: Alex signed the form without understanding the details: Burgess raises the question of informed voluntary consent, a doctrine in medical ethics. This concept, which only originated in the late 1950s, has since become an urgent problem in psychiatry. An important role in the context of the novel is also played by the theme of anti-psychiatry, an international movement that originated in the 1960s and aimed at exposing psychiatry as a mass form of violence. Psychiatry was undergoing dramatic changes: hospitals were reformed, a number of highly effective physical methods of treatment were introduced back in the 1930s – insulin coma,

chemical convulsions and electroconvulsive therapy, which by 1950 had become widely used. E. Burgess draws an analogy with these methods using the fictional “The Ludovico Technique” in the novel. The title of the novel reflects the metaphor of interference in human nature – in Cockney, the dialect of London’s lower classes, “orange” means “a person”, and “a clockwork orange” means “a crazy person” or “a puppet”. Such a paradoxical concept of social suppression is one of the main characteristics of dystopian works, since the technique presented in the novel symbolizes the negative possibilities of state control.

With the motive of using “The Ludovico Technique”, the writer raises the problem of interference in human nature and the problem of free choice: the “The Ludovico Technique” has a side effect – after injections, when Alex intends to commit a violent act, he is sick and the hero discovers that he cannot carry it out. The writer reduces a person's free will to the level of a conditioned reflex. Burgess shows that “The Ludovico Technique” is an invasive intervention in human nature and undermines Alex’s freedom of choice. Due to the Christian cyclical structure of the narrative (sin, punishment and redemption of the protagonist), the writer emphasizes the idea of the need for free choice of each person, whether it is good or evil.

According to Burgess, the state is a structure hostile to a person’s personality. The main conflict of the writer’s works is the conflict between the main character and the government. Alex is fighting against the government, which is personified by the mass of employees and society, the government is everywhere and in everyone. The problem of the relationship between the individual and the government is represented by the comic figure of the Minister of the Interior: in the media, he talks about the achievements against crime, keeping silent, however, at what price it gets. This combination of political tyranny and brutal suppression creates a special gloomy atmosphere, which was especially strong during the Cold War era, when *A Clockwork Orange* was published. With his novel A. Burgess warns against the risks of behaviorist and mechanistic philosophy, which can lead to the creation of a technological totalitarian world and a dystopian society deprived of responsibility for its own actions. In *A Clockwork Orange*, the author captures the problem of the influence of medical manipulations on a person.

#### *References*

1. Burgess A. *A Clockwork Orange*. Antologiya: My Favorite Fiction, 2016.

2. Khabibullina L.F. *Antiutopiya v tvorchestve Entoni Berdzhessa* [Dystopia in the work of Anthony Burgess] / L.F. Khabibullina. – Dissertaciya... kandidata filologicheskikh nauk: 10.01.05. – Kazan', 1993 (in Russian).

## **SECTION IX. Educational Sciences**

### **Sergeyeva L.D.**

Master, senior lectures, Almaty University of Power Engineering and Telecommunications named after Gumarbek Daukeyev (AUPET)

### **INCLUSIVE EDUCATION: HISTORY OF DEVELOPMENT, STATE AND PROSPECTS IN KAZAKHSTAN**

The origin and formation of inclusive education began in the era of the Ancient World. With the emergence of public education, the position on the possibility of teaching people with physical and (or) psychological disabilities was built on the basis of the works of ancient philosophers, doctors, lawyers, historians and early teachers. In the IV-VI centuries AD the attitude of the state and citizens towards persons with pronounced defects of mental and physical development varied from aggressive and intolerant to their acceptance by society and the first attempts at education.

Academician of the Russian Academy of Education N.N. Malofeev reports the following about the attitude towards people with disabilities in antiquity: “At present it is impossible to indicate the true number of people with severe mental and physical disabilities in the ancient world, but it can be assumed that there were none less, and possibly much more than today. Nevertheless, despite their relative numbers, these people for millennia were perceived by society as an inferior minority” [1, p 15].

The three main centers of civilization in the ancient world - Egypt, Ancient Greece and Ancient Rome - at first did not accept people with disabilities as full members of society. They called for their expulsion and extermination. However, with the development of social relations and the emergence of pedagogy, these attitudes have changed - a

transition was made from non-recognition to coexistence and recognition of persons with psychophysical disabilities.

The outstanding Russian psychologist L. S. Vygotsky describes the change in public opinion during that period towards blind people: "... the first era covers antiquity, the Middle Ages and a significant part of modern history. Until now, vestiges of this era are visible in popular views of the blind, in legends, fairy tales, and proverbs. In blindness, they saw, first of all, a huge misfortune, which was treated with superstitious fear and respect. Along with the attitude to the blind as a helpless, defenseless and abandoned creature, there is a general conviction that the blind develops the highest mystical powers of the soul, that they have access to spiritual knowledge and vision instead of the lost physical vision. Until now, many still talk about the aspiration of the blind to spiritual light: apparently, this contains a grain of truth, albeit distorted by fear and misunderstanding of the religiously thinking mind. The keepers of folk wisdom, singers, diviners of the future, but legend, were often blind. Homer was blind. They say about Democritus that he blinded himself in order to completely surrender to philosophy" [2].

In the 6th-10th centuries, the state and science were largely guided by the conclusions and works of ancient philosophers in relation to persons with disabilities and disabilities. However, the growing strength of religion contributed to the humanization of the mores of society and the manifestation of compassion for disadvantaged people. Theologians and philosophers of the Middle Ages recognized the possibility of training and charity for persons with disabilities, but, as in ancient times, the deaf would be excommunicated from education, the opportunity to work and live with dignity. Members of this category could not heed the word of God. As a result, they were expelled from the church and did not have the right to participate in prayer and communion [1].

One of the founders of humane pedagogy, the author of *The Great Didactics*, philosopher and educator Jan Amos Komensky (1592-1670), in his writings put forward an important thesis on the upbringing and education of children with developmental disabilities: retarded, to whom it is impossible to sufficiently impart knowledge due to a physical handicap? - I answer: no one can be excluded from human education, except for a person" [3].

The teachers of the New Age researched the barriers to education of persons with disabilities and disabilities and looked for ways to overcome them. In particular, coeducation with other students was introduced. The training was conducted mostly in the native language

instead of Latin, the psychology of people with various vices, their skills and perception of the world were studied.

Currently, it is important to continue researching barriers to the development of inclusive education, based on the writings of philosophers and educators of the Enlightenment. European society has gone through many stages of attitudes towards people with disabilities: “from hatred and aggression to a tolerant and compassionate attitude towards them, and then to the ideas of equality and integration” [4].

Today, inclusive education is a policy that recognizes and embraces the diversity of students at all levels of education: preschool, primary, secondary, tertiary and lifelong learning.

Inclusive education in Kazakhstan is a state policy. It ensures the continuous improvement of general education, which should be available to all children without exception (including those with special educational needs) and guaranteeing them special conditions and the necessary social, psychological and pedagogical support. At the same time, there remains a disparity in access to quality educational services for various reasons: place of residence (city / village), economic status of the family, health status, etc. Representation of education should aim at equal opportunity, considering and catering to the different needs of students.

Inclusive education in relation to persons with disabilities has become one of the priorities of the State Program for the Development of Education for 2011-2020 in relation to children with disabilities. Children with developmental disabilities from birth to 18 years old make up 2.8% of the total child population in Kazakhstan.

Children with special educational needs are children with disabilities, HIV, AIDS-infected, with problems of social adaptation in society, orphans, with deviant behavior, children from disadvantaged families, refugees, kandas, national minorities, etc.

Kazakhstan is adopting a policy focusing on the increased role of human capital, ensuring equal educational opportunities and achieving high educational standards.

Kostanay Regional University named after A. Baitursynov was one of the first in the republic to create the Center for Inclusive Education in 2001. For 19 years of work of the Center, and the public association “Accessible Education for Disabled Students” created on its basis, all universities and colleges of not only Kostanay, but also Akmola regions have joined the project.

More than 400 students with disabilities have received higher or secondary specialized vocational education. Among the graduates of the university there are master's degrees, candidates of sciences, PhD, Paralympic champions of Europe and the world. Today, 20 students study at the university in 16 educational programs. Of these, 9 students study on a grant and 1 student studies on a rector's grant.

All conditions for teaching children with disabilities have been created at the Almaty University of Power Engineering and Telecommunications named after Gumarbek Daukeyev (AUPET). If necessary, such students can study remotely (distant learning). AUPET provides all kids with the latest laptops. Also, such students, if physical capabilities allow, attend lectures, seminars and laboratory classes along with all students. The tradition of our university is a person-centered approach. At our university, there is never a division of students on one or another basis. All faculty treat all students equally warmly, teach them in good faith. Our graduates are the best engineers in Kazakhstan, who love their country and respect each other. We are proud of our graduates!

Thus, the goal of all strategies for the social adaptation of students with disabilities is to create conditions for their education on an equal basis with other students. Such conditions will have a beneficial effect on the educational process in general and contribute to the realization of the right to higher education, which is a powerful means of social protection of a person with disabilities, increasing his social status, professional and personal growth and civic engagement.

### *References*

1. Malofeev II. II. Western Europe: the evolution of relations between society and the state. M.: Exam, 2003.p. 15.
2. Vygotsky LS Fundamentals of defectology // Collected works in b. v. V. 5 / edited by T. A. Vlasova. M.: Pedagogy, 1983.
3. Kornetov G.B. History of pedagogy. P. 90-92.
4. Ekushevskaya A.S/ Historical evolution of society's attitude to a person with disabilities // Philosophical sciences and cultural studies. 2014. No. 5. pp. 308-311.
5. <https://bilimdinews.kz/?p=119299>
6. <https://cu.edu.kz/caspian-university/>

## SECTION X. Social sciences

**Chirkin Dmitriy Yuryevich**

3-d year student, the Department of Political Science,  
Ural Federal University named after the first President  
of Russia B. N. Yeltsin, Yekaterinburg, Russia

### **THE ANALYSIS OF THE IMPLEMENTATION OF DIGITAL TECHNOLOGIES IN THE CONTEXT OF THEIR EFFECT ON THE SOCIETY**

**Abstract.** The article deals with the concept of digital economy and its development prospects in Russia. The reasons of the rise of this branch are analyzed, too. The author also studies possible areas, where information technology can be used. Moreover, the article researches possible social conflicts, caused by the digital technologies.

**Key words:** digital economy; coronavirus; totalitarianizm; business; digitalization

The XXI century may become a new spiral of the evolution for the humanity, since the digitalization processes that have already been initiated may change the world beyond recognition. The expansion and wide use of information technology in the social processes and in the ordinary people's lives can have such an impact on the community that may be compared to the invention of writing, first printing presses, and the discovery of electricity. The implementation of information technologies in all the levels of human life has been strongly accelerated by the current COVID-19 pandemic. It is more likely that after the pandemic the humanity will face global digital transformation. Nevertheless, this process, as anything in the world, will have its advantages and disadvantages. Therefore, this article will be devoted to the analysis of the strong sides of the named process and to the threats it may constitute to the social development.

First of all, we shall determine the word "digitalization". Digitalization is the common infiltration of information technologies into the human and social life, while the technologies are based on the collection and analysis of the "big data" and artificial intelligence. Digital technologies are the technologies used for the collection, storage, processing, search, transfer, and delivery of data in electronic form, which are based on software and hardware tools and systems; in-demand in all the economic sectors; making new markets; and affecting business

processes. [1] The rise in the digital transformation of the society is due to certain preconditions for it: the number of Internet users in Russia amounts to 118 million [2]; 63% of companies use electronic data interchange solutions; the average Internet speed has reached 12.2 Mb/s; there are 160 cell phones per 100 people, etc. The preconditions for digitalization at the state level in Russia may include: the economy globalization, erasing the boundaries between national economies; the functioning of current and building of new economic zones and the Common Economic Area; the dynamic development of Internet technologies; the enhancement of the CPU performance; the widespread use of mobile devices; deep integration of social networks into the human life; the appearance of digital startups that traditional and often conservative companies have to compete against; the understanding of the need for the digital transformation acting as the condition for the survival in the world economy cyberspace. [3] In other words, Russia has everything necessary for the digital transformation which has been developing in several fields.

Digital economy is the business activity, where the main production factor is presented by the data in digital format. Moreover, in comparison with the traditional forms of economic activities the processing of the large digital data volumes and using the data analysis results enhance significantly the efficiency of various production types, technologies, equipment, storage, sale, and delivery of goods and services. [4] Currently, it is safe to say that Russia's economy has been digitalizing rapidly. Digital technologies have been put into use, such as cloud storage, ERP systems, CRM programs, supplying workers and machines with sensors for collecting information, and robotic automation of production. Business strategies "something as a service" (as-a-service), when a thing is rented, not bought, have gone mainstream. For instance, leasing servers for a company. The key resource of value creation in this case is the high-speed processing of big data, since transactions happen in real time, and often simultaneously. The big data analysis methods and the artificial intelligence help to find new resources of value creation based on the study of digital images of consumers and the patterns of their economic behavior. The clients' data become the main asset of digital companies, and the access to the big data increases the market value assessment. [1]

Digitalization of the buying activity. More and more people order products via the Internet. The online trade ratio in 2020 in Russia accounted for 10.9% of the whole trade turnover [5]. People also use mobile apps for shopping (the applications of the ecosystems of Tinkoff

Bank, Sberbank, Yandex, and Mail.ru). As well as in the digital economy, the user data analysis is applied here for providing perfect services. Moreover, the “sharing” concept (temporary sharing) and subscriptions (Okko, Netflix) are in common use.

Digital government. In this case digitalization is used for decreasing the bureaucratization of the governmental bodies (such services as Gosuslugi or My Documents), for keeping the citizens under control, and for ensuring security (the Moscow experiment). For example, tracking the coronavirus positive people via facial recognition cameras of the “Smart City” system and the control over the citizens using QR codes and a special application. The switch to the automatic formation of reports will stimulate the significant reduction of the administrative costs, the enhancement of data security and the security of the data-based decisions, and the decrease of the corruption component. Having a “digital twin” in the government platform allows a person to use the digital services. The transition of interactions between companies and citizens to the digital field helps to enhance their transparency. The governments strive to regulate the processes in the media area and cyberspace, to approve and implement new mechanisms of control over citizens for the enforcement of law, and to develop approaches for the regulation of new technologies and resolution of ethical issues related to the technologies. Generation of the standards of the users’ behavior on the Internet (including the aspect of digital identification) and implementation of the elements of digital censorship become possible. [1]

Transformation of living conditions. Smart home, smart watch. Digital devices are more and more getting into the human life. Digital services and the modern approach to the development of *smart* spaces switch the living conditions of people to more comfortable ones. A *smart space* is a physical or digital environment, where people and technological systems openly interact in the connected and coordinated intelligent ecosystems. Among such examples there are *smart* cities, *smart* houses, digital workspaces and factories. Nowadays, the world enters the age of the accelerated provision of reliable *smart* spaces, when technologies become an integral part of the human everyday life in any of his/her role: a worker, a client, a group member or a citizen. The development of digital spaces launches a challenge against the traditional territorial principles, geographically defined communities and sovereignty. Digitalization of certain types of activities helps to put into action system projects, such as *smart home* (the solutions on the creation of intelligent services of security and resource use optimization

by the households) and *smart city* (systems of technical and technological solutions on the city space development and the city infrastructure management, including the transport system, energy supply, water supply networks, waste management system, and other community services). [1]

Furthermore, one cannot forget about the coronavirus factor that forced the digital transformation all over the world. The switchover of companies, businesses and the education system to the remote format made the world consider digitalization as the inevitable path of development.

However, as any other phenomenon, digitalization has its benefits and drawbacks. First of all, it should be noted that digital transformation has made people's life more fast-moving and interrelated, and contributed to globalization. Due to the digital technologies, everything that was predicted by the science-fiction writers in the past has become a reality. People have gained access to all the information that has ever been produced by the world civilizations; they also have got an opportunity to communicate with each other over any distances, etc. But all this presents the overall technological progress, which is, particularly, owed to the Internet technology. Now, let us give consideration to the benefits of the digitalization itself.

1. The change of the approach to trade and business. In the early days, the industrial society was focused at the mass standardized production of goods and services. It might be explained by the difficulty in considering the opinion of every final consumer and by the small variety of goods and services. Now, it is time when client-oriented business strategies go into action. Due to the collected data (geolocation, reading emails, Internet traffic analysis, etc.), companies can offer the client the customer-focused product. New digital technologies extend the business potential in the optimization of numeral processes and improve the quality of decision-making. Thus, the Internet of things and cloud computing optimize the collection and storage of data, and the technologies and methods of computer-assisted learning together with the artificial intelligence allow to perform deep processing of the data and build the behavior algorithms and predictive models. In retail trade the new type of business models is connected with the transformation of the e-commerce to the a-commerce (automated commerce), within which a seller builds the algorithms describing the client's consumption pattern and, afterwards, automatically delivers the product to the client based on the predicted need. [1] On the other hand, the client can consider the variety of goods and services in the market and choose the

cheapest product or service. Moreover, due to the applications with a great number of functions (the so-called *superapps*, such as WeChat or SberPrime) the users receive the opportunity to save time since the applications cover all spheres of human life.

2. Reduction of production costs. The robotic automation of production and the decrease of the number of agents between the seller and the buyer (by launching applications) lowered the final product cost. Most of the same-type operations are performed by robots.

3. Human life has become more comfortable than before. The smart home facilities and the automation of numerous processes due to algorithms and data collection will allow a person to have more spare time and use it for creative and intellectual activities.

Nevertheless, along with the obvious advantages, that can become a catharsis for the whole human civilization in the long run, digitalization also challenges the world, which can later turn into a disaster. Some of the issues consequently present the flip side of the digitalization benefits that can be resolved later on, while other drawbacks of digitalization are more terrifying.

1. Digital inequality. Job cuts and substitution of workers by algorithms and robots can cause mass unemployment, since not all the people can acquire competences for working in digital economy. Some of the workers left can complete a retraining program, and the major part will have to live on the unemployment benefits or some form of the universal basic income. It may lead to the growth of social tension and crime, since people will have a lot of spare time, and the society will be divided into those who have the necessary digital competences and those who do not.

2. Threat of new monopolies. The largest digital companies (Google, Amazon, Facebook, Apple) always collect data on the users for the purpose of improving their products or offering exclusive commercials or content. Despite the license agreement notifying about the data collection, the users cannot ensure the security of their data hosted by the companies anyhow. In addition, all these companies are registered in the USA and are subject to the laws of the country, which in its turn means a security threat to the countries, the citizens of which use the services of these companies. Also, large digital companies pursue their own policy in terms of the users' data. They stipulate the rules for the product use and manage the users' data at their own discretion. The users in their turn cannot influence the companies anyhow, despite addressing the feedback department, since the companies have broad

powers of legal autonomy. Moreover, it is quite difficult to condemn the companies for monopolization of the digital market.

3. Possibility of digital totalitarianism. Digital technologies that deal with the big data collection and analysis can be used for strengthening control over the citizens. On the pretext of provision of safety and health care (as in Moscow) the people's life can be brought under the total control literally. This may lead to the change of human consciousness through the lens of Foucault's Panopticon. Due to potentially possible government surveillance of every citizen, the last one starts feeling guilt or anxiety. China has already enforced the concept of *social credit*, lacking which a citizen loses the opportunity to buy airline or train tickets, and certain services will be more expensive for him. *The social credit* is affected by the citizen's behavior on the Internet where he is followed by the intelligence and security officers and in the real life where he is followed by hundreds of surveillance cameras. [6]

Conclusion: digital transformation will, undoubtedly, become one of the development paths of the human civilization. Modern problems (crime, terrorism, epidemics) require solutions involving big data that can be processed only by the artificial intelligence. Nevertheless, the successful development of digital transformation and the implementation of digitalization should be carried out with consideration to the possible threats and challenges posing by this path of development.

### References

1. Abdrakhmanova G.I., Vishnevsky K.O., Gokhberg L.M, and others. What is digital economy? *Trends, competences, measurement: paper for XX April international scientific conference on the questions of economy and society development, Moscow, April 9-12, 2019*. Scientific editor - Gokhberg L.M, National Research Institute *High School of Economics*, Moscow, High School of Economics Publishment, 2019, 82 p. (in Russian)
2. The Internet of 2020 in Russia and worldwide: statistics and trends. URL: <https://vc.ru/future/109699-internet-2020-v-rossii-i-mire-statistika-i-trendy>
3. Khalin V.G., Chernova G.V. Digitalization and its effect on the Russian economy and society: advantages, challenges, threats and risks, *Management consultancy*, 2018, No.10 (118). URL: <https://cyberleninka.ru/article/n/tsifrovizatsiya-i-ee-vliyanie-na-rossiyskuyu-ekonomiku-i-obschestvo-schestva-vyzovy-ugrozy-i-riski> (Date of reference: 2021)

4. The Russian Federation Government Executive Order of July 28, 2017 No. 1632-p *On the approval of the program “Digital economy in the Russian Federation”* [Electronic resource]. URL: [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_221756/2369d7266adb33244e178738f67f181600cac9f2/](http://www.consultant.ru/document/cons_doc_LAW_221756/2369d7266adb33244e178738f67f181600cac9f2/) (Date of reference: 20.09.2021)
5. In the Russian Federation the online trade has exceeded the 10% of the retail turnover for the first time. URL: <https://www.interfax.ru/business/725382>
6. Tomin L.V., Balayan A.A. Digital panopticon. How autocracies use the technological infrastructure? *The Eurasian integration: economics, law, politics*, 2019, No.3 (29). URL: <https://cyberleninka.ru/article/n/tsifrovoy-panoptikum-kak-avtokratii-ispolzuyut-tehnologicheskuyu-infrastrukturu> (Date of reference: 15.09.2021)



Lulu Press, Inc. 627 Davis Drive, Suite 300,  
Morrisville, NC, USA 27560  
2021