

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РФ  
БАШКИРСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

КАФЕДРА ИНОСТРАННЫХ ЯЗЫКОВ  
ЕСТЕСТВЕННЫХ ФАКУЛЬТЕТОВ

# **Иностранный язык в профессиональной коммуникации**

Материалы V Всероссийской научно-практической  
конференции студентов, магистрантов, аспирантов



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В сборнике представлены материалы V Всероссийской научно-практической конференции студентов, магистрантов и аспирантов. Основной задачей конференции является создание базы для эффективного использования иностранных языков – английского, немецкого и французского – в профессиональной и научной коммуникации. На секционных заседаниях обсуждался самый широкий круг проблем: от вопросов лингвокультурологии до естественных, точных и технических наук.

Сборник предназначен для молодых ученых, аспирантов и магистрантов, а также для студентов, заинтересованных в приобретении навыков осуществления иноязычной профессионально-научной коммуникации.

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**КУЛЬТУРА, ОБЫЧАИ И ТРАДИЦИИ СТРАН  
ИЗУЧАЕМОГО ЯЗЫКА**

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**Post-Punk in music and life  
(Пост-панк в музыке и в жизни)**

During 1976–77, in the midst of the original UK punk movement the notion of post-punk emerged. This is a rock music genre, which is a more experimental and arty form of punk. That form opens horizons and possibilities to create something new. Originally punk-rock positioned itself like a genre which meaning was the desire to play independently of the ability to do it. Main feature in the creative work of punk-rockers was wild energy and aggression guitar both in the music and in the lyrics. But at the same time post-punk has a slower and more monotonous rhythm with a predominance of bass and drums. The growing sense of alarm in melodies, out-of-body vocals, depressive and melancholic lyrics about life's meaning and death are characteristic features of post-punk.

Some of the brightest representatives of the genre were foreign bands such as Joy Division, Sex Pistols, Bauhaus, The Smiths, The Cure, Siouxsie and Banshees, DEVO, Sonic Youth, and others. The era of post-punk came to the USSR with delay of a few years. The most famous bands were Kino, Petlya Nesterova, Agata Kristi, Durnoe Vliyanie and Gragdanskaya Oborona, but most of soviet bands of that genre were forgotten and lost. For example, Elen (or Sputnik Vostok) is one of my favorite bands, one of its albums preserved in the Internet only like a list of songs' names.

Igor Mosin, drummer of Durnoe Vliyanie, said in R.I.P. magazine's interview: "Post-punk is a way of feeling and understanding of life. For example, we sit and talk here right now, it is punk. But when I come home and talk about it, it is post-punk." I understand this quote in a way that post-punk is something more passive but more meaningful than punk. Moreover this is a genre which founded its reflection in fashion, art and style of life. Eventually punk is the riot against the system, where everyone does what nobody had done before him. It has changed the whole culture.

During several decades the genre of post-punk has undergone considerable changes. In the early 2000s, a new group of bands appeared that played a stripped down and back-to-basics version of guitar rock. They were characterised as part of garage rock, new wave or post-punk revival. Their unity as a genre has been disputed because the bands came from across the globe with different influences and style.

Special interest among teenagers to that genre arouse after Butcher Billy, a Brazil artist, who published a series of posters known as Butcher Billy's Bizarre Love Triangle. He portrayed the famous singers of Post-Punk like heroes of his favorite kids' cartoons. Billy said that Ian Curtis or Johnny Rotten were as iconic to him as Superman or Batman.

At present I think that culture of post-punk is developing in Russia too. It is considered that Moscow and Rostov-on-Don are the centers of modern post-punk. Major amazing Russian bands which allow us to feel its atmosphere has come from these cities. I believe Post-Punk made a significant contribution to the world history of music.

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### **Peculiarities of Irish English** **(Особенности ирландского акцента)**

The first thing that is striking, grates on the ear is an open syllable pronunciation "i". Instead of [ai] they manage to speak [oi]. For example, five instead of [faiv] is pronounced like [foiv]. Similarly, [loit] = light, etc.

Closed "o" they pronounce like [o (u)] instead of [a]. For example, money instead of [mani] is pronounced like [mo (u) ni]. Closed "u" read as [u] or [o] instead of [a]. For example, much instead [matsh] pronounced like [motsh].

An Example of differences from other native speakers may in how the Irish pronounce the sound th [θ,ð]. They do not bother to manipulate the tongue and blow air between the teeth, they just change it to t (deaf sound) or d (ringing sound). So, the phrase: "So do you see the thirty trees over there? That's right!" sounds like "So do ya see the tirty trees over dere? Dat's right!"

Naturally, the Irish variant of English has its own lexical features. For example, instead of "saying" in what ever language, Irish "have" it. Instead of saying, "I speak Irish" Irish says "I have Irish". Or, instead of "to have just done" to indicate a just completed action in Ireland they say "to be after doing". Example: I'm after finding a euro on the road! = I've just found a euro on the road. Another interesting feature is that many Irish do not use words yes and no. Instead of this, they repeat the verb of the question. Can you swim? — I can! Do you like tomato juice? — I don't.

**Irish Proverbs.** The Irish are known for their acumen and sense of humor. Proof of this are the proverbs of the Emerald Isle.

- *What butter and whiskey will not cure, there is no cure for.*
- *Man is incomplete until he marries. After that, he is finished.*
- *A diplomat must always think twice before he says nothing.*
- *A change of work is as good as a rest.*

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### **Freier Fall** **(Свободное падение)**

Mathematik wird zu einem notwendigen Attribut der Rechtswissenschaften. Schauen wir uns die folgende Aufgabe an.

Heutzutage gibt es immer öfter Fälle des Suizides. Jugendliche, aber auch Erwachsene, wählen verschiedene Wege das Leben zu beenden – immer öfter durch den Sprung aus dem Fenster. Diese Art des Todes wählen nicht nur Selbstmörder, sondern auch Verbrecher. Deshalb stellt die grundlegende Aufgabe die Abschätzung der Höhe, aus dem der Fall passierte, und deren Ursache dar.

Der aktive Fall – das ist der Fall unter Beschleunigung des Körpers durch einen Stoß, Sprung, dem Abstoß von etwas oder einem Schlag. In Abhängigkeit stehen der Ort, an dem die Kraft ausgeführt wurde, die Wirkungskraft, die Körpermasse, die Geschwindigkeit, die der Körper erreichen kann, der Einfluss der Position des Körpers während des Fluges und die Drehung der Achse. Durch diese Einflussfaktoren befindet sich das Opfer in einer angemessenen Entfernung zum Gebäude.

Der passive Fall – das ist der Fall ohne vorherige Beschleunigung des Körpers. In Abhängigkeit vom Startpunkt bewegt sich der menschliche Körper in einer horizontalen Position, entlang der sagittalen Achse mit einem darauffolgenden flachen Aufprall oder mit einer aufrechten Position entlang einer vertikalen Achse mit dem Aufprall auf den Füßen, gefolgt von einem Schlag auf die Oberfläche, der dem Fall folgt.

Zweifelloso ist die grundlegende Aufgabe des Ermittlungsbeamten die Feststellung der Höhe.

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### **The Oldest Copy of Mona Lisa** **(Самая древняя копия Моны Лизы)**

The Mona Lisa is a masterpiece of western art and has been copied by many artists in the past. But one of replicas has now turned out to be something special. Experts have discovered that one of the copies, at Madrid's famous Prado Museum, was painted by a scholar of Leonardo da Vinci at the same time he was painting the original.

For a long time the Prado painting was thought to be one of the many copies that date back to the 16th and 17th centuries. But modern x-ray and infrared technology shows that changes in the two paintings were made at exactly the same time. Conservators at the museum claim that the two paintings were painted in the same studio not far away from each other.

Still, the Renaissance original and the copy look very different from each other. The copy is much brighter while Leonardo da Vinci's original, hanging in Paris's Louvre has become darker over the centuries. The Louvre painting is dull with cracks in the paint. The woman also seems to be older than in the Prado copy. Art educators say that the new discovery may show some new insight into the master's painting technique.

If you ask any person to name the picture, painted by Leonardo da Vinci, he always remembers about the "Mona Lisa". This picture is truly inexhaustible source of interesting facts, some of which we have today and get acquainted.

In fact, the picture is called not the "Mona Lisa" but the "Portrait of Mrs. Lisa del Giocondo."

Mona –is an abbreviation of the Italian "ma donna", which means "my lady."

It is believed that the painting depicts Lisa Gherardini, the wife of Francesco delGiocondo - Florentine silk merchant. However, there are also more exotic versions. On one of them is that "Mona Lisa" – is Katherine - Leonardo's mother, on the other - it is a self-portrait of the artist in the female incarnation, and on the third – it is a pupil of Leonardo, dressed in women's clothes.

Paul Ekman (the prototype of Dr. Lightman from the TV series "Lie to Me") explains the success of the "Mona Lisa" by the fact that Leonardo da Vinci caught a flirting smile - microexpressions, which can be seen on her face literally a split second.

In the entire history of its location in the Louvre painting have never seriously suffered at the hands of vandals, although many attempts were made using acid, stone, clay cup and spray paint.

Now the situation is within the specific defense system, which includes a bullet-proof glass, and complex signaling unit for creating a microclimate which is favorable to save the canvas. The cost of this system is \$ 7 million.

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**English as an International Language - no problem, OK?**  
**(Английский как международный язык - не проблема, ОК?)**

"You say to-may-to, I say to-mah-to"

The British and Americans like to talk about the differences between British and American English. There are a few small differences in the grammar and there are a few words that are different on either side of the Atlantic, but the big difference is the accent. Some British films have subtitles in America because people can't understand what the actors are saying, and some American TV series (The Sopranos, for example) are difficult for the British to understand.

However, if you listen to Standard English (the language that TV newsreaders use, for example) in Britain or the US, there are no problems of understanding at all. The problems are with the different kinds of American and British English. These different dialects and accents depend on people's social class and the geographical area where they live. It is possible, for example, that a middle-class speaker from the south of England will find it difficult to understand a working-class speaker from the north. In the same way, a wealthy Californian may not understand a working-class New Yorker. All of these people have accents, but the middle-class accents are usually closer to Standard English.

With so many different Englishes, it is difficult for learners of the language. What sort of English should they learn? Is American English better than British English, or the other way round? The answer depends on their reasons for learning English. If they are learning English for their work, the choice will probably be easy. But for many students, it doesn't matter. What matter is that they understand and are understood.

The world is changing and English is no longer the property of the British, Americans or Australians. Most English that you hear and see around the world is spoken and written by non-native speakers - between, for example, a Greek and a German, or between a Russian and an Italian. English is the main language of business, academic conferences and tourism, of popular music, home computers and video games. English has become the Latin of the modern world.

Because of this, the question of American or British English is becoming less and less important. More and more people now talk about English as an International Language - a language that is not American or British. It has hundreds of different accents, but if people can understand what you are saying, no problem. OK?

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### **Trois degrés de l'enseignement gallo-romain (Три ступени образования в римской Галлии)**

Suivant le modèle hellénistique, l'enseignement romain ou gallo-romain est, dans l'ensemble, organisé collectivement au sein d'une école.

Trois catégories d'établissements partagent les enfants et les adolescents issus, pour la plupart, de milieux privilégiés.

**1. Les écoles primaires.** - Tenue par le primus magister l'école primaire, installée dans une sorte de boutique, accueille des garçons et des filles de 7 à 11-12 ans. Les élèves s'y rendent accompagnés d'un esclave, le paedagogus, qui remplit parfois les fonctions de répétiteur et d'éducateur moral. Les heures de travail, groupées dans la matinée, sont consacrées à la lecture, à l'écriture, au calcul et à la récitation.

Comme chez les Grecs, l'enseignement revet une forme passive et coercitive.

**2. Les écoles secondaires.** - L'enseignement secondaire est dispensé par le grammaticus à une élite de garçons et de filles, âgés de 11-12 à 15 ans.

Cet enseignement, à dominante littéraire et érudite, comporte, d'une part, l'étude de la grammaire, d'autre part, l'explication des auteurs classiques.

La formation grammaticale réside essentiellement dans l'analyse abstraite des éléments du langage et des catégories de l'entendement. Des préoccupations utilitaires se font parfois jour lorsqu'il s'agit, par exemple, de mettre les élèves en garde contre les défauts à éviter dans la pratique de la langue.

L'étude des auteurs classiques donne lieu à la lecture expressive puis à la récitation par coeur des textes préalablement expliqués et commentés quant au fond et à la forme. Le commentaire met à contribution une large information livresque où entrent en jeu la mythologie, l'histoire, la géographie et les sciences. Les programmes s'organisent autour de quelques auteurs prestigieux: Térence et Virgile pour la poésie, Salluste pour l'histoire et Cicéron pour l'art oratoire.

**3. Les écoles supérieures.** - De 15 à 20 ans, le jeune Romain apprend, sous la direction du rhéteur, à maîtriser l'art oratoire. L'élève est entraîné progressivement à composer des discours sur des sujets choisis par le maître et se rapportant à des thèmes plus ou moins scabreux: actes de piraterie, enlèvements, viols.

Pour célèbre rhéteur Quintilien (35-95), l'apprentissage de l'art oratoire, préparé par une large culture littéraire, philosophique et juridique, doit conduire à la formation de conférenciers désintéressés. Pour d'autres, au contraire, il s'agit de fournir à l'Empire les avocats et les cadres administratifs dont il a le plus grand besoin. L'exercice de ces fonctions exige qu'un enseignement du droit, assuré par le magister juris, s'ajoute à l'acquisition des règles de la rhétorique.

Avant d'atteindre, au début de l'Empire, une forme relativement stable, le système éducatif qu'on vient d'évoquer est passé par différentes étapes, répondant chacune à un stade du développement de la culture romaine.



### **The History of British Car Industry (История Британского Автопрома)**

In Britain there were always more car manufactures than in France or Germany, and for that matter it ceded to America. Comparatively recently a vast variety of brands was observed before the monopolization of car industry.

The brands are *Hillman, Humber, Morris, Wolseley, Vauxhall, Alvis, Armstrong-Siddeley, Lagonda, Lanchester, Riley, Sunbeam, Singer, Triumph, Standard* and etc.

But there is another one that is recognized by everybody. It is **Rolls-Royce** (*produced in 1904*) – the offspring of the aristocrat Charles **Rolls** and the engineer Henry **Royce**.

The reputation of this brand has brought by the famous model “*Silver Ghost*” which is got its name for the silver color of exhibition model and the quiet work of its engine.

Since then, traditionally the majority of *Rolls-Royce* models have its familiar ghostly name and as a rule something connected with “silver”. This list excellently proves that fact:

*Rolls-Royce Phantom(1927), Rolls-Royce Silver Wraith(1947), Rolls-Royce Silver Cloud(1957), Rolls-Royce Silver Spur(1996), Rolls-Royce Wraith(1939), Rolls-Royce Silver Dawn(1951), Rolls-Royce Silver Shadow(1972), Rolls-Royce Silver Seraph(1998)* and etc.

As it is said in one of their advertisement: “The only thing you’ll hear in the cabin of the Rolls-Royce is the ticking of the clock”.

But not only brilliant work of the engine made the cars famous, but also their reliability. It is proven that every of 10 constructed Rolls-Royces ever, 7 are still working.

The most exclusive car of the Rolls-Royce was Rolls-Royce Phantom IV. It was being released from 1950 till 1956, and only in limited edition. There were only 18 of such.

The 7-th series of the Phantom was produced in 2003 under the cover of the BMW. Nowadays this car is included in the Top 10 ratings of the most expensive cars in the world, and the trigger price is \$320,000 and can reach way over one million.

The four-door Rolls-Royce Ghost is the most high-powered car ever produced by Rolls-Royce Motor Cars. The engine is about 563 horsepower. The car is designed on the BMW platform.

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### **National Aboriginal Day in Canada** **(Национальный день аборигенов в Канаде)**

Aborigines - the natives of the country, which preserve the culture and traditions of its people. In each country, the number of Aboriginal people decreases every year against the backdrop of the total population in the state. Aborigines live in Canada and make only 2% of the total population. But, despite their small numbers, they do a lot for the development and prosperity of Canada.

On June 21 the Day of the aboriginal is celebrated in Canada. It is celebrated throughout the country, but the most grandiose celebrations take place in the north-western Canada.

**The Story.** In 1982, the first time it was suggested to honor the indigenous people of Canada, but only in 1995 the Royal Commission on Aboriginal Affairs officially adopted the holiday. In 1996 Romeo Lemblan the president of Canada declared that the Day of the indigenous population was to be celebrated on June 21. Under the concept of Aboriginal (indigenous people) were Canadian Indians, Inuit and Métis.

Why was June 21 chosen? Everyone knows that this day is the longest sunny day and the shortest night. Canadians living in the Arctic Circle, look forward to this day and treat it with respect. Besides, this holiday gives the chance to Canadians not to forget that it is their Homeland, it is their home where they are owners, despite a large number of immigrants.

**Holiday traditions.** Tourists who visit Canada these days, have the opportunity to get acquainted with the traditions, culture and customs of the country. Especially the natives, who made a significant contribution to the development of agriculture, industry, animal husbandry, ecology, art and so on are marked out. Canada is divided into fraternities in the territory inhabited by indigenous Canadians who are building their own state, with its schools and the media who teach children their native language.

Holiday is celebrated by mass festivities, big concerts, lots of free goodies, songs and dances in the folk style. It hosts various summer music festivals. There is a home holiday tradition - the sacred fire extinguishing. During this celebration one can try the national cuisine - filet broshett, goose stew, fried bread and maple syrup, as well as traditional dishes - stack, roast beef and vegetables.

All festivals are held in the town square. For those who wish to take part in various competitions prepared prizes: from \$ 100 for children to \$ 1000 for adults. Today, relatives and close friends present each other gifts or just small souvenirs. In the evening, large and beautiful fireworks are featured for all guests of the festival.

### **Tea traditions of England** **(Чайные традиции Англии)**

Tea is an essential attribute of life for any Briton, exactly the same as bread or potatoes. A popular proverb says: "seven cups of tea will help to wake up, nine of cups will help you sleep". The British are ready to drink tea constantly and know how to brew it. With 59 million inhabitants, the British daily drink 165 million cups of tea. 86% of cups of tea consumed at home. The British drink tea not less than: 6 times a day: at work, at home, away, primarily on the time of day.

Traditionally, a typical day of an Englishman starts with a cup of tea in the morning, drunk still in bed. A cup of strong black tea, like nothing else warms the body and soul and gives a charge of vivacity for the whole day. And the second tea party takes place some time later, at breakfast, when tea is served to the traditional oatmeal and eggs and bacon, and in that and in other case used a blended mixture of "English Breakfast". It's better to drink this tea, too strong and full of caffeine, with milk. The third cup is drunk at lunch; this tea is usually also very strong, but compared to the "English Breakfast" it's softer, this time of the day you can drink tea of any variety, etiquette provides no restrictions here. At this time, drink so-called "English high tea" with light snacks. Europeans unlike us have lunch at about 7-8 PM. At this time the British drink delicious tea, Earl grey with oil of bergamot. And the last tea party is done for the night, just before bedtime.

Tea table is in the spacious living room, by the fireplace. It is preferred to have a plain tablecloth, white or blue, not bright and better hang from the table. We must remember that the napkins and the tablecloth should be of the same ornament. Before serving tea, put on a tea set the table. A drink is poured by the lady of the house. For tea drinking the ware from one service is used. The porcelain service of classical style includes nearly thirty subjects: vases under sugar, a jug under milk, 12 cups and as much saucers, a vase for jam, a big teapot under boiled water, a tray for tea spoons, a teapot for tea leaves with a support, plates for a lemon and cakes, bank for tea leaves. Among other things forks, knives, nippers and a strainer will be necessary. All ware has to be from one service. By rules of etiquette, offer guests about seven of tea – According to the rules of etiquette and offer about seven grades of tea - to everyone on the taste.

Brew the tea for about 5 minutes, then pour it through a strainer spill on the cups. Near the hostess there has to be a kettle with boiled water to dilute the drink. Snacks served at the table directly, but only at guests. On the 5 hour ceremony such snacks as - eggs, toasts, tomatoes, sandwiches, biscuits, almond cookies, cakes, rich rolls, salty oil, jams are prepared. On a separate plate served lemon, cut into small slices without sugar. Admirers of tea with lemon need to know that sugar is taken

after lemon. The English drink tea with milk, with sugar and lemon. It is customary to pour tea into the milk. It was done this way for purely practical reasons (earlier tea was had from thin porcelain cups which could crack due to high temperature), but then it became clear, that at such way, the taste and aroma of the tea retains better. Adhering to tea etiquette, the cup needs to be held with three fingers. When guests have tea at a table, lift only a cup, without touching a saucer if someone sits in a chair or on a sofa, a saucer with a cup hold opposite to a breast.

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### **Wales – The Land of Songs (Уэльс — страна песен)**



Wales is one of the most beautiful countries in the United Kingdom. Cymru, as it is known in Welsh, is surrounded by sea on three sides, whereas the eastern part of country borders with England. The country is full of little towns, castles and picturesque seaside villages. Cardiff, the capital, is the bustling university town with an impressive castle, wonderful museums, galleries and lovely buildings.

English is the official language, but Welsh, one of the oldest languages in Europe, is still spoken in some parts of the country. In fact, a special committee was established in 1988 to protect the language and today Welsh school children are taught both languages. Welsh has a beautiful song-like quality, which is perhaps one reason why singing is such a favorite past time. Playing music, including traditional instruments such as the harp, is another popular hobby.

Wales' breathtaking beauty attracts travelers from around the world. Snowdonia, Britain's second largest national park is located in the north of Wales. With its amazing forests, lakes, waterfalls, rivers and ancient burial sights, the park is a popular tourist attraction. In the north of the country, high above a pretty bay, stands

Caernafon Castle built in 1283 for the first Prince of Wales. In the west is St. David's, quaint village by the sea that has the largest cathedral in Wales.

Wales has many wonderful traditions. The Welsh are proud of their culture. One of the oldest cultural competitions, The Royal National Eisteddfod, takes place every year at the beginning of August. It is an eight-day festival of music and poetry to celebrate Welsh language, art and culture. It is the largest and most popular festival in Wales and attracts thousands of visitors.

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### **Karl Theodor Wilhelm Weierstraß (Карл Теодор Вильгельм Вайерштрассе)**

Karl Theodor Wilhelm Weierstraß war ein deutscher Mathematiker. Sein Hauptverdienst war die logisch fundierte Aufarbeitung der Analysis.

Als Karl acht Jahre war, wurde sein Vater Steuerinspektor und die Familie musste viel in Preußen umherziehen. Im Sterbejahr seiner Mutter 1827 erhielt sein Vater einen festen Posten in Paderborn. So konnte Karl das dortige „Akademische Gymnasium“ besuchen. Er musste aber auch in der Buchführung arbeiten, um die Familienfinanzen zu verbessern. Und trotzdem hatte er immer gute Noten und las die führende deutsche Mathematik-Zeitschrift Crelles Journal, Werke von Pierre-Simon Laplace, Niels Henrik Abel und Carl Gustav Jacob Jacobi. Das bestärkte ihn in seiner Hinwendung zur Mathematik.

Nachdem er 1838 die Universität Bonn ohne Abschluss verließ, ließ sich sein Vater überzeugen, ihn von 1838 bis 1840 an der Akademie Münster Mathematik und Physik studieren zu lassen, die seinen Neigungen mehr entsprachen. Hier entwickelte er auch die Grundlagen seiner späteren Theorie komplexer Funktionen, veröffentlichte aber nichts.

Er arbeitete in völliger Isolation von der mathematischen Welt intensiv an seiner Theorie der Abelschen Funktionen und publizierte in der Zeitschrift seiner Schule. Aufmerksamkeit erregte aber erst der Aufsatz in Crelles Journal 1854 „Zur Theorie der Abelschen Funktionen“. Dem folgte 1856 eine ausführlichere Arbeit.

Als Folge erhielt er im selben Jahr die Ehrendoktorwürde der Albertus-Universität Königsberg. Die führenden Berliner Mathematiker Peter Gustav Lejeune Dirichlet und Ernst Eduard Kummer bemühten sich, ihn nach Berlin zu ziehen. Seit 1856 unterrichtete er Mathematik am Königlichen Gewerbeinstitut, wurde aber im selben Jahr Professor an der Friedrich-Wilhelms-Universität Berlin. Gleichzeitig bemühte man sich intensiv, ihn nach Österreich zu verpflichten.

In Berlin bildete sich bald eine große Schule um ihn. Ihr Kennzeichen war die Einführung „weierstraßscher Strenge“ in die Analysis.

Er starb am 19. Februar 1897 in Berlin an einer Lungenentzündung und wurde auf dem St. Hedwigs-Friedhof in Berlin beigesetzt.

Sein Hauptwerk galt der logisch korrekten Fundierung der Analysis und der Entwicklung der Funktionentheorie auf der Basis der Potenzreihenentwicklungen. Er leistete wichtige Beiträge zur Theorie der elliptischen Funktionen, zur Differentialgeometrie und zur Variationsrechnung.

Viele wichtige Konzepte der heute gelehrten Analysis stammen von ihm, z. B. Konvergenzkriterien für Reihen, die Behandlung unendlicher Produkte und der Begriff der gleichmäßigen Konvergenz

In der Variationsrechnung, über die Weierstraß regelmäßig las, gab er notwendige Bedingungen für Extrema. Bekannt ist auch seine Kritik am Dirichlet-Prinzip, mit dem Bernhard Riemann seine Funktionentheorie begründete.

**Бикташева Адэлина**

БашГУ, ФТИ, 2 курс

Консультант по английскому языку:

ст. преп. Афанасьева Г.А.

### **Culture and traditions of Canada (Культура и традиции Канады)**

Culture of Canada was formed under the influence of cultural traditions of North American aboriginal's peoples, the French and the British. In the past, Canada had to fight for its own cultural identity, the influence of its southern neighbor was just oppressive. Because of this struggle a whole galaxy of great writers and world-renowned musicians has appeared in the country.

The population of Canada is one of the most ethnically diverse in the world. The official religion is Catholicism, which is professed by many people, but in addition there are many Protestants, Jews, Hindus, Muslims, Buddhists and aboriginal Indians. English and French are the two official languages in the country.

There is much to see in the Canadian capital Ottawa, founded in 1857. Ottawa is famous for showrooms: Byward Market, Arts Court, Le Salon des Arts. Ottawa is the National Gallery of Canada, the Museum of Nature, Science and Technology Museum. There are many musical ensembles and groups including the national and symphonic orchestra the concerts of which can be appreciated by music connoisseurs.

Peoples living in Canada, seek to preserve their traditions and national features. Distinctive features of Canadians are politeness and friendliness.

The Canadian cuisine is always based on the rule of «the thinner - the better», though there are no specific national dishes here. French and Italian cuisines are popular here, as well as German, Chinese and Japanese dishes.

The nature of the country is rich and unique. A lot of national parks and nature reserves are concentrated here; there are waterfalls, historic villages and castles, open-air museums. Among them are Fortress of Louisburg, Fort Anne, a picturesque

park of Mount Robson, and the museum complex of Samuel de Champlain and many other attractions of this vast country.

The Gatineau Park of the capital is famous for its splendour and colourful annual Tulip Festival. It is organized under the auspices of the Dutch royal family, and always makes a lasting impression on many visitors.

The second important Canadian city is Montreal - the capital of the province of Quebec. It is a modern city of skyscrapers, highways transport junctions; at the same time it is air and sea gates of the country and has huge international hub - airports and railway stations.

As for Canadian holidays they are divided into two categories: political and religious. The main celebrations, accompanied by official holidays are Christmas and Easter. Major political events are Canada Day (July 1), New Year's Day (January 1), Victoria Day, Labour Day (September) and Thanksgiving Day (October).

**Брагинский Артем**

БашГУ, ФТИ, 1 курс

Консультант по английскому языку:

к.филос.н., доцент Кулыева А.А.

### **English writers. Classical novels, science fiction and fantasy** **(Английские писатели. Классика, научная фантастика и фэнтези)**

#### **Charles Dickens.**

Charles Dickens was born on February 7th, 1812 in Portsmouth, England. His father was an office man, who worked hard to provide for his family. When he was 10, his family moved to London, where his father got into debtor's prison. After that, Charles left school to work in a factory. There he worked for two years. Over his career he wrote 15 novels, 5 novellas, hundreds of short stories and non-fiction articles. He obtained international attention and fame in 1836 with a series of publications called "Pickwick Papers". Dickens published many other novels later. Among them "Oliver Twist", "Dombey and Son", "David Copperfield" and many others.

He mostly wrote about the hard life of poor people in Victorian England. One of his most influential works ever written was "A Christmas Carol" novella. Charles Dickens was an English writer and social critic. He created some of the world's most memorable fictional characters and is considered to be one of the greatest novelists.

#### **H.G. Wells and John R.R. Tolkien. Science fiction and fantasy.**

H.G. Wells was born in Bromley, Kent County, England on September 21, 1866. His mother was Sarah Neil who worked as a maid to the upper class and his father Joseph Wells, was a professional cricket player and a shopkeeper. Wells developed an interest in reading beginning in his childhood. Wells became famous through his first work - "Time Machine" in 1895. Shortly after the publication of this book, Wells wrote the following: "The Island of Dr. Moreau"; "The Invisible Man" ,

and "War of the Worlds". The English author, Herbert George Wells, also commonly referred to as the father of science fiction. In addition to writing a lot of science fiction works, Wells also produced other numerous literary works under many other genres.

John Ronald Reuel Tolkien was born on January 3, 1892 in Bloemfontein, South Africa, the son of Arthur and Mabel Suffield Tolkien. In 1920 Tolkien began to teach at the University of Leeds, and several years later became a professor at the University of Oxford.

In 1937, Tolkien wrote a novel in the style of fantasy, "The Hobbit." "The Hobbit" has won many awards.

Over the years, Tolkien created a work that is considered his masterpiece - a series of books "The Lord of the Rings." Although the "Ring" and has undergone its share of critics, many reviewers and flow among all the influx of readers to the world of Tolkien, as a result of his books have become international bestsellers. Works of JRR Tolkien had a significant impact on popular culture of the XX century. They have been repeatedly adapted for film, animation, audiopoes, theatrical scenes, computer games.

**Бухмастова Елена**  
БашГУ, ФМиИТ, 2 курс  
Консультант по английскому языку:  
ст.преп. Титлова А.С.

### **“The Old Vic Theatre” (Театр “Олд Вик”)**

“The Old Vic” is an English non-profit dramatic theatre. It is located in the South part of London, on Waterloo-Road. The theatre was founded in 1818 by James King and Daniel Dunn. The history of “The Old Vic Theatre” is divided into two parts: the first part – from the opening the theatre till 1898, and the second one – from 1898 till present. At first it was called “Royal Koburg”, in honor of Prince Leopold Sakson-Koburg, who was the patron of the troupe. Its repertoire mostly included modern, sensational melodramas. In 1833 the theatre got a new name “Victoria”, in honor of Princess Victoria, who had visited the theatre once. Sometimes the theatre was called “Old Victoria”, and this name has stayed till our days.

Originally “The Old Vic” was not a drama theatre, and the directorate turned it to a music-hall. In 1880 Emma Cons started to control the theatre. She was the first woman, who became the member of London Country Council. The theatre got to implement education programs under the guidance of Cons. She organized lectures, invited good orchestras. In 1898-1937 the theatre was headed by Cons’s niece Lilian Baylis. With her coming W. Shakespeare’s plays and opera performances were put on the stage of the theatre. Ticket prices were low, so a wide range of audience could



visit the performances. “The Old Vic Theatre” became a leading theatre of the country under the guidance of Baylis.

“The Old Vic” opened its first Shakespearean season in 1914. The theatre acquired the reputation of the “Shakespeare’s house” and became leading non-profit theatre in Great Britain for decades. The theatre was destroyed because of bombing in 1940. The troupe of “The Old Vic” had to tour around the country. In 1950 the theatre got a stationary playground again.

Nowadays, “The Old Vic” stages the English and foreign classic. W. Shakespeare’s, B. Shaw’s, O. Wilde’s, H. Ibsen’s, A. Chekhov’s, U. Congreve’s plays are put on the stage of the theatre. Among the directors of the theatre there were such prominent figures of art as Laurence Olivier and Bernard Shaw. “The Old Vic” hall has seats for 1067 spectators, its rooms are adapted for people with disabilities. The American actor Kevin Spacey is an artistic director of the theatre.

**Валишин Талгат**

БашГУ, ФТИ, 1 курс

Консультант по английскому языку:

к.филос.н., доцент Кулыева А.А.

**Stephen William Hawking**

**(Стивен Вильям Хокинг)**

Stephen Hawking is an English theoretical physicist, cosmologist, author and director of research at the Centre for Theoretical Cosmology within the University of Cambridge. His scientific works include a collaboration with Roger Penrose on gravitational singularity theorems in the framework of general relativity, and the theoretical prediction that black holes emit radiation, often called Hawking radiation. Hawking was the first to set forth a cosmology explained by a union of the general theory of relativity and quantum mechanics. He is a vigorous supporter of the many-worlds interpretation of quantum mechanics. Hawking is an Honorary Fellow of the Royal Society of Arts, a lifetime member of the Pontifical Academy of Sciences, and a recipient of the Presidential Medal of Freedom, the highest civilian award in the United States.

Stephen William Hawking was born on 8 January 1942 (300 years after the death of Galileo) in Oxford, England. His parents' house was to the north of London, but during the Second World War, Oxford was considered a safer place to have babies. When he was eight, his family moved to St. Albans, a town about 20 miles north of London. At the age of eleven, Stephen went to St. Albans School and then entered University College, Oxford; his father's old college. Stephen wanted to study Mathematics, although his father would have preferred medicine. Mathematics was not available at University College, so he pursued Physics instead. After three years and not very much work, he was awarded a first class honours degree in Natural Science.

Stephen Hawking has worked on the basic laws which govern the universe. With Roger Penrose he showed that Einstein's General Theory of Relativity implied space and time would have a beginning in the Big Bang and an end in black holes. These results indicated that it was necessary to unify General Relativity with Quantum Theory, the other great scientific development of the first half of the 20th Century. One consequence of such a unification that he discovered was that black holes should not be completely black, but rather should emit radiation and eventually evaporate and disappear. Another conjecture is that the universe has no edge or boundary in imaginary time. This would imply that the way the universe began was completely determined by the laws of science.

Professor Hawking has twelve honorary degrees. He was awarded the CBE in 1982, and was made a Companion of Honour in 1989. He is a recipient of many awards, medals and prizes, a Fellow of the Royal Society and a Member of the US National Academy of Sciences.

### **A Brief History of Time.**

Stephen Hawking, one of the most brilliant theoretical physicists in history, wrote the modern classic ***A Brief History of Time*** to help non-scientists understand fundamental questions of physics and our existence: where did the universe come from? How and why did it begin? Will it come to an end, and if so, how?

Hawking attempts to deal with these questions (and where we might look for answers) using a minimum of technical jargon. Among the covered topics are gravity, black holes, the Big Bang, the nature of time and physicists' search for a grand unifying theory. This is deep science; the concepts are so vast (or so tiny) that they cause mental vertigo while reading, and one can't help but marvel at Hawking's ability to synthesize this difficult subject for people not used to thinking about things like alternate dimensions. The journey is certainly worth taking for as Hawking says, the reward of understanding the universe may be a glimpse of "the mind of God".

**Власюк Андрей**

БашГУ, ФМиИТ, 2 курс

Консультант по немецкому языку:

к.филол.н., доцент Салахов Р.А.

### **Gottfried Wilhelm Leibniz**

**(Готфрид Вильгельм Лейбниц)**

Gottfried Wilhelm Leibniz war ein deutscher Philosoph, Mathematiker, Logiker, Physiker, Erfinder, Theologe, Historiker, Jurist, Sprachwissenschaftler, Diplomat, dessen theoretische und praktische Erfindungen weitgehend die moderne Philosophie und Wissenschaft beeinflusst haben. Er gründete die Berliner Akademie der Wissenschaften und war ihr erster Präsident.

Gottfried Wilhelm Leibniz wurde am ersten Juli 1646 in Leipzig geboren. Sein Vater war Universitätsprofessor, ein berühmter Anwalt, seine Mutter war Tochter eines Leipziger Professors, was in vielem das künftige Schicksal ihres Sohnes vorbestimmt hat. Sein Vater, der starb, als Gottfried 6 Jahre alt war, hinterließ eine

riesige Bibliothek, wo sein Sohn die ganzen Tage verbrachte. Sein Talent war von Kindheit an nicht zu übersehen. Mit 14 oder 15 Jahren wurde er Student an der Leipziger Universität.

Er war nicht einmal 18, als er schon Magister der Literatur und Philosophie wurde. 1663 studierte Leibniz ein Semester an der Universität von Jena. Im November 1666 verteidigt Leibniz in Nürnberg an der Universität Altdorf erfolgreich seine Doktorarbeit und lehnt das Angebot ab, an der gleichen Institution zu bleiben und zu arbeiten.

Im Jahre 1667 zog der junge Wissenschaftler nach Mainz. Fünf Jahre war der Wissenschaftler Mitarbeiter des Hofrats Hermann Andreas Lasser. Es war eine gute Zeit in seiner schöpferischen Biografie: eine Reihe von politischen und philosophischen Schriften erschien in jenen Jahren.

Von 1672 bis 1676 lebte Leibniz in Paris. Der Aufenthalt in der französischen Hauptstadt leistete einen großen Beitrag zu seiner Entwicklung als Wissenschaftler, insbesondere als Mathematiker. So wurden von ihm im Jahre 1676 die ersten Grundlagen der so genannten Differentialrechnung entwickelt, einer herausragenden mathematischen Methode. Sein Hauptinteresse galt in dieser Zeit den exakten Wissenschaften.

1676 kehrte Leibniz nach Deutschland zurück. Im Laufe von über 40 Jahren, die er in Hannover verbrachte, schrieb Leibniz eine Menge von wissenschaftlichen Arbeiten auf solchen Gebieten wie Geschichte, Philosophie, Mathematik, Physik, Rechtswissenschaft, Sprachwissenschaft, die ihn in ganz Europa bekannt gemacht haben. Der Wissenschaftler initiierte die Gründung der Berliner wissenschaftlichen Gesellschaft und wurde im Jahre 1700 ihr erster Präsident.

Der deutsche Wissenschaftler war der Autor der russischen Reformprojekte in den Bereichen der Bildung und der öffentlichen Verwaltung, des Projekts der Gründung der St. Petersburger Akademie der Wissenschaften. Peter der Erste sagte: „Ich war nicht der einzige berühmte Ausländer, mit dem der berühmte Deutsche Kontakte geknüpft hat“. Gottfried Leibniz stand im Briefwechsel mit vielen berühmten Wissenschaftlern, Politikern, Philosophen seiner Zeit.

Gottfried Wilhelm Leibniz starb am 14. November 1716 an der Überdosis einer Arznei.

**Газизов Айдар**

БашГУ, ФМиИТ, 2 курс

Консультант по английскому языку:

к.филол.н., ст.преп. Анищенко А.А.

## **Food and Cuisine of Canada**

### **(Еда и кухня Канады)**

The features of the cultural traditions of any country are certainly reflected in the food and cuisine. For example, cultural traditions of Canada may be represented through its food culture.

Food plays an inextricable role in our daily lives. Food is such an essential element of people's lives that many people think of countries first and foremost in terms of their food and cuisine. While Canada is not known for its culinary contributions or accomplishments the way China, India, France and Italy are, but it is known in many parts of the world for its diverse foods and foodstuffs, as well as its regional specialties and escalating gastronomic achievements. This is due to the incredible diversity of the country's environment, its multicultural character, and its rapidly growing coterie of world-class chefs, cooks and culinary specialists.

Today Canada is well known throughout the world for the quantity and quality of its fresh-water fish, ocean fish, and shellfish – Atlantic and Pacific salmon, Arctic char, cod, eel, clams, oysters, mussels, lobsters, mackerel, sturgeon, gold eye, white fish, mullet, pickerel, pike, bass, trout, and the like. Many of these delicacies are packed up in fresh, frozen, or smoked form and shipped off to destinations in other parts of the world in response to the high demand for them. While drink is an essential part of the food and cuisines of all peoples and countries in the world - think of what tea means to China and Japan and wine and beer mean to Germany, France, and other European countries – Canada does not have a long tradition in this area.

The country is also well-known for its fruits, grains, vegetables and berries, particularly wild rice, an international favorite, fiddleheads, wheat, corn – a basic staple enjoyed originally by the aboriginal peoples but now loved by all Canadians as buttered corn on the cob – peaches, potatoes, pears, plums, blueberries and apples.

While Canada's oceans, lakes, agricultural lands, forests and wilderness areas yield many of the foodstuffs that Canadians and people in other parts of the world enjoy today, dietary and culinary practices have changed considerably in Canada over the last fifty years. Like many countries in the world, Canada is rapidly becoming a "fast food nation", with more and more people anxious to "eat on the run." The similar phenomenon is seen also in the Russian culture. But Russian people try to avoid this.

Note that food can't be appreciated until you try it. So I would like to try all the dishes to understand the gastronomic possibilities of this country.

**Гайсина Галия**

БашГУ, ФМиИТ, 2 курс

Консультант по немецкому языку:

к.филол.н., доцент Салахов Р.А.

**David Hilbert**

**(Давид Гильберт)**

Am 23. Januar 1862 kam David Hilbert in Königsberg zur Welt. Die Stadt Kants und der ostpreußischen Aufklärung prägte ihn. Hier studierte er Mathematik, wurde Privatdozent und außerordentlicher Professor.

In der kleinen Universitätsstadt Göttingen hatten die Mathematiker Genies Carl Friedrich Gauß und Bernhard Riemann gelehrt. Hier wirkte seit 1886 Felix Klein. Der ausgezeichnete Organisator wollte Göttingen wieder zu einem Zentrum der Mathematik und Naturwissenschaft machen. 1895 gelang es Klein, den 33-jährigen Hilbert nach Göttingen zu berufen. Als man ihm vorwarf, es sich mit der Berufung eines so jungen Mannes leicht zu machen, entgegnete er: «ich berufe mir den Allerunbequemsten».

Hilberts Enthusiasmus riss alle mit. Rasch strömten von allen Seiten der Welt die begabtesten Mathematiker nach Göttingen. Und bald entstand in Göttingen fast ein ganzer Stadtteil mit Instituts- und Laborbauten.

In Göttingen stellte Hilbert zuerst Untersuchungen zur Theorie der algebraischen Zahlkörper an und bis 1902 schloss sich eine Untersuchung der Grundlagen der Geometrie an. In den nächsten Jahren widmete er sich den Integralgleichungen und brachte seine Erkenntnisse in der mathematischen Physik ein. Während seiner letzten Forschungsperiode bis 1930 erforschte er die logischen Grundlagen der Mathematik.

Um die Jahrhundertwende besaß Hilbert bereits einen weltweiten Ruf als einer der leistungsfähigsten lebenden Mathematiker. Er befand sich wahrscheinlich damals auf dem Höhepunkt seiner Schaffenskraft. Im Jahre 1900 übertrug man ihm ein Hauptreferat auf dem Internationalen Mathematikerkongress in Paris. In seinem Vortrag «Mathematische Probleme» berichtete Hilbert über 23 mathematische Probleme. Diese Liste beeinflusste die gesamte Mathematik des 20. Jahrhunderts, weil sie die wichtigsten offenen Fragen der damals bestimmenden Zweige der Mathematik umfasste.

Einige nach ihm benannte Definitionen und Sätze aus der Mathematik sind:

- Hilbert-Raum aus der Funktionalanalysis
- Hilbert-Kurve, eine raumfüllende, stetige Kurve
- Hilbert's Hotel, ein Gedankenexperiment, das die verschiedenen Arten der Unendlichkeit verdeutlicht.

Am 14. Februar 1943 starb David Hilbert in Göttingen. Sein Grabstein trägt sein Lebensmotto: «Wir müssen wissen. Wir werden wissen».

**Галимзянова Аделина**

БашГУ, химический факультет, 1 курс

Консультант по английскому языку:

ст. преп. Титлова А. С.

### **Morris Dance** **(Танец Моррис)**

*Morris dance* is a form of English folk dance usually accompanied by music. It is based on rhythmic stepping and the execution of choreographed figures by a group of dancers, usually wearing bell pads on their shins.

The origins of Morris dancing are lost in the mists of time. It survives today as a form of folk dance performed in the open air in villages in rural England by groups of specially chosen and trained men and women. It is a ritual rather than a social dance which the dancers take seriously.

The name is first recorded in the mid-15th century as *Morisk dance*, *moreys daunce*, *morisse daunce*, i.e. "Moorish dance".

It is unclear why the dance was called so, unless in reference to fantastic dancing or costumes, i.e. the deliberately "exotic" flavor of the performance. The English dance thus apparently arose as part of a wider 15th-century European fashion for supposedly "Moorish" spectacle, which also left traces in Spanish and Italian folk dance. The means and chronology of the transmission of this fashion is now difficult to trace; the *Great London Chronicle* records "spangled Spanish dancers" performing an energetic dance before Henry VII at Christmas of 1494, but Heron's accounts also mention "playing of the mourice dance" four days earlier, and the attestation of the English term from the mid-15th century establishes that there was a "Moorish dance" performed in England decades prior to 1494.

Today, there are six predominant styles of morris dancing, and different dances or traditions within each style named after their region of origin: *Cotswold morris*, *North West morris*, *Border morris*, *Sword dancing*, *Mumming*, *Molly dancing*.

The "soul" of morris dancing exists within many individual groups, which are for the most part constituted as autonomous clubs or sides, each with its own constitution and procedures. Sides do not exist in isolation, and generally co-exist in a spirit of good-will and meet regularly, not just at large Folk Festivals or meetings organized by the three national umbrella organizations (Ring, Federation and Open), but also at annual Feasts or Ales that many sides organize.

**Галимова Юлия**

БашГУ, ФТИ, 2 курс

Консультант по английскому языку:

ст. преп. Хабутдинова Л.Х.

### **The main concepts of American education (Основные концепции американского образования)**

Educational institutions in the United States should reflect the nation's basic values and ideals.

The underlying principle of the American system of education is to educate people in such a way that everyone has the opportunity to develop his/her greatest potential. One of the major problems is the question of what should be the true goal of education. The American system tends to focus on teaching man and society to get along in the community.

Another major purpose of education in America is to lay grounds for achieving success in life. Americans value education largely as means to reaching a higher

standard of living.

Equality of opportunity – the declared motto for life in the United States – is also an important aspect of the American system of education. Because of the inequalities inherent in society as a whole, the goal of equal opportunity in education remains an ideal rather than a reality. Furthermore, the very structure of education itself, which contains both public and private schools, may not encourage equality of opportunity.

There is competition in getting jobs or entering the best universities. Furthermore, a lot depends on the personal qualities of the individual school graduate.

All university students must pay tuition fees. In private universities these are usually much higher. In addition to tuition fees one has to pay for books and room and board. Deserving students may receive scholarships of various types that offset the high costs of higher education.

Unlike the European system of higher education, individual colleges and universities in the US do not have their own entrance examinations. Admission is based on scholastic achievement in high school and performance on standardized national test (the SAT or ACT). In addition, colleges and universities may require applicants to submit samples of their writing.

**Галлямов Ринат**  
БашГУ, ФМиИТ, 2 курс  
Консультант по английскому языку:  
ст. преп. Моисеева А.В.

### **The Grand Canyon** **(Большой Каньон Колорадо)**

The Grand Canyon is one of the most remarkable natural wonders in the world. Located in the state of Arizona, USA, it is one of the deepest gorges on Earth with an average depth of one mile (1.6km) and an average width of ten miles (16km). The canyon was carved over the past 6 million years by the action of the Colorado River.

The canyon isn't just a single gorge, however, but also includes numerous side canyons created by erosion. Because many layers of rock were exposed during this process, the walls of the canyon are countless shades of brown, yellow, red and gray. As the sun moves across the sky the light changes making the vista transform dramatically over the course of the day.

The Colorado Plateau, through which the canyon is cut, was once the bottom of a shallow sea. Along the rim visitors can still find fossilized snails, corals and shell fish. Around 20 million years ago the land was pushed upwards and the sea retreated. Around six million years ago the Colorado River changed its course and started cutting its way across the Plateau. The uplift also added new tributaries to the river, increasing the river's flow and adding many of the side canyons. Water let loose from

the glaciers of the ice ages also increased the amount of water that was moving down the river and giving it more power to erode the stone.

The first European that saw the Grand Canyon was Don Garcia Lopez de Cardenas from Spain, who visited it in 1540 during a search for the fabled Seven "Gold" Cities of Cibola. However, Native Americans were already familiar with the canyon for thousands of years. The ancient Anasazi people are the first thought to inhabit the area starting about 1200 B.C.

In 1869 John Wesley Powell led the first known boat expedition down the Colorado River and through the canyon. Starting from Green River, Wyoming on May 24, Powell and nine men in four wooden boats with food for 10 months traveled down the Green River to where it joined the Colorado. The trip became so difficult that one man quit the expedition after the first month, and another three left the group at Separation Canyon two months later. The three attempted to climb out of the canyon but were never heard from again. Powell finished his journey on August 13, 1869. Two years later Powell would retrace the voyage, this time taking photographs and making detailed, accurate maps.

**Гильванов Руслан**

БашГУ, инженерный факультет, 2 курс

Консультант по английскому языку:

к.филол.н., доц. Акубекова Д.Г.

### **The Cooper's Hill Cheese-Rolling and Wake (Куперсхилдская сырная гонка)**

The Cooper's Hill Cheese-Rolling and Wake is an annual event held on the Spring Bank Holiday at Cooper's Hill, near Gloucester in England. It is traditionally by and for the people who live in the local village of Brockworth, but now people from all over the world take part. The Guardian called it a "world-famous event". The event takes its name from the hill on which it occurs.

This ceremony originally took place each "White Monday" before later transferred to the Spring Bank Holiday. Two possible origins have been proposed for the ceremony. The first said that it evolved from a requirement for maintaining grazing rights on the common.

The second proposal deals with the custom of rolling objects down the hill. It is thought that bundles of burning brushwood were rolled down the hill to represent the birth of the New Year after winter, also traditionally buns, biscuits and sweets are rolled from the top of the hill by the Master of Ceremonies to encourage the fruits of harvest.

Since the fifteenth century the cheese has been rolled down the hill, and people have competed to catch it.

Each year the event becomes more and more popular with contestants coming from all across the world to compete or even simply to watch.



From the top of the hill a 9 lb round of Double Gloucester cheese is rolled, and competitors race down the hill after it. The first person over the finish line at the bottom of the hill wins the cheese.

The cheese currently used in the event is 7–9 lb. Double Gloucester, a hard cheese traditionally made in a wheel shape. Each is protected for the rolling by a wooden casing round the side and is decorated with ribbons at the start of the race.

Due to the steepness and uneven surface of the hill there are usually a number of injuries. A first aid service is provided by the local St John Ambulance at the bottom of the hill, with a volunteer rescue group on hand to carry down to them any casualties who do not end up at the bottom through gravity. A number of ambulance vehicles attend the event, since there is invariably at least one, and often several injuries requiring hospital treatment.

The race of 2005 was delayed while the ambulances returned from the hospital, all of them having been required to transport casualties from previous races. Nevertheless, it is one of the most popular events in recent years, with many more participants than were able to run in the four races.

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### **Oxford and Cambridge Compared (Сравнение Оксфорда и Кембриджа)**

Oxford and Cambridge are the most prestigious universities in the English-speaking world. You never say “Cambridge and Oxford”; Oxford always comes first. They are often called Oxbridge.

To get the Degree of Bachelor of Arts (B.A.) students have to study for three years. The students wear a special uniform daily and full academic dress at the examinations. According to the long established tradition Latin is used at public degree ceremony.

Oxford and Cambridge universities consist of a number of colleges. Each college has its own name and its coats of arms. On the territory there is usually a chapel, a dining hall, a library, rooms for undergraduates, fellows and the master, and also rooms for teaching.

Oxford is one of the oldest universities in Europe. It is situated at a distance of 100 km from London. It is the second largest one in Britain after London University. It dates in chronicles from 911 AD. Most colleges are made of grey stone. They have stood there for many centuries. Oxford is an aristocratic university. Now there are 27 colleges for men, 5 for women and another five which have both ones. All the students at Oxford talk in a very superior way known as the Oxford accent, which is a bit like the BBC accent.

Cambridge is situated at a distance of seventy miles from London. It is one of the most beautiful towns in England and looks more like a country town. The Cambridge University started during the 13th century (1284). It has more than twenty nine colleges. A college is a group of buildings which form a square with a lawn in the centre. The colleges line the bank of the river Cam. They have beautiful college gardens with green lawns and lines of tall trees.

The oldest college in Cambridge is Peterhouse, which was founded in 1284. The most famous is probably King's college (founded in 1441) because of its magnificent chapel and English fifteen-century architecture.

Since the year of 1970 most colleges of Cambridge are mixed. A lot of famous people studied at Cambridge. They are Sir Isaac Newton, Oliver Cromwell, John Milton and Sir Charles Darwin. In Trinity College, which is a very famous, there is a statue of Sir Isaac Newton, the greatest scientist in the world.

Sport is a part of students' life at both universities. There is a great rivalry between the universities and they play all sorts of games between each other like cricket and rugger (rugby football). Also they compete at punting and rowing, which are the most popular sports. The Oxford team wears dark blue uniform and the Cambridge team wears light blue one.

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### **George Washington—the 1st President of the United States** **(Джордж Вашингтон – первый президент США)**

**George Washington** was born on Feb. 22, 1732, the first son of Augustine Washington and his second wife, Mary Ball Washington, in the family estate in Westmoreland, Virginia. He was from a wealthy family and started a career as a surveyor. After his brother's death in 1752, George inherited part of his estate and took over some of his duties as adjutant of the colony. At the age of 20 he was made Major Washington and was charged with training the militia in the quarter assigned to him.

In 1759, Washington married Martha Dandridge Custis, a rich young widow, and settled on his estate at Mt. Vernon. The same year he became a leader in Virginian opposition to the British colonial policy, and served (1774–75) as a delegate to the Continental Congress. After the American Revolution broke out, Washington was named the commander in chief of the Continental forces.

In July 1775 he took command of unorganized, poorly disciplined militia, officered by insubordinate men. He was to stop the British army at Boston with ordinary men, who were not soldiers and he was constantly hampered by the Congress. Washington however overcame these troubles with the brilliant strategic

move, he occupied Dorchester Heights, forcing the British to evacuate Boston on Mar. 17, 1776.

Later Washington was forced to defend New York City with a poorly equipped and untrained army against a large British force commanded by Sir William Howe. He was not experienced enough to conduct a large-scale action, and he committed a military blunder. He sent part of his force to Brooklyn, where it was defeated and surrounded. The only way to save his army was a retreat to Pennsylvania. That's how Washington developed military skill through trial and error.

During this warlike period Washington had many routs and victories. But in the end he made the American Revolution successful not only by his personal military triumphs but also by his skill in directing other operations.

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### **Cirque du Soleil (Цирк дю Солей)**

One of the most gorgeous phenomens in the world, induce delight and admiration is Cirque du Soleil. It is Canadian Entertainment Company, which can be characterized like "the largest theatrical producer in the world". It's history begin from 1984 when the company was registered, but in fact the idea of Cirque du Soleil was born earlier and based in Montreal, Quebec, Canada, and located in the inner-city area of Saint-Michel.

The main distinction of this show is that it's the only circus that never uses animals. All programs are played by humans. It's also interesting, that the scene is located above the viewers, unlike in common circus. But the main advantage is that the show is the whole performance with single dramaturgical foundation. Each show is a synthesis of circus styles from around the world, with its own central theme and storyline. Shows employ continuous live music, with performers rather than stagehands changing the props.

Cirque du Soleil have his own features and amass thousands viewer from all over the world.

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### **Theodore Dreiser (Теодор Драйзер)**

Theodore Dreiser is a famous American writer and publicist. He was born in 1871 in the state of Indiana. He was the 12th child in the family. His mother came

from the family of Czech immigrants and his father came to America from Germany and was a factory worker. Since his early childhood the boy knew what poverty was.

In 1887 he moved to Chicago where he worked in restaurants washing dishes and cleaning. For a short period of time he studied at the University of Indiana. Working at the newspaper “Chicago Daily Globe” he started to publish his first sketches and stories.

His first novel “Sister Carrie” is a story about real life. One of his elder sisters, Emma, was the main character of the novel. The story about the girl, who became an actress at a high price of losing her best human qualities, was considered to be immoral by critics. The feature of American literature that struck Dreiser most of all was the contradiction between the real life and the life described in literary works. That is why Dreiser’s works always depicted the life of common people, the cruelty of their existence in American society. His novel “An American Tragedy” was the sign of critical realism in the American literature of the 20th century. In his three novels “The Financier”, “The Titan”, and “The Stoic” Dreiser described the life of financier Cauperwood. He is not only a cruel American businessman, a person without “soul and heart”, but a very tragic figure. Having an extraordinary personality, he can’t fully realize himself in American society. His love for arts, his unusual talent stays deep inside him.

In 1928 Dreiser came to Russia, as he was always interested in the country and especially in its literature. The works of Tolstoy and Dostoyevsky influenced his creative work. Even today Dreiser remains the largest writer of realistic American literature of the 20th century.

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### **Customs and traditions of English speaking countries (Обычаи и традиции англоязычных стран)**

Every country and every nation has its own traditions and customs. It is very important to know traditions and customs of different people. It will help you to know more about the history and life of different nations and countries.

One cannot speak about England without speaking about its traditions and customs. They are very important in the life of English people. Englishmen are proud of their traditions and carefully keep them up.

If you arrive in Great Britain you'll hear the word “tradition” everywhere. Englishmen have sentimental love for things and traditions. They never throw away old things.

In many houses in Great Britain people have fire-places. Although their bedrooms are awfully cold, the English people do not want to have central heating because they do not want any changes.

Therefore the Yeomen-Warders are dressed in traditional medieval clothes and the traditional dress of the Horse Guards regiment has existed since the twelfth century

There are six public holidays in Great Britain. Christmas day is one of their favorite holidays. It is celebrated on the 25-th of December. There are some traditions connected with it. One of them is to give presents to each other. Another tradition is to send Christmas cards. All these cards are brightly colored. Most of big cities of Great Britain, especially London, are decorated with colored lights and Christmas trees.

Many families celebrate Christmas day in the open air near the Christmas tree in order to catch the spirit of Christmas. Children find Christmas presents in their stockings. The traditional English dinner on Christmas is turkey and pudding. Other great holidays are Father's day, Mother's day, Halloween and other.

In conclusion, let me say that English-speaking countries have a variety of traditions and customs. It is striking that for many centuries these traditions and customs have been able to survive and remain relevant in today's world of high technology.

The study of the traditions of English-speaking countries helps to understand and accept the conditions of life of people, their social status, history of the country or its individual regions.

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### **Sights of Great Britain**

#### **(Достопримечательности Великобритании)**

Great Britain is rich in historic monuments, royal palaces and some of the world's top museums. The most interesting sights are famous university cities Oxford and Cambridge, Shakespeare's birthplace — Stratford-upon-Avon, towns of Cardiff, Edinburgh, Glasgow.

Stratford-on-Avon is associated with the name and life of William Shakespeare. It is 93 miles north-west of London. The greatest English poet and playwright was born here in 1564. When Shakespeare won the recognition of his contemporaries and became wealthy he bought New Place, one of the largest houses in Stratford. It was in 1597 but he continued to live and work in London until 1610. Shakespeare died at the age of fifty two in 1616 in New Place. Shakespeare was buried in the church at Stratford on the banks of the Avon. The Royal Shakespeare Theatre was opened in

Stratford in 1932. Only Shakespeare's plays are performed here. The plays staged in this theatre attract people from all over the world

Cambridge and Oxford Universities are famous centres of learning. Oxford University was founded in the 12th century. The component parts of the University of Oxford are the colleges. Each college is practically autonomous, with its own set of rules of government. But not only this differs Oxford from universities in other countries. Oxford has a "golden heart", an area of less than half a square mile in which various historic buildings may be found. But they do not stand in isolation, they are mixed together with houses, shops and offices.

Cardiff is the capital of Wales and its chief port. Cardiff is also a tourist centre. The most famous places of interest are the Castle, National Museum of Wales, New Theatre, Welsh Folk Museum. The Welsh people love singing. That's why Wales is sometimes called "the land of song". Song festivals are very popular and usually gather a lot of people.

Edinburgh is a city where the historic past lives side by side with the present. The first thing one can see is a very large hill in the middle of Edinburgh — the Rock. Edinburgh Castle stands on the Rock. It is the most famous building in the city. Edinburgh is famous for many things: its art galleries, museums, libraries. But it is especially famous for its festivals. The well-known monument in Edinburgh is the monument to Walter Scott. The monument is in the form of a Gothic spire, 200 feet high with a statue of Sir Walter Scott inside this beautiful structure. In the niches of the monument there are 64 statuettes of well-known characters from Scott's novels and poems.

Stonehenge is a prehistoric monument, presumably built by Druids, members of an order of priests in ancient Britain. Stones stand here in circles or are arranged into a horseshoe shape. The scientists consider that Stonehenge was built in order to calculate the annual calendar and seasons. There are many other theories about Stonehenge but exactly why it was built remains a mystery.

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### **English Halloween Customs (Традиции Празднования Хэллоуина)**

The celebration of All Saints Day or just Halloween takes place on October 31st. The tradition of Halloween began in the fifth century B.C. This day the Irish Celts celebrated their New Year at that time, because they organized their year according to the agricultural calendar and marked the transition from one year to the next on October 31.

In the year 835 A. D. the Roman Catholic Church made November 1st a church holiday to honour all the saints. This day is called All Saint's Day. Since that time many years have passed. Some traditions are gone, new traditions appeared. I am going to tell you about the most popular customs of Halloween.

The most known custom is the tradition of dressing.

The tradition of dressing in costume for Halloween has both European and Celtic roots. Hundreds of years ago, winter was an uncertain and frightening time. Food supplies often ran low and, many people afraid of the dark, the short days of winter were full of constant worry. On Halloween, when it was believed that ghosts came back to the earthly world, people thought that they would encounter ghosts if they left their homes. To avoid being recognized by these ghosts, people would wear masks when they left their homes after dark so that the ghosts would mistake them for fellow spirits. On Halloween, people placed bowls of food outside their homes to appease the ghosts and prevent them from attempting to enter their home.

Fire has always played an important part in Halloween. Fire was very important to the Celts as it was to all early people. In the old days people lit bonfires to ward away evil spirits and in some places they used to jump over the fire to bring good luck. Today, we light candles in pumpkin and then put them outside our homes to ward off evil spirits.

Another tradition is Apple Bobbing. It has the roman origins. The Roman festival for remembering the dead was also in October. During this time, the Romans remembered their goddess, Pomona. She was the goddess of the trees and fruits, and when the Romans came to Britain, they began to hold these two festivals on the same day as Samhain. Apples probably became associated with Halloween because of this festival. Some people believe that, if you slice an apple through the equator (to reveal the five-pointed star within) and then eat it by candlelight before a-mirror, your future spouse will appear over your shoulder.

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### **Language difference between British and American English (Языковые отличия между британским и американским английским)**

In the early part of the seventeenth century English settlers began to bring their language to America, and another series of changes began to take place. The settlers borrowed words from Indian languages for such strange trees as the hickory and persimmon, such unfamiliar animals as raccoons and woodchucks. Later they borrowed other words from settlers from other countries – for instance, chowder and prairie from the French, scow and sleigh from the Dutch. They made new combinations of English words, such as backwoods and bullfrog, or gave old English

words entirely new meanings, such as *lumber* (which in British English means approximately *junk*) and *corn* (which in British means any grain, especially wheat). Some of the new terms were needed, because there were new and un-English things to talk about. Others can be explained only on the general theory that languages are always changing, and American English is no exception.

Aside from the new vocabulary, differences in pronunciation, in grammatical construction, and especially in intonation developed. If the colonization had taken place a few centuries earlier, American might have become as different from English as French is from Italian. But the settlement occurred after the invention of printing, and continued through a period when the idea of educating everybody was making rapid progress. For a long time most of the books read in America came from England, and a surprising number of Americans read those books, in or out of school. Moreover, most of the colonists seem to have felt strong ties with England. In this they were unlike their Anglo-Saxon ancestors, who apparently made a clean break with their continental homes.

A good many Englishmen and some Americans used to condemn every difference that did develop, and as recently as a generation ago it was not unusual to hear all "Americanisms" condemned, even in America. It is now generally recognized in this country that we are not bound to the Queen's English, but have a full right to work out our own habits. Even a good many of the English now concede this, though some of them object strongly to the fact that Americanisms are now having an influence on British usage.

There are thousands of differences in detail between British and American English, and occasionally they crowd together enough to make some difficulty. If you read that a man, having trouble with his lorry, got out his spanner and lifted the bonnet to see what was the matter, you might not realize that the driver of the truck had taken out his wrench and lifted the hood. It is amusing to play with such differences, but the theory that the American language is now essentially different from English does not hold up. It is often very difficult to decide whether a book was written by an American or an English man. Even in speech it would be hard to prove that national differences are greater than some local differences in either country. On the whole, it now seems probable that the language habits of the two countries will grow more, rather than less, alike, although some differences will undoubtedly remain and others may develop.

It also seems probable that there will be narrow-minded and snobbish people in both countries for some time to come. But generally speaking, anybody who learns to speak and write the standard English of his own country, and to regard that of the other country as a legitimate variety with certain interesting differences, will have little trouble wherever he goes.



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### **Ufa am Vorabend der internationalen Gipfeltreffen BRICS und SOZ-2015 (Уфа накануне международных саммитов БРИКС и ШОС-2015)**

Im Artikel geht es um die wichtigen Ereignisse auf dem Gebiet der Politik und Wirtschaft, die die Hauptstadt der Republik Baschkortostan betreffen. Ich habe ein besonderes Interesse dafür, weil ich an der Fachrichtung Tourismus studiere und ich glaube, dass diese Ereignisse viele Touristen nach Ufa anlocken können.

Die Gipfeltreffen finden am 8.-10. Juli 2015 in Ufa statt. BRICS ist eine Abkürzung von 5 Ländern: Brasilien, Russland, Indien, China und Südafrika. SOZ ist auch eine Abkürzung von Schanghaier Organisation für Zusammenarbeit. Eine ihrer Hauptaufgaben ist Aufnahme der Strategie der Entwicklung der Schanghaier Organisation für Zusammenarbeit.

Die Gipfeltreffen sind nur Förderer einiger Prozesse in unserer Hauptstadt. Dazu gehört zum Beispiel Bau von Hotels, Erneuerung des Flughafens und der Kultureinrichtungen.

Die Rekonstruktion des internationalen Flughafens Ufa soll die Kapazität dreimal erhöhen. Außerdem baut man die zweite Start-und Landebahn für große Cargo- und Passagierflugzeuge. Das alles macht unseren Flughafen zu einem modernen und komfortablen internationalen Flughafen. Er bleibt auch nach dem Gipfeltreffen bestehen und wird von Bewohnern und Gästen unserer Republik benutzt.

Wichtig ist auch die geistige Zusammenwirkung der Länder von BRICS und SOZ. Dazu gehören internationale Festspiele, wissenschaftliche Konferenzen, Kunstausstellungen, Geschäfts- und Journalistentreffen. Das alles bereichert unser Wissen davon, wie die Menschen in anderen Ländern leben, wir können neueste Errungenschaften in innovativen Bereichen kennen lernen und internationale Kontakte knüpfen. Es ist eine gute Möglichkeit, zu einem Teil der Weltkultur zu werden.

Die Gipfeltreffen spielen eine große Rolle für den Tourismus. In Ufa gibt es viele Orte, die die Gäste besuchen werden. Das sind Salavat-Julaev-Denkmal, Theater, Museen, Paläste und viel anderes.

Die Gipfeltreffen werden bestimmt im Fernsehen verfolgt und Ufa wird in der ganzen Welt bekannt sein. Wir glauben, viele Touristen aus der ganzen Welt werden dann den Wunsch haben, unsere Stadt zu besuchen. Das wird unseren Tourismus weiter entwickeln und auf die internationale Szene bringen.

Wir hoffen, dass alles, was zur Vorbereitung auf die Gipfeltreffen gemacht wird, unserer Republik großen Nutzen bringt.

### **Traditions and customs of Singapore** **(Традиции и обычаи Сингапура)**

Singapore is popular because of the way it has economically evolved and progressed and at the same time preserved its age-old traditions and customs. Though it appears extremely modern and polished from the outside, the local customs and traditions in Singapore are still dominant there, kept alive by the older generations. Owing to the presence of diverse religions and ethnicities such as the Indians, the Malays and the Muslims, there is a kaleidoscope of diverse local customs and traditions in Singapore.

Some of the local customs and traditions in Singapore are like to always present the business card with both hands and not have the card in black, which is an inauspicious color for the Chinese people. The custom in Singapore is generally not to adapt to handshakes as greetings, but other forms such as bowing, salaaming, saluting etc. Another popular custom in Singapore is that the people here enter barefoot inside their homes and shoes are removed outside as a sign of respect. There are many other local customs and traditions in Singapore that vary from religion to religion. The different religions in Singapore respect the traditions and customs of each other and thus contribute to the stability of the multi-cultural society of Singapore.

The culture in Singapore is defined by the different ethnic groups in the city state. Chinese, Malay, Indian, and Western influences are all palpable there, making for a mix of traditions and local customs. This diversity of the culture in Singapore is also reflected in the many languages spoken there, including English, Chinese, Malay, and Tamil.

#### **Singapore: A “Fine” City**

Culture in Singapore is largely defined by peace, justice, and social and religious harmony. The saying that Singapore is a “fine” city, not only refers to its cleanliness or its quality of life. In fact, to ensure safety and order in the state, the government has prohibited various things. If you do not want to pay a heavy fine or even spend time in jail, you should avoid the following:

- chewing gum
- spitting
- littering
- jay walking
- dancing on counters or tables at a bar
- smoking indoors
- drinking and driving
- public drunkenness

- taking drugs

Keep in mind that the last point is particularly serious. It is enough to carry even a small amount of specific drugs to face the death penalty.

Despite its small size, the local customs and culture in Singapore are unique and a mixture of various ethnic influences. All this has its roots in the country's history as a trading hub.

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### **The Sherlock Holmes' Museum (Музей Шерлока Холмса)**

In the 1880s a young doctor sat in his office waiting for new patients. To pass the time, he wrote stories about a man who was very good at solving crimes. These stories were so popular that the doctor decided to give up medicine and become a writer instead. The doctor was Arthur Conan Doyle and his creation was Sherlock Holmes.

Holmes and his famous friend Doctor Watson shared rooms at 221b Baker Street.

Their landlady was the long-suffering Mrs. Hudson. She had to put up with strange visitors, revolver practice indoors, chemical experiments and late-time violin playing.

In 1990, a museum was at last opened at 221b Baker Street, though it should have happened long ago. After all, it is the world's most famous address and people have been writing to it for more than 100 years.

In The Sherlock Holmes' Museum you step back a hundred years in time. It is unique. There is no modern virtual reality. There are no horrors, no mummies or hidden corpses, no wax figures... Even more, the atmosphere of this quiet house is electric. You have a feeling the great detective had just left the room for a moment with Dr. Watson, and Mrs. Hudson is somewhere in the backrooms, and you'll see her entering the room with a tray of tea cups.

Everything in the museum reminds us of the stories we know so well. It contains things which Holmes and Watson would have had — Holmes' violin, his deerstalker and pipe, the Persian slipper in which he kept his tobacco, unanswered letters pinned to the wall with a knife, his magnifying glass... Dr. Watson's diary contains handwritten notes and extracts from "The Hound of the Baskervilles".

The Sherlock Holmes' Museum is unlike other museums. Very little here is locked up in glass cases. You can sit in Holmes's armchair by the fireplace, you can examine his things and put on his deerstalker. Except that you can't smoke his pipe!

People have been writing to this address for the last 100 years. Most letters come from the United States and many correspondents ask if Mr. Holmes can help them with some problem, such as finding a missing relative (or a pet). Greeting cards arrive at Christmas and on Holmes' birthday (he was born on January, 6th).

Although the stories were written more than a century ago, the popularity of the characters hasn't faded away even today. The love and admiration of thousands of people all over the world show that Sir Arthur Conan Doyle was a man of extraordinary genius and sharp intelligence.

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### **The Sherlock Holmes' Museum (Музей Шерлока Холмса)**

London is the main Britain's tourist attraction. The city is known for its ancient cathedrals, churches and particularly for its art museums and galleries. London is a real treat for museum lovers. There are many museums and art galleries open to the public in Britain. These include the major national collections and a wide variety of municipally and independently owned institutions. There are hundreds to choose from, including the British Museum, the Science Museum and the Natural History Museum. London is also home to some unique and diverse museums too such as the Cartoon Museum, London Transport Museum, London Motor Museum, Pollock's Toy Museum and the Sherlock Holmes' Museum.

Sherlock Holmes and Doctor John H. Watson lived at 221b Baker Street between 1881-1904, according to the stories written by Sir Arthur Conan Doyle. In 1990, a museum dedicated to the famous fictional detective Sherlock Holmes, was at last opened at 221b Baker Street, though it should have happened long ago. After all, 221b Baker Street is the world's most famous address and people have been writing to it for more than 100 years.

In The Sherlock Holmes' Museum, you step back a hundred years in time. It is unique. There is no modern virtual reality, but it is all virtually real. There are no horrors, no mummies or hidden corpses, no wax figures... Even so, the atmosphere of this quiet house is electric. You have a feeling as if the great detective had just left the room for a moment with Dr. Watson, and Mrs. Hudson is somewhere in the backrooms, and you'll see her entering the room with a tray of tea cups.

Everything in the museum reminds us of the stories we know so well. It is filled with things which Holmes and Watson would have had — Holmes' violin, his deerstalker and pipe, the Persian slipper in which he kept his tobacco, unanswered letters pinned to the wall with a knife, his magnifying glass... Dr. Watson's diary contains hand-written notes and extracts from "The Hound of the Baskervilles".

The Sherlock Holmes' Museum is unlike other museums. Very little here is locked up in glass cases. You can sit in Holmes's armchair by the fireplace; you can examine his things and put on his deerstalker. However, please bring your own pipe to smoke!

People have been writing to this address for the last 100 years. Most letters come from the United States and many correspondents ask if Mr. Holmes can help them with some problem, such as finding a missing relative (or a pet). Greeting cards arrive at Christmas and on Holmes' birthday, (he was born on January, 6th). Dr. Watson is not forgotten either.

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### **Straßennamen in Deutschland** **(Названия улиц в Германии)**

Unser Artikel berichtet von einigen Straßennamen und Regeln für ihre Benennung. Wenn eine neue Straße gebaut wird und einen Namen braucht, kann jeder einen Vorschlag machen. Man muss einfach nur einen Brief ans Rathaus schicken. Die Vorschläge werden dort gesammelt und besprochen. Eine Straße kann nach Flüssen, Blumen, Bäumen oder Gebirgen benannt werden oder nach wichtigen Persönlichkeiten.

Es gibt bestimmte Regeln für Straßenbenennungen. Wichtig ist, dass sie nicht zu Verwechslungen führen, sonst weiß der Taxi-Fahrer nicht, wo er hinfahren soll und die Briefe werden in die falsche Straße geschickt. Eigentlich sollten die Namen auch nicht zu lang sein, weil das nervt. Aber neuerdings werden immer mehr Straßen nach berühmten Frauen benannt. Die letzten zweihundert Jahre hat man die Frauen nämlich stark vernachlässigt. Damit man auch erkennt, dass es ein Frauenname ist, wird immer der Vorname mitverwendet. Dadurch werden die Straßennamen länger. Und es gibt auch immer mehr Doppelnamen, das macht die Schilder auch noch länger. Wichtig ist auch, dass der Straßename die Bewohner der Straße nicht beleidigt. Es wird niemals einen "Deppenweg" oder eine "Idiotenstraße" geben.

Meistens werden die Namen so gewählt, dass sie irgendwie zusammenpassen. So entstehen dann ganze Viertel mit Straßen, die alle nach Dichtern benannt sind, oder es gibt ganz viele Straßen nebeneinander, die alle Namen wichtiger Physiker tragen. Es existieren Straßen, wo Namen der Märchenfiguren herrschen. Da mündet dann der *Schneewittchenweg* in den *Rotkäppchenplatz* und die *Dornröschenstraße* kreuzt die *Rumpelstilzchenstraße*.

Der häufigste Straßename in Deutschland ist "*Hauptstraße*". Davon gibt es 7630. Gleich danach kommt "*Dorfstraße*". Außerdem wimmelt es von

*Bahnhofstraßen, Kirch-, Garten-, Berg- und Lindenstraßen.*

Zum Glück findet man immer auch ein paar lustige Namen: zum Beispiel die "*Fröhliche Türkenstraße*" in Regensburg. Und in mehreren Dörfern in Deutschland gibt es tatsächlich eine Straße mit dem Namen "*Blaue Pfütze*".

Ziemlich oft kann man am Straßennamen erkennen, was in der Nähe passiert ist. Die *Papa-Schmid-Straße* in München zum Beispiel ist gleich neben dem Marionettentheater. Papa-Schmid nannte man den Mann, der es gegründet hat. Nicht weit davon gibt es die Straße "*Lueg ins Land*". Dort gab es früher einen Wachturm, von dem aus man ganz weit ins Land lugen, also spähen konnte. *Zahnbrecherweg* bedeutet in keinem Falle, daß da jemandem die Zähne herausgebrochen oder ohne Narkose gezogen werden, sondern es gab mal einen Politiker, der so hieß.

Die Welt der Straßennamen ist sehr vielseitig und interessant. Da können verschiedene Forschungen durchgeführt werden.

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### **Neologisms in English** **(Неологизмы в английском языке)**

A neologism is a newly coined term, word or phrase, which may be in the process of entering common use, but has not yet been accepted into mainstream language. The cause of neologisms is a public scientific and technological progress: the emergence of new social and economic realities, the discoveries in the field of science and technology achievements in the sphere of culture.

The ways of formation of neologisms in English:

1) Affixal way (prefixal and suffixal) - is more common in daily communication and is used as "slang" - **mega** prefix (the word **megastar** (totally awesome) is something extremely good), - scientific terms: for example, a suffix - **on** (**gluon** - a new elementary particle in physics). Affixal way is one of the most productive ways of new word formation. 127 prefixes and suffixes of Latin origin prevail in the formation of new words. These are **agri-**, **anti-**, **cardio-**, **counter-**, **geo-**, **hemi-**.

Among the most productive prefixes are **anti-**, **co-**, **de-**, **non-**, **post-**, **pre-**, **re-**, **sub-**, **in-**, **bio-**. One of the most popular is mega- that is used as an intensifying particle (mega-university).

Semisuffixes such as **-aholic/-holic** or **-oholic** are also often used (ex: **workaholic**, **chocoholic**, **bookaholic** etc.)

2) Compounding is the most common method of derivation. For example: think-tank - «collective brain»; netiquette – «unwritten rules of communication in Internet».

3) Conversion is a transition of the word from one part of speech to another. For example: E-mail me / us to (E-mail (electronic mail)).

4) Scientific progress is one of the reasons of neologism emergence. The spheres where neologisms are mostly registered: information technologies (superminicomputer- an advanced powerful minicomputer), education (CLASS - Computer-based Laboratory of Automated School System), medicine (SIDS- sudden infant death syndrome).

5) Euphemistic neologisms are popular in English. Such words are used to substitute indelicate or unpleasant words. Most of euphemisms were coined according to politeness principle. Euphemisms are used to mitigate age discrimination (the middlence, the senior, the mature); to describe mentally handicapped or physically disabled people (physically different, handicapable); to describe people of low income (the neediest, the needy, the ill-provided).

In conclusion, it may be emphasized that, English is in constant changes and dynamics. Vocabulary is the most mobile stratum of language, the most responsive to the changes in the social, cultural and other spheres.

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### **The Outstanding Personality of Winston Churchill** **(Выдающаяся личность В.Черчилля)**

Born at Blenheim Palace, in Oxfordshire, Winston Churchill was a descendant of the first famous member of the Churchill family: John Churchill, 1st Duke of Marlborough.

Being the son of a prominent politician it was unsurprising that Churchill was drawn into politics himself. He started speaking at a number of Conservative meetings in the 1890s.

Later he became a war correspondent in the second Anglo-Boer war between Britain and self-proclaimed Afrikaaners in South Africa. He was captured in an ambush of a British Army convoy, but managed to escape.

At the beginning of the World War II Churchill was appointed First Lord of the Admiralty. After Chamberlain's resignation in May, 1940, Churchill was appointed Prime Minister and formed an all-party government. In response to previous criticisms that there was no single minister in charge of the prosecution of the war, he created and took the position of Minister of Defense. He immediately put his friend, the industrialist and newspaper baron Lord Beaverbrook in charge of aircraft production. It was Beaverbrook's astounding business acumen that allowed Britain to quickly increase aircraft production and engineering that eventually made the difference in the war.

Although the importance of Churchill's role in World War II was undeniable, he produced many enemies in his own country. He neglected such problems as public

health care and better education for the majority of the population. This produced much dissatisfaction among the population, particularly those who had fought in the war. Immediately after the end of the war in Europe Churchill was defeated at election by Clement Attlee and the Labour Party.

In 1951 Churchill again became Prime Minister and headed the British government until his resignation in 1955. During this period he renewed the "special relationship" between Britain and the United States, engaged himself in the formation of the post-War order.

On January 15, 1965 Churchill suffered a stroke — a severe cerebral thrombosis — that left him gravely ill. He died nine days later on January 24, 1965. A state funeral service was held at St Paul's Cathedral. This was the first state funeral for a commoner since 1914.

At Churchill's request, he was buried in the family plot at Saint Martin's Churchyard, Bladon, near Woodstock, Oxfordshire, England.

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### **What does it mean? (Что бы это значило?)**

While travelling, tourists face some expressions which mislead them. The direct translation of these expressions doesn't coincide with their real meaning. Sometimes you guess the real meaning of the written words but sometimes you have a question "What does it mean?"

#### **1. What is a Butt Stop?**

Butt Stop/Smoking Area. It is a sign that designates a smoking area. In such an area you can see a middle sized metal box similar to our mail boxes. It hangs on the wall outside a building in those places where smoking is not prohibited. In North America, smoking is prohibited almost everywhere inside the buildings, offices and houses. You may smoke only out of doors in specially designated areas marked with a *Butt Stop* sign with a metal box on the walls or a specially designed bin on the ground. After finishing smoking, you should put you cigarette butts inside these boxes or bins. It is forbidden to dispose of cigarette butts anywhere else. Sand is put inside those boxes and bins to help extinguish glowing cigarette butts.

#### **2. A Building Pass**

It is a plastic card with a magnetic stripe that allows you enter a building or an office.

#### **3. Empty Nesters**

These are people whose grown-up children have left home leaving their bedrooms empty.



#### 4. Happy Hours

It takes place at some bars and cafes between approximately 5 and 8 p.m. *Happy Hour* means hors d'oeuvres, *Finger Foods* and drinks are at a discounted rate and, in some cases buffet food is free or inexpensive during this time. *Happy Hour* is chance to eat a cheap meal. It is done for the purpose of promotion for bars and cafes if they want to attract customers.

#### 5. High Rise

It is building with many stores.

#### 6. Sandwich Man

A company can hire a person to carry a *Sandwich Board* for advertising. This type of advertising consists of two hinged boards that hang front and back from the shoulders of a person who walks back-and-forth as a walking advertisement. It is supposed to draw the attention of potential consumers, as it is large moving board that many pedestrians have to avoid on the sidewalks.

If you like to travel across the countries, keep in mind the expressions and learn (or better – study) the foreign language to avoid misunderstanding and unpleasant situations in the time spent in other countries. And you won't feel yourself as you are from the other planet.

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### **Mein Lieblingsfest in Deutschland ist Karneval (Мой любимый немецкий праздник - карнавал)**

Der Fasching hat einige Benennungen - Fastnacht, Narrenfest, weil in verschiedenen Landschaften dieser Tag unterschiedliche Bedeutung hatte.

Der Karneval ist ein schönes Fest, wenn alles lacht und jubelt. Man nennt dieses Fest nicht zufällig die „Fünfte Jahreszeit“. In Südwestdeutschland wird Karneval Fastnacht und im Münchener Gebiet Fasching genannt. Die Karnevalsbräuche haben sich aus dem katholischen religiösen Leben entwickelt. Über die italienischen Städte kamen sie nach Deutschland und sind im katholischen Süddeutschland und Rheinland erhalten. Der heutige Fasching ist ein Rest eines uralten Frühlingsfestes: Die Götter schenken der Erde und dem Vieh Fruchtbarkeit. Der traditionelle Fasching ist lokal begrenzt.

Im heutigen Deutschland ist der Karneval in Köln besonders bekannt.

Für die traditionelle Fastnacht sind Maskenumzüge (Dämonen, Scherz- und karikaturistische Masken) und besondere Spiele (Schlagen, Geldsammeln, Spaßmachen, Faschingsrennen und Tänze) üblich.

Traditionsgemäß treten jedes Jahr am 11. 11. (also, noch am 11 November des alten Jahres) um 11.11 Uhr die Vorstände und Elferäte zur Intronisierung des

Prinzenpaares der närrischen Saison zusammen. Die Elferratssitzung wird vom Präsidenten eröffnet.

Nach alter Tradition beginnt die Vorbereitung zu den Karnevalen und Maskenbällen 2 Monate im Voraus.

Die letzten drei Tage der närrischen Saison sind die eigentlichen Tage des Karnevals, wobei der Fastnachtsonntag, Rosenmontag Fastnachtdienstag die Hauptfesttage sind.

Zu den Faschings-Veranstaltungen in den drei letzten Tagen gehören auch lustige traditionelle Spiele: Fußballspielen, Karnevals-renne.

Tausende fröhliche Menschen aus nah und fern drängen sich jedes Mal zur Fastnacht in den Straßen der deutschen Städte, um den großen, immer originellen Karnevalszug zu bewundern.

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### **Modern trends in travel industry (Современные тенденции в туристической индустрии)**

Just as destinations can rise and fall in popularity, so can the activities and tours you take while on holiday.

A decade or so ago, bungee jumps and skydives were the activity to take while on a trip, the adrenaline-packed punch that was the crowning glory of your overseas adventure, while also making you the envy of friends and family when you got home.

Nowadays, people are more surprised if you haven't jumped out of a plane or off a bridge upon your return home. And the same goes for tours too.

So, to reveal some modern trends in travel industry the survey has been conducted.

100 students from the Bashkir State Agrarian University (48 women and 52 men) took part in the poll. They were asked to express their opinion about the type of tourism they would prefer. The results are the following:

- traditional tourism - 23 %;
- Tolkien tourism - 21 % (The Lord of the Rings is a cultural and pop phenomenon with millions of fans and fanatics all over the world. So, New Zealand became the ultimate country of attraction because it was the main location of the film series by Peter Jackson);
- war tourism - 17 % (Tourists visit an active war zone to experience what it's like to be in the middle of bombs, bullets, and grenades);
- fertility tourism - 10 % (A subset of what is known as medical tourism. Thousands of couples every year, most from advanced countries, travel to find the

perfect donor. Various statistical studies seem to suggest that the countries populated by tall, blond, blue-eyed men are strongly favored over nations that don't have men like this);

- atomic tourism - 7% (Curious tourists fascinated with the Atomic Era visit places important to the history of the Atomic Age, places where significant incidents related to atomic power took place);

- drug and shark tourism - 5 % (Nowadays the destinations for drug tourism are pretty well established — even mainstream. Every year the infamous Dutch Cannabis Cafés attract a couple of million young people from around the world. As for shark tourism, it appeals to all these people who love sharks and their bloody jaws);

- dark, halal and suicide tourism - 4 % (Dark tourism revolves around anything that has to do with death, disaster, tragedy, and in a few cases, even the afterlife).

It's interesting to note that only guys voted for Fertility Tourism because they took it for sex tourism. But most people still prefer traditional tourism and last year professional practice in Turkey proves it.

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### **Trafalgar Square**

**(Трафальгарская площадь)**

Trafalgar Square, the home to Nelson's Column and a host of other historic monument, is located in the city of London. It was originally constructed to commemorate the Battle of Trafalgar which was a victory in the war against Napoleon. From the 14th to the late 17th century, much of the area occupied by Trafalgar Square was the courtyard of the Great Mews stabling, which served Whitehall Palace. In 1812 the architect John Nash wanted the area to be a cultural space, open to the public. In 1830, it was officially named Trafalgar Square.

One of the most prominent structures at Trafalgar Square in London, Nelson's Column designed by William Railton was erected in 1843 and commemorates the death of Admiral Horatio Nelson at the Battle of Trafalgar in 1805. The statue is 18 feet tall, and rests atop a column that rises 183 feet above Trafalgar Square in London. In 1845, the fountains were built based on designs thought to be by Sir Charles Barry. In 1867 Sir Edwin Landseer designed the bronze lions placed on guard at the base of Nelson's Column. The statue of Nelson faces south toward Westminster Palace. Nelson was a much loved military hero in his day.

The National Gallery occupies the north side of Trafalgar Square. It was built in 1838 to house the growing national collection of Art and to be a venue comparable

with other national art galleries, such as the Louvre in Paris. The pictures, most of which used to belong to private collectors, have been either bought or gifted to the collection. The collection of over 2000 paintings contains some of the world's greatest works of art.

On the east side is South Africa House, with African animals featured on the stone arches, which currently serves as the embassy for South Africa to Britain. Sir Robert Smirke, who designed the British Museum, also created Canada House on the west side. Now open to the public, Canada House is worth visiting to enjoy the original classical interior and to see the interesting changing exhibitions on view.

Trafalgar Square today is still the place of many political demonstrations. Demonstrators are known to gather around the base of Nelson's column trying to gain attention for their cause. The square is also an appealing spot for New Year's Eve revelers who wish to dive into the Trafalgar Square Fountain while much of the world watches on TV. One of the unforgettable sights of London is to see the giant tree at night, when it is lit by hundreds of twinkling fairy lights, carol singers grouped around while floodlights illuminate the sparkling water in the fountains of the square. It is also famous for its collection of pigeons, and tourists spend time feeding the pigeons of Trafalgar Square. A well known photograph of Elizabeth Taylor from 1948 features Elizabeth posing in Trafalgar Square feeding pigeons.

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### **Hunter College (Хантер Колледж)**

Hunter College, located in the heart of Manhattan, is the largest college in the City University of New York (CUNY). Founded in 1870, it is also one of the oldest public colleges in the country. Currently more than 23,000 students attend Hunter, pursuing undergraduate and graduate degrees in more than 170 fields of study.

In addition to offering a multitude of academic programs in its prestigious School of Arts and Sciences, Hunter offers a wide range of programs in its preeminent Schools of Education, Nursing, Social Work, Health Professions and Urban Public Health.

Hunter students are strongly committed to higher education. More than a half of the students have no support from the parents, jobs and more than a third are the first in their families to attend college, and despite the challenges they face, their level of academic achievement is extremely high. Many go on to top professional and graduate programs, winning Fulbright scholarships, Mellon fellowships, National Institutes of Health grants, and other distinguished honors.

Hunter College receives grants from such prestigious institutions as the National Institutes of Health, the National Science Foundation, and the National Endowment for the Humanities, and they contribute to the most important professional journals in their fields.

The fact that I am interested in this college is not accidental. My sister worked at this college by the program Fulbright. She participated in the competition and won a grant. She has taught at the college for a year. She had the free opportunity to attend any courses. She received a great experience, and also got additional education free of charge.

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### **Youth projects and exchanges as personal fulfillment**

**(Молодежные проекты и обмены как способ самореализации человека)**

There are many youth projects carried out by different countries. This paper focuses on international youth exchanges – short-term projects for young people from different countries aged 16 to 30. These projects can be at least between the two countries, but usually involve 4 countries and more.

The goals of youth exchanges are:

- Promotion of fundamental values among young people, in particular, respect for human dignity, equality, respect for human rights, tolerance and non-discrimination, including young people with disabilities;
- Promotion of mobility among young people in the world;
- Development of intercultural learning in the field of youth;
- Encouragement of initiative, enterprise and creativity;
- Provision of formal and informal learning and creating innovative opportunities in connection with active citizenship, especially for young people with fewer opportunities.

The themes of youth projects are various. Youth Exchange must have a thematic concept, which partner groups wish to explore together. The chosen theme should be expanded to specific everyday activities. Examples of topics: youth participation in society, the fight against racism and xenophobia, inter-ethnic and inter-religious dialogue, post-conflict reconstruction and solutions, historical heritage and the environment.

Young people gather in one of the countries to discuss any topic – be it environmental issues, equality, employment, and any other relevant for young people. Typically, the project will organize workshops, master classes or other training. Young people are expected to make a presentation about the situation in their country, share their views and experience. As a group they create some product:

express their vision of the theme in a creative way –in the form of concerts, theater performances for the local audience, photos and so on.

Basically youth projects are conducted in the following areas:work with youth and social work; language and support in learning the language; youth entrepreneurship; man, nature, technology; Arts, Culture and Media; professional world; training / internship; sports and adventures; politics and history; labor camp; Religion.

So, these projects are a great opportunity for youth development itself.It is also a chance to communicate with people from another country and to practice the language (most projects are conducted in English).

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### **Johann Peter Gustav Lejeune Dirichlet**

**(Йоганн Петер Густав Дирихле)**

Johann Peter Gustav Lejeune Dirichlet (geboren am 13. Februar 1805 in Düren; gestorben am 5. Mai 1859 in Göttingen) war ein deutscher Mathematiker.

Mit zwölf Jahren besuchte Dirichlet zuerst ein Gymnasium in Bonn, das heutige Beethoven-Gymnasium. Im Alter von 16 Jahren erlangte Dirichlet die Hochschulreife. Einer seiner Mathematiklehrer auf dem Gymnasium in Köln war Georg Simon Ohm.

Im Mai 1822 begann er ein Mathematikstudium in Paris und traf dort mit den bedeutendsten französischen Mathematikern dieser Zeit zusammen – unter anderem Biot, Fourier, Francoeur, Hachette, Laplace, Lacroix, Legendre und Poisson. Durch Fouriers Vermittlung verschaffte ihm Alexander von Humboldt 1827 seine erste Stelle als Dozent in Breslau und zog ihn 1828 nach Berlin. Hier unterrichtete er zunächst an der allgemeinen Kriegsschule und später lehrte er an der Bauakademie. 1832 wurde er zum Mitglied der Preußischen Akademie der Wissenschaften gewählt.

Dirichlet heiratete am 22. Mai 1832 Rebecka Henriette Mendelssohn, die Schwester der Komponistin Fanny Hensel und des Komponisten Felix Mendelssohn Bartholdy.

1855 trat er in Göttingen als Professor der höheren Mathematik die Nachfolge von Carl Friedrich Gauß an. Diese Position hatte er bis an sein Lebensende 1859 inne.

Dirichlet forschte im Wesentlichen auf den Gebieten der partiellen Differentialgleichungen, der bestimmten Integrale und der Zahlentheorie. Er verknüpfte die bis dahin getrennten Gebiete der Zahlentheorie und der Analysis.

Dirichlet-Reihen sind als Verallgemeinerung der Zetafunktion nach ihm benannt. Nach ihm benannt ist der dirichletsche Einheitensatz über Einheiten in

algebraischen Zahlkörpern. Seine neue Art von Betrachtungen der Potentialtheorie wurde später von Bernhard Riemann verwendet und weiterentwickelt. Seine Vorlesungen über Zahlentheorie wurden nach seinem Tod von Richard Dedekind herausgegeben und mit einem berühmten eigenen Anhang versehen.

Seine Erfolge verteilen sich in gleicher Weise auf die Theorie der binären quadratischen Formen, das Problem der Primzahlen in gewissen arithmetischen Folgen, die höheren algebraischen Zahlen, die Anwendung analytischer Funktionen auf arithmetische Probleme, die Theorie der unendlichen Reihen und die mathematische Physik mit der Potentialtheorie.

Von seinen Schülern sind besonders zu erwähnen G. Eisenstein, B. Riemann, L. Kronecker, R. Dedekind und R. Lipschitz.

An der Weierstraße 17 in Düren, wo Dirichlets Geburtshaus stand, erinnert eine Gedenktafel an Dirichlet. Der Dirichletweg in Düren ist nach ihm benannt.

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### **Der Karneval – die fünfte Jahreszeit in Deutschland (Карнавал – пятое время года в Германии)**

Als Karneval (regional auch Fasching, Fassenacht, Fasnacht, Fasnet, Fosnet, Fastelov(v)end genannt) bezeichnet man die Zeit der Ausgelassenheit und Fröhlichkeit und überschäumenden Lebensfreude vor Beginn der österlichen Fastenzeit. Sie beginnt in Deutschland schon am 11. November um 11:11 Uhr und dauert bis zum Aschermittwoch.

Die Ursprünge des Karnevals reichen weit bis ins Mittelalter und haben mit Ostern zu tun, dem Fest, an dem die Christen der Kreuzigung und Auferstehung Jesu gedenken. Vor Ostern aber sollten die Gläubigen fasten, d.h. kein Fleisch essen. So taten Christen Buße und stellten ihren Glauben unter Beweis. Während die Fastenzeit anfangs nur wenige Tage dauerte, war sie bis zum 11. Jahrhundert auf fast sieben Wochen ausgedehnt worden, vom Aschermittwoch bis zum Ostersonntag.

Kein Wunder, dass irgendwann irgendwer auf die Idee kam, es noch einmal richtig krachen zu lassen, bevor das Fasten begann. Von Italien aus verbreitete sich dieser neue Brauch. Von dort stammt auch sein Name: "Carnevale" bedeutet so viel wie "Fleisch, leb wohl!"

Dieses Ereignis wird in Deutschland auch "die fünfte Jahreszeit" genannt. Es bietet Karnevalszüge und farbenfrohe Umzüge und viel Spaß. Die wichtigsten Zentren des Karnevals in Deutschland sind Städte wie Köln, Düsseldorf und Mainz. In anderen Städten wird es auch zur Mode, wie beispielsweise im Zentrum von München in Bayern.

Kostüme und Masken dienten ursprünglich einem Vorhaben: Man wollte den bösen Winter verjagen, dem man die Schuld an einer schlechten Ernte gab. Gleichzeitig wollte man die guten Frühlingsgeister wecken. Das sieht unserer Meinung nach dem russischen Brauch der Butterwoche ähnlich aus.

Eingeleitet wird die Faschingszeit häufig durch den weit verbreiteten Brauch der Fastnachtserweckung: Hierzu wird eine Strohuppe entweder aus einem Brunnen gezogen oder aus einem Grab geholt. Begleitet wird das Ritual in der Regel durch eine Fastnachtsrede.

Der Rosenmontagsumzug stammt ursprünglich aus Köln. Jedes Jahr überlegt man sich in Köln ein neues Motto. Nach diesem Motto schmückt sich dann der Kölner Festwagen. Fest an Bord sind Prinz, Bauer und Jungfrau, die das Kölner Freigestirn bilden. Ein anderer fester Bestandteil des Karnevals sind Büttenreden.

In der Nacht zum Aschermittwoch wird der Karneval beendet.

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### **English gardens and gardeners (Английские сады и садоводы)**

The earliest English gardens that we know of were planted by the Roman conquerors of Britain in the 1st century AD. We know very little about the gardens of Anglo-Saxon England, which is another way of saying that the warlike Anglo-Saxons probably did not hold gardening to be important. It was not until the Middle Ages that gardens once more became important in British life.

Elizabeth gardens were planned almost as carefully as the house itself. All was neatness with straight walks and flower –beds. Covered walks, bushes cut in fantastic shapes, fountains and lawns were all arranged with trim accuracy. Travellers brought new plants from abroad. The herb garden was of great importance to the housewife.

In the 16<sup>th</sup> century British gardeners looked to the continent for inspiration and learned much from the Dutch and Italians in creating formal gardens. Topiary came from Italy and was adopted in gardens like Hampton Court.

Neat geometrical lawns, parallel lines of trees, a long straight drive and formal statuary – these were some of the characteristics of the classic 17<sup>th</sup> – century gardens. Unfortunately, many of them have gone and they are known only from plans and illustrations.

Britain's greatest contribution to the art of gardening was the 18<sup>th</sup> – century movement back to nature. They began to cut down the formal avenues and break up the terraces. In their place they made gardens, using only the beauties of countryside, the trees, rivers and lakes. The wealthy landowners could afford to develop their gardens on a grand scale, creating lakes and forests.



Passion for gardening in Great Britain brought forward many distinguished garden designers. Among them was William Kent. Formal flower –beds have been replaced by a lake, temples, ruins and statues to form what he called “landscape pictures”. Kent’s most famous pupil was Lancelot Brown. He is the most outstanding of all the landscape gardens of the 18<sup>th</sup> century. He carried out much of the work planned by William Kent.

Brown’s greatest power was probably his management of water, and he created many “natural lakes”.

The next generation saw a return to more contained styles introduced by Humphry Repton, a talented painter. In his garden designs he retained the wide spaces, but renewed flower – beds and terraces near the house.

More modest gardens sprang up around the smaller country houses of the landowners. The gardens also reflected a growing interest in flower – beds. Formal lawns, previously cut with scythes, became suddenly very popular among ordinary gardeners with the invention of Budding’s lawn – mower in 1830. Although the task of keeping a garden is so essentially individual, for many people in Britain gardening is the basis of social and competitive relations.

**Мамиляева Сюмбель**

БашГУ, ФТИ, 1 курс

Консультант по английскому языку:

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### **The adequacy of the translation of proverbs from English into Russian and Bashkir**

**(Адекватность перевода пословиц с английского на русский  
и башкирский языки)**

Proverbs are the objects of many researches. The comparison of proverbs of different peoples shows how much these people have in common, which, in turn, contributes to their better understanding and rapprochement. The proverbs reflect a great historical experience of the people, their wisdom and representation, associated with their work, life, traditions and culture. Correctly and properly used proverb gives the speech unique originality and particular expressiveness.

The theme of our research work is «The adequacy translation of proverbs from English into Russian and Bashkir». The subject of our work is «The adequacy of the translation of proverbs from English into Russian and Bashkir». The hypothesis of our research is the following: knowing the proper basic principles of translation of proverbs from English into Russian and Bashkir one can improve the whole impression of foreign language and be able to read, translate and speak English correctly. To test the hypothesis and to achieve the goal of our research work I we had the following tasks to do: define the meaning of the proverbs, to define the adequacy of the translation of English, Russian and Bashkir proverbs, to establish the causes of

problems in translation of English, Russian and Bashkir proverbs, to show the ways of solving the problems of translation difficulties, to compare different types of translation, to demonstrate the link between the cultures of three nations in proverbs, to set the most commonly and frequently used types of translation. There are some examples of translation of proverbs: 1. Seeing is believing. Лучше раз увидеть, чем сто раз услышать. Ишеткэн менэн кургэн бер тугел. 2. There is no smoke without fire. Нет дыма без огня. Елисмэй, япрак хелкенмэй. 3. To kill two birds with one stone. Убить двух зайцев одним выстрелом. Бер атыуза ике куян.

After having analyzed a lot of English, Russian and Bashkir proverbs we came to the following conclusions: We use proverbs in our life to express our attitude to some side of a life phenomenon or human behaviour in a brief, expressive form; the basic translating principles are adequacy, inadequacy and equivalence; The most frequent principle used in translation of proverbs from English into Bashkir is equivalence – 77, 11%, then follows inadequacy – 31, 42%. The lowest frequency is represented by adequacy – 25, 7%. Knowing the basic principles of translation of proverbs from English into Russian you increase the perception of the adequacy of the meaning of the proverb, of text and of foreign language communication.

**Мещерякова Ольга**

БашГУ, ФМиИТ, 2 курс

Консультант по английскому языку:

ст. преп. Моисеева А.В.

### **Anton Shipulin: Russian Star of the World Biathlon** **(Антон Шипулин: российская звезда мирового биатлона)**

Shipulin Anton was born August 21, 1987 in Tyumen. His parents are masters of sport in ski racing and biathlon. From an early age under his father's guidance, he was engaged in ski racing. In 2002 in Khanty-Mansiysk at the age of 15, Anton began his career in biathlon. After he won two victories at the European Youth Festival, many coaches turned their attention to Anton. He received an offer from the famous skiing coach Putrov V.M. and in 2006 moved to Ekaterinburg.

Anton won his first victory in the relay at the 2006 World Cup in Presque Isle. In 2007 in Val Martello, he won the silver medal in the individual race. At the European Championships in 2007 Anton won silver medal in the sprint, bronze medal in the pursuit and gold medal in the relay. In 2008 in Nove Mesto Anton became the absolute champion in Europe, winning all three races and relay.

The season of 2008/09 Anton began with starts in the Cup IBU. In December 2008 in Val Martello in the pursuit athlete came to finish third. In January 2009 in Oberhof, Anton made his debut in the sprint and took 72nd place. As a result, Anton didn't make it to the World Cup 2009 in Pyeongchang. Anton won the bronze medal at the European Championship in Ufa in the sprint and relay, and again got the right

to start at the World Cup. In the end, he finished the season on the 93rd place of the overall standings of the World Cup.

2009/10 Olympic season Shipulin spent quite confident. He was the top sniper in the team. At the Olympic Games 2010 in Vancouver Anton became a member of the Russian Olympic team in biathlon, where being a part of the men's relay he won the bronze medal. Since 2010, he took a Master's degree programme at the Institute of Physical Culture, Sports and Youth Policy of the Ural Federal University.

In January 2011 he won the first individual victory in the sprint in Anterselva.

In April 2012 in the "Race of Champions" in Moscow, Anton took the silver medal in the mass start. In September 2012 at the World Championships in Ufa he won gold medal in the mixed relay and bronze medal in the sprint.

In March 2013 he won the silver medal in Megamass start at the international tournament «Russian Open Cup for the prizes of the Tyumen region governor », and a day later, in the pursuit he won the gold medal.

In February 2014 he took the fourth place in the sprint at the Olympic Games in Sochi. The same month as a part of the Russian men's relay team Anton Shipulin became the Olympic champion in the relay.

He was named the best athlete of the 2014 Olympic year.

**Миннигулова Эльвина**

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асс. Саблукова В. А.

### **Traditions and customs of England (Традиции и обычаи Англии)**

It is paradoxical that England, being the country with rich national customs, has no national suit.

The oldest and well-known tradition in England, it is considered tea drinking which treat with special respect and this tradition of England will be read not less, than in the east. The British respecting themselves take the own, especially mixed tea with themselves in travel. Tea, all drink and everywhere, but after a dinner tea can't be had.

Still the Englishman can't imagine the house, without well-groomed garden near the house. It is special custom of England which will be read by all. For identification of the best garden near houses, even competitions are held. The Englishman, whose garden near the house is recognized as the best, it is considered very dear person and he by right can be proud of himself.

British by right are proud of the purest English, often comparing the pure English and "dirty" English of Americans. English for British is a way unmistakably to define, the interlocutor belongs to what class of society.

Traditions of England oblige to be reserved in judgments as a sign of respect for the interlocutor and avoiding of categorical phrases or a complete negation something. Ability patiently to listen to the interlocutor, without objecting it, not always means consent. British diligently avoid in informal conversation of any personal moments that is everything that can seem invasion to private life.

One more remarkable tradition of England is a good, prestigious education for the children. Well-founded British prefer to send the children on to private schools boarding houses, schools with separate training of boys and girls are especially popular (it is considered that so that won't distract children from study).

By a lunch, by tradition in England, it is accepted to change clothes, is inadmissible to be present during a lunch at the same clothes in which the person went in the afternoon. It isn't obligatory to change clothes in something solemn, the clothes can be democratic, for example, a t-shirt, a sweater and jeans.

Fine custom of England is decoration of the house for Christmas and carrying out the Christmas. On ancient custom of England for Christmas all windows of houses are lit with candles therefore night on the Christmas eve still designate "night of candles". In modern England in Christmas Eve instead of a traditional Christmas log light a thick Christmas candle.

There is a custom in England of distribution of alms by the monarch on the Maundy Thursday on the Holy Week. This ceremony is held in one of cathedrals or abbeys of the country, and money is given to the pensioners living in arrival. This tradition originates in the 13th century when kings distributed poor and sick food and clothes, and even washed them feet.

**Миргалеев Денис**

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### **British Armed Forces (Британские вооруженные силы)**

The British Armed Forces is the military of United Kingdom. They have several tasks: defense of the country (including overseas territories and Crown dependencies), as well as promoting the UK's wider interests, supporting international peacekeeping efforts, and providing humanitarian aid. They consist of: the Royal Navy (naval forces), the Royal Marines (light infantry force), the British Army (the UK's principal ground warfare branch) and the Royal Air Force (air force).

Members of British Armed Forces swear allegiance to their Commander-in-chief (British monarch – Queen Elizabeth II). But real administration is on Defence Council of the Ministry of Defence, headed by the Secretary of State for Defence (Michael Fallon).

The UK is an active member of NATO. Currently the British Armed Forces take part in war in Afghanistan (ISAF). Overseas garrisons and facilities are maintained at Ascension Island, Belize, Brunei, Canada, Diego Garcia, the Falkland Islands, Germany, Gibraltar, Kenya, Qatar and Cyprus. They have modern equipment (Nuclear weapon which first tested in 1952), small incidence (Active personnel: 156,940 and Reserve personnel: 75,110), and big budget (38 billion pounds in 2013).

Military service is a matter of pride for UK citizen. Many famous people served in the British Armed Forces. Member of the reigning family Prince Harry served in military forces in 2005-2015. Winston Churchill, Edward Michael "Bear" Grylls, John Tolkien and Sean Connery served in the army as well.

Service in the Army gives people great possibilities in education and qualification. It gives welfare and support to them and their families.

**Муратова Лилия**

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### **Origin and development of English**

#### **(Происхождение и развитие английского языка)**

At the beginning of the 21st century it is beyond question that the English language has become the lingua franca, the language used for communication between people living in different countries in the world. Speakers of English comprise a very large number of people across the globe. The British Council estimates that about 377 million people speak English as first language, 375 million people speak it as a second language and about 750 million people speak it as a foreign language. Today English is considered the universal language for business, international communications, tourism, trade and technology.

The English language is a member of the Indo-European family of languages. It belongs to the Anglo-Frisian sub-group of the West Germanic languages. The commonly accepted traditional periodisation divides the English history into three periods: Old English, Middle English, New English. The history of the English language is subdivided into seven periods differing in linguistic situation and the nature of linguistic changes.

The English history is rich in different types of contacts with other countries, that's why it is very rich in borrowings. The Roman invasion, the adoption of Christianity, Germanic, Scandinavian and Norman conquests of the British Isles, the development of the colonialism and trade, cultural relations served to increase the English vocabulary. The English vocabulary has changed greatly over the centuries. It is a mixture of words of French, Latin, Germanic, Greek origins, almost all of the notable languages of the world. The vocabulary of the English language continues to change and develop with hundreds of new words arriving every year. These words

are called borrowings. Borrowings are words adopted by the speakers of one language from a different language (the source language). English has gone through many periods in which large numbers of words from other languages were borrowed. But even with all the borrowings from many other languages the heart of the English language remains Anglo-Saxon of Old English.

The English vocabulary grew as a result of the two historical factors: the Industrial Revolution and the British Empire. During its development Modern English borrowed words from more than fifty languages. An important development of English outside Great Britain happened with the colonization of North America, Australia, Africa and other parts of the world. Different dialects of English developed overtime in many former colonies of the British Empire. There are now distinct forms of English spoken in America, Australia, New Zealand, Africa, India and so on. Nowadays people speak English on every continent. I think the future of English as a global language will depend on political, economical, demographic and cultural trends in the world.

**Мусина Румия**

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**Whoopi Goldberg**

**(Вупи Голдберг)**

Her real name is Caryn Elaine Johnson. She was born on 13 November, 1955 in Manhattan, USA in a poor family. She got the actor's pseudonym (Whoopi) Caryn in childhood, at that time it was only a ridiculous nickname.

At eight she joined the Children's Theatre where she showed her comic potential. Ever since she has been performing in the theatre and in the movies (Ghost, The Player, Sister Act, The Long Walk Home, Made in America and many others). Unfortunately, young Caryn's talent didn't extend on school subjects - she was registered lagging behind, especially on reading and writing. And, as a result, she dropped out, without getting a secondary education.

In the late 1960s Caryn left home and joined the hippie movement that was quite popular those years. Living in a commune, she quickly shared liking for hard drugs. Caryn couldn't call herself a no-hoper - she tried to refuse drugs, but unsuccessfully. Alvin Martin, the member of the Against Drugs organization who became her first husband helped her to get rid of that harmful dependence. They had a daughter- Aleksandra.

In 1974 Caryn moved to San Diego and started making the career in the theater under the name of Whoopi Goldberg. Participating in theatrical performances, Whoopi not only accumulated experience, but also gained popularity, quickly flying up to theatrical tops. Great success waited for the actress in 1983, after her

participation in the performance "The Show of Ghosts" where she brilliantly played 6 different roles. Her talent was noticed. And she was invited to act on Broadway.

Due to her unrestrained energy and persistence Whoopi Goldberg made it to the big stage. Having played the main character in Stephen Spielberg's "The violet" she got many awards: The Oscar, The People's Choice Awards, The Kids' Choice Awards as Favorite Movie Actress and others.

Whoopi Goldberg does a lot of charity works for homeless children, human rights, leading campaigns against AIDS.

Now she lives a quiet life in Malibu with her mother, daughter and three grandchildren; plays only small roles in films as she doesn't want to leave the family for too long.

At the moment Whoopi Goldberg is busy with acting in the cinema.

**Мухаметзянова Эльвина**

БГМУ, фармацевтический факультет, 1 курс

Консультант по английскому языку:

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### **Mysterious country – Australia (Загадочная Страна – Австралия)**

The English language has spread all over the world. But there are five countries which are called Englishspeaking countries such as the UK, the USA, Canada, New Zeland, Australia. They are located in different parts of the world and they are different in many ways: nature, climate, weather and lifestyle.

Australia is the only country in the world that is also a continent. It is the sixth large country and the smallest continent. The continent was opened by Europeans in period of searching sea ways to India. The name of the country comes from Latin word «australis» which mean souyhern. The country's official name is Commonwealth of Australia. Australia has two territories. The capital of the country is Canberra

Australia is a constitutional monarchy like Great Britain. The British queen Elizabeth II is also the queen of Australia and the head of the state. But the queen has less power than government. Mainly she serves as a symbol of historical relationship between Great Britain and Australia.

Australia is a member of the Commonwealth of Nations which is an association formed by Britain and some of its former colonies.

Modern Europeans adjoin with indigenious people. Aborigines are native people of Australia. Their life level is very low. They are deprived of their right to participate in public life of the country. The aborigines do not recive the qualified medical care and that's why the mortality rate among them is very high.

The driest and hottest months in Australia are December, January, February. Winter starts in June. This season is considered the most beautiful of the continent. It's raining in winter and wild nature arouse.

The nature of Australia is preserved very well. Eucalyptus is considered to be a vegetable symbol of the country. There is a huge number of endemic animals – kangaroos, koalas, amazing platypuses, brave flying squirrels, terrible echidnas, emus and even penguins.

Australia is a very exotic country with its original and distinctive flora and fauna, history and traditional.

**Назарова Анна**

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Консультант по английскому языку:  
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### **American Traditions (Обычаи США)**

Every nation has different customs and traditions, its own way of life. In Europe there are people who have lived in the same house and been in the same job for 20-30 or more years. That's not the American way of life. The Americans love change, they call it the spirit of adventure, a spirit that they think is more characteristic of America than of Europe. They like to move away, to change houses and jobs.

Unlike the Englishman, American will tell you all about himself, his wife and family, and ask where you have come from, what your job is, how you like America and how long you are staying. The American prefers *sociability*. With this sociability goes overwhelming *hospitality*.

A national *Thanksgiving Day* is perhaps the only holiday spent by the Americans at home. The table the table is traditionally decorated by a harvest of Indian corn, apples, oranges, walnuts, grapes and flowers. The centerpiece is the traditional roast turkey.

Another American tradition is *Halloween*. Its origin dates back hundreds of years to the Druid festival. The Druid New Year began on November 1, marking the beginning of winter and the reign of the Lord of Death. The custom of telling ghost stories on Halloween comes from the Druids. On this occasion children usually wear ghost costumes or false faces. They also carve out rounded eyes in pumpkins and put burning candles inside them to make them visible from far away.

In Texas, where the West begins, the biggest annual festival is *the Fat Stock Show*. Its rodeo, hold together with the stock show, is the biggest indoor rodeo on the earth.

*The New Year's Eve* is a time for merriment. Most Americans spend this night with friends, at home or in restaurants. Thousands of people gather in New York in Times Square to see the New Year.



*The Tournament of Roses* takes place in Pasadena, California, on January 1st each year. The prizes are given in the most unusual floral compositions.

At Easter there is a tradition for people to buy new clothes. After church services many people take walks along the streets of their towns, wearing their new Easter hats and suits. This is usually called the “*Easter Parade*”.

*Memorial Day* comes on May 30. It is dedicated to the memory of those who died for America in different wars. The national flags are put on the graves of soldiers on this day.

The 4th of July is an *Independence Day*. It is the biggest national holiday of the USA. On this day in 1776 the Declaration of Independence, was adopted. During this holiday American people have parades.

And, of course, no nation can exist without humor. As they themselves say, an American man must have one wife, two cars, three children, four pets, five suits, six acres, seven credit cards and eight cents in his pocket.

**Насипова Лилия**

Баш ГАУ, факультет информационных технологий  
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асс. Муфтьева Р. М.

### **Steve Jobs (Стив Джобс)**

Steve Jobs was born on the 24<sup>th</sup> of February in 1955 in San Francisco. His full name was Steven Paul Jobs. Birth parents abandoned him and then Steve was adopted by Paul and Clara Jobs.

In 1972 Steve Jobs graduated from high school in California and became a college student at Reed College in Portland. He also visited lectures at the HP Company, and then began to work there with his friend Steve Wozniak.

In 1976 Steve Jobs, Steve Wozniak and Ronald Wayne founded Apple Corporation. Some years later Steve Wozniak created a new personal computer which carried Apple forward. Its name was Apple II. Steve Jobs worked on design and sales of new device.

There was a battle for power in Apple in 1985. Steve Jobs lost it and left the company. He decided to found a new corporation which was called NeXT. This company produced technologies for organizational markets.

In 1986 Steve Jobs got the computer graphics branch of Lucasfilm Ltd. Later it was reorganized into Pixar Animation Studios. Steve worked on famous animated cartoon ‘Toy Story’ as an executive producer.

In 1996 NeXT was included in Apple. Steve returned to work for Apple. Afterwards the NeXTSTEP codebase was used for the Mac OS X. In 2000 he became Chief Executive Officer of Apple. He supervised elaboration of the iMac, iPad, iPod, iTunes, iPhone etc.

Apple iMac was introduced in 1998 and its design was developed by Steve Jobs.

The first generation of iPod was released on the 23<sup>rd</sup> of October in 2001. The major innovation of the iPod was its small size.

First iPhone was released on the 29<sup>th</sup> of June in 2007. iPhone is a small device with multimedia capabilities and functions as a quad-band touch screen smartphone.

In 2003, Steve became ill put a rare form of cancer. On October 5, 2011 he died.

To most people, Steve Jobs is Apple and Apple is Steve Jobs. The company faced a test of its identity with Jobs' announcement that he was stepping down as CEO. Steve Jobs has long been recognized as a visionary in the computing field, but his impact extends beyond that, into popular culture and even the way people live today.

**Низамова Айгуль**

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### **The Royal Disease (Королевская болезнь)**

Haemophilia acquired the name 'the royal disease' due to the high number of descendants of Queen Victoria afflicted by it. Queen Victoria passed the mutation for Haemophilia to her son Leopold and, through some of her daughters, to various royals across the continent, including the royal families of Spain, Germany, and Russia. No earlier occurrence of the disease in the Royal family had been known. Medically, there are only two possibilities: either one of Victoria's parents had a 1 in 50,000 random mutation, or Victoria was the illegitimate child of a haemophiliac man.

Haemophilia is a group of hereditary genetic disorders that impair the body's ability to control blood clotting or coagulation, which is used to stop bleeding when a blood vessel is broken. Like most recessive sex-linked X chromosome disorders, haemophilia is more likely to occur in males than females. This is because females have two X chromosomes while males have only one, so the defective gene is guaranteed to manifest in any male who carries it. Because females have two X chromosomes and haemophilia is rare, the chance of a female having two defective copies of the gene is very remote, so females are almost exclusively asymptomatic carriers of the disorder.

Prince Leopold was first diagnosed with haemophilia in 1858 or 1859. He died in 1884 at the age of 31. He suffered a fit, the cause or the consequence of a fall on some stairs at Cannes, injuring his knee and hitting his head and died the following morning, apparently from a cerebral haemorrhage. His daughter, Alice of Athlone, had one haemophiliac son (Rupert) and two other children — a boy and a girl — whose status is unknown.

Victoria's youngest child, Beatrice, gave birth to one daughter, one normal son, and two haemophiliac sons.

Queen Victoria's third child, Alice, passed haemophilia to the German and Russian imperial families. Of Alice's six children, three were afflicted with haemophilia. At the age of three, her son Frederick died after a fall from a window induced a haemorrhage. Alice's daughter Irene, a carrier, married her first cousin, Prince Henry of Prussia, and gave birth to two haemophiliac sons.

Alice's another daughter, Alix, was also a carrier. Alexandra (Alix) married Tsar Nikolas II and carried the disease into the Russian imperial family. She had four daughters, Olga, Tatiana, Marie, and Anastasia, before giving birth to the long-awaited son, Alexis, heir to the Russian throne. Within a few months after his birth, his parents realized that their precious and only son, Alexis, had haemophilia. These children, along with their parents, were eventually murdered during the Russian Revolution.

So haemophilia produced a dramatic effect on the Royal Princes and their families.

**Патрушева Ксения**

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### **Fanfiction (Фанфикшн)**

**Fan fiction** or **fanfiction** (also abbreviated to **fan fic**, **fanfic** or **fic**) is fiction about characters or settings from an original work of fiction, created by fans of that work rather than by its author. It is a popular form of fan labor, particularly since the advent of the internet.

The modern phenomenon of fan fiction as an expression of fandom and fan interaction was popularized and defined via *Star Trek* fandom and their fanzines published in the 1960s. The first *Star Trek* fanzine, *Spockanalia* (1967), contained some fan fiction; many others followed its example. These fanzines were produced via offset printing and mimeography, and mailed to other fans or sold at science fiction conventions for a small fee to help recoup costs. Women dominated fan fiction authoring; 83% of *Star Trek* fan fiction authors were female by 1970, and 90% by 1973.

Fan fiction has become more popular and widespread since the advent of the World Wide Web; according to one estimate, fan fiction comprises one third of all content about books on the Web. In addition to traditional fanzines and conventions, Usenet group electronic mailing lists were established for fan fiction as well as fan discussion. Online, searchable fan fiction archives were also established. The online archives were initially non-commercial hand-tended and fandom- or topic-specific. These archives were followed by non-commercial automated databases. In 1998, the

not-for-profit site FanFiction.Net came online, which allowed anyone to upload content in any fandom. The ability to self-publish fan fiction at an easily accessible common archive that did not require insider knowledge to join, and the ability to review the stories directly on the site, became popular quite quickly.

Fan fiction can be categorized in a number of ways. Some of these categories are similar to original fiction (e.g. romance); some are specialized (e.g. Mary Sue stories). Please note: these categories apply to western fandoms. Fandoms in other parts of the world have different conventions.

Stories are also categorized by their relationship to canon ("canon" is the word used to describe something that is "official" in a story).

Mary Sue is a trope originating in Star Trek fan fiction that has crossed over to the mainstream, at least among editors and writers. In much early *Trek* fanfic, a common plot was a minor member of the USS *Enterprise's* crew saving the life of Captain Kirk or Mister Spock, often being rewarded with a sexual relationship as a result. A Mary Sue is an idealized character representing the author.

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### **Meet Ufa (Знакомьтесь, Уфа)**

Ufa is one of the largest economic, cultural, sports, scientific and religious centers of Russia. In 2015 Ufa will host the summit of the Shanghai cooperation organization and BRICS. Ufa is the greenest city in Russia with population over 1 million. There are a large number of different attractions such as: the mosque "Lala-Tulpan", Friendship Monument, the Eternal flame, the Mayakovskii square and many others.

The most famous monument of the city of Ufa is certainly a monument to Salavat Yulaev. This monument is even depicted on the state emblem of the Republic of Bashkortostan. He became the hallmark of Ufa and Bashkortostan.

Salavat Yulaev is a Bashkir national hero, poet, companion of Pugachev. The Bashkirs remember and honor their hero, that fought for their rights.

The monument to Salavat Yulaev in the Bashkir capital is the biggest equestrian statue in Russia and even Europe! It is 9.8 metres high. The weight of the monument is 40 tons.

This monument was opened in Ufa on November 17, 1967.

The author of the monument is the famous muralist and painter Soslanbek Tavasiev. The muralist worked on it for over thirty years.

The place is very popular among the residents of Ufa and tourists. Moreover, the monument looks magnificent. It is the highest place in the central part of Ufa. The monument stands on a cliff overlooking the Belaya river. It is the best place to

observe the other side of the river covered in forest. Every year there are many events, and so here it is very common to see newlyweds. They come here to be photographed on the background of the monument, to look at beautiful views, and just walk.

**Проворова Юля**

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### **A book that is a real page turner**

**(Книга, которую читаешь на одном дыхании)**

Today, people forget that there is a free ticket to the unknown and beautiful place that is a book. You don't need fame, money and beautiful appearance to read a book. The only thing you need is imagination. However you have to keep reading books until you find the one you'll like so much that you'll never forget it.

I would like to share my idea of the book that opens a whole other world the moment you start reading it. The plot and the characters are so close and familiar that there is a feeling that I could be the author of this book. It plunged into this story and forgot about time. It is "Pride and Prejudice", the unique novel written by Jane Austen. It is a beautiful love story, which comes when least expected. The language of the novel is very clear and elegant, makes you fully merge in the 19th century's atmosphere: high-waisted dresses, timid looks and pompous balls. Jane Austen's book is like a living being that invites you to appreciate the long-since-vanished traditions. The characters have drawbacks that are so innocent and likable that adorn them more than merits can.

I have read this novel several times and it amuses me every time like it is the first time I read it. I find something new every time: some hidden meaning, new interpretation of dialogues or resemblance with my experience. It is a real page turner when you can predict all the collisions and new twists and turns. You won't find jaded words or any other clichés. You can't predict what will happen next from the very beginning up to the end.

"Pride and Prejudice" is undoubtedly a classic novel. Though there is no supernatural activity or battle scenes the book is amazingly dynamic and besides there is a lot of philosophy, irony and good English humor.

After reading "Pride and Prejudice" I am convinced that this novel is a must read for everyone. Jane Austen described the characters and relationships between people very well which will delight any taste in literature no matter age you are. I most strongly recommend it to mature readers of 16 and older. Jane Austen is an amazing writer and some of the issues brought up in the book are still relevant today, which is great to discuss with your family. Obviously in our society today there are problems with boundaries and decency and it is good to refer to the past and try to

find the answers which brings up another good discussion point: how etiquette and right and wrong has changed over the past years.

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### **McDonald's story (История Макдональдса)**

Everyone knows about McDonald's restaurants that can be found in every major city throughout the world. Most people understand and accept that eating at McDonald's is unhealthy, but it is very popular among the youth as well as adults. And visiting McDonald's has become a habit for many people. Now it is a huge restaurant chain.

The founders of McDonald's, McDonald brothers, Richard and Maurice in the 40s of the 20th century, were the owners of a small restaurant in San Bernardino, California, which brought them a little profit. The economic situation in the country has not changed for the better and restaurant owners decided to change the service. Then the restaurant became self-service establishment and visitors take their own food at the counter of the cashier, and then sat at a free table. The brothers also changed the system of cooking - now the kitchen looked like a conveyor which continuously produces the same burgers and the rest of the meal. Prices for food have become less and visitors too. Dick and Mack received from his business about 350 thousand dollars every year. In 1954, Ray Kroc, a seller of Multimixer milkshake machines, learned that the McDonald brothers were using eight of his machines in their San Bernardino restaurant. He went to San Bernardino to take a look at the McDonalds' restaurant. In the early 1960s, the McDonald brothers decided to sell all rights to the brand McDonald's to Ray Kroc. Brothers set the price \$ 2.7 million. So, Ray Kroc became the owner of all rights to use the brand McDonald's, and the brothers Dick and Mac no longer had nothing to do with it. In 1975 McDonald's restaurants were opened in more than 20 countries in the world. Ray Kroc incorporated his company as McDonald's Systems, Inc., which he would later rename McDonald's Corporation.

Now McDonald's restaurants are the second after network Subway. Nowadays Don Thompson is the president of the company and the chief executive officer and Jim Skinner is the general manager of the company.

Nowadays McDonald's includes a menu of some burgers, rolls, salads, wraps, fish, desserts and drinks. Today the company continues to follow the inspiring principles that gave rise to the brothers. McDonald and Ray Kroc developed: a small menu that meets the highest standards of quality, friendly service, cleanliness and availability of a wide range of people. Now it is a huge network of restaurants around

the world with an established system of work and special marketing. McDonald's is the world's leading global food service retailer with more than 36,000 locations in more than 100 countries around the world.

McDonald's is developing new concepts and products that provide a more personal experience while still giving excellent value for money.

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### **Diana-Princess of Wales (Диана – Принцесса Уэльская)**

Diana, Princess of Wales (1 July 1961 – 31 August 1997), was the first wife of Charles, Prince of Wales, who is the eldest child and heir apparent of Queen Elizabeth II.

Diana was born into an aristocratic British family with royal ancestry as The Honorable Diana Frances Spencer. After her parents' divorce, she was raised in Park House near the Sandringham estate, and was educated in England and Switzerland. Diana became Lady Diana Spencer after her father inherited the title of Earl Spencer in 1975. She became a public figure with the announcement of her engagement.

Her wedding to the Prince of Wales on 29 July 1981 was held at St Paul's Cathedral. She gave birth to two sons, the princes William and Harry, who were respectively second and third in the line of succession to the British throne.

As the Princess of Wales, Diana assisted the Prince of Wales on his official duties. She was also the patron, president and a member of numerous charities and organizations. She was well known for her fund-raising work for international charities and as an eminent celebrity of the late 20th century.

However, Charles and Diana's marriage ended in divorce in 1996. Media attention and public mourning were very extensive after her death in a car crash in Paris on 31 August 1997.

In 1983 she told in one of the TV shows: "I am finding it very difficult to cope with the pressure of being Princess of Wales, but I am learning to cope". From the mid-1980s, Diana's name became much associated with numerous charities. As Princess of Wales, she was expected to make regular public appearances at hospitals, schools and other facilities. The Princess did a lot of charity works, visiting terminally ill people over the world, leading campaigns for animal protection, AIDS awareness and against the use of inhumane weapons. In addition, she was the patroness of charities and organizations working with the homeless, youth, drug addicts and the elderly. Her patronages also included British Red Cross Youth, Relate marriage counselors and the British Deaf Association, for In June 1995, the Princess made a brief visit to Moscow, where she visited a children's hospital that she had

previously supported through her charity work. Diana presented the hospital with medical equipment. During her time in the Russian capital, she was awarded the international Leonardo prize, which is given to the most distinguished patrons and people in the arts, medicine and sports.

Regardless all her titles, I think she was a wonderful person with big and gentle heart. She was not just a beautiful woman of fashion, but also a strong individual, who tried to do her best to help people in need and to make our world a little better and safer.

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### **Why do we learn English? (Зачем мы изучаем английский язык?)**

I think that any educated person must learn foreign languages. But I prefer English to other foreign languages.

English is becoming a global language. Half a billion people in the world use English at home or work. English is so widespread that it has become the standard language for all kinds of international communication.

Some time ago some newspaper reporter called the modern Earth "a world village". It really means that year by year the earth is getting smaller with the development of communication and increase in international trade. People in different countries and nations have to get along well with the progress in world trade and technology as well as with each other. So, it is very useful to learn foreign languages.

"Knowledge is power", one of the great men said. Speaking a foreign language you can not only read the papers, magazines and original books by great writers, but as well watch satellite TV programs, communicate while travelling in the different parts of the world. Besides, understanding and speaking foreign languages became necessary while looking for a good job.

First English language became widely spoken in the world with the rise of British Empire. Then success of American industry and the growth of exports in technologies caused increase in circulation of the language.

And the third factor is the remarkable boom in computer-related equipment and technologies as well as the influence of British and American pop culture.

Fortunately, I began learning English even before I could understand the importance of speaking and understanding it. Now I know that it is very useful for a XXI century professional no matter what field you are in. The world is getting smaller and international connections tighter. One can not do well without one of the most common European languages.



Some people learn English because they need it in their work; others to travel abroad and for lots of people learning English is just a hobby. I have been learning English since the age of 11. I like learning English very much. But I like and know Russian as well. The great German poet Goethe once said: "He, who knows no foreign language, does not know his own one." I agree with him. The knowledge of English helps me to master my Russian too.

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### **Russian holidays (Российские праздники)**

Every nation has its own culture and traditions. Although, Russia is a well-developed country with a high level of culture, most holidays and traditions date back to pagan times. For example, Easter, Christmastide, the Kupala Night, the Shrovetide.

Easter is the time for holidays, festivals and time for giving chocolate Easter eggs, the day of parties, and above all a celebration that Jesus raised from the dead and lives forever. Eggs play an important part in Easter celebration; they are predominantly given to children.

Traditionally Russians have kept a 40-day fast before Christmas. Christmas is Christian holiday that celebrates the birth of Jesus Christ. For millions of Christians throughout the world it is the happiest and the busiest time of the year. No one knows the exact date of Christ's birth but most Christians celebrate Christmas on 7 January.

Non-official "Men's Day" is the 23d of February, it is a public holiday called "The Homeland Defenders Day". All men in Russia are liable for call-up, so they all are celebrities.

On the 8th of March we celebrate Women's Day when men are supposed to do everything about the house and cook all the meals. At least once a year women can take a break and forget about all those dishes, cooking, kids, take a magazine and relax on a couch.

The greatest national holiday in our country is Victory Day. On the 9th of May, 1945, the Soviet Army and its allies completely defeated the German fascists and the Second World War and the Great Patriotic War ended. A magnificent memorial on Poklonnaya Gora has been built to commemorate the Victory. Many veterans take part in the military parade and lay wreaths on the Tomb of the Unknown Soldier.

Besides Russian holidays we celebrate the holidays of other religions (Muslim, Jewish) because Russia is a multi-national country.

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### **The Russian steppe (Русская степь)**

Steppe is a plain in the temperate and subtropical zones, covered with grassy vegetation.

Steppe plays an important role in the life of Russian nature. This is a giant solar panel, which converts light energy into matter. Their appearance is perhaps the biggest biological revolution after the extinction of dinosaurs. Steppes are in the south of Russia, particularly near the Black Sea and the Caucasus, as well as in the valley of the river Ob.

In the steppe area the climate is sharply continental, the winter is cold, sunny and snowy, and the summers are hot and dry. The steppe climate is characterized by long duration of the frost-free period, large annual and monthly mean temperatures. The climate of steppes is dry, therefore the soil suffers from lack of moisture. Due to the fertility of the soil there is a lot of arable land and places for grazing, so steppe suffers from desertification. The soil in the desert is black earth, with a high content of lime. In the northern steppe this black soil reaches its maximum power and obesity because sometimes it contains up to 16% humus. To the south black soil lacks humus, it is lighter and becomes brown soil, and then totally disappears.

**Flora.** The vegetation consists mainly of grasses growing in small bundles, between which bare soil is visible. Most prevalent are different types of feather. In the very obese steppes there develops a kind of feather, having much larger size. In the same dry barren steppe the feather grass is smaller.

**Fauna.** Both by species composition, and by some ecological characteristics, steppe wildlife has much in common with the animals of the desert. Steppe is also characterized by high aridity, only slightly less than in the desert. Pests are active in the summer, especially at night. Many of them are drought resistant or are active in the spring, when there is moisture after winter. Typical species of ungulates are characterized by sharp eyesight and ability to run fast and long (antelope et al.); typical rodents build complex burrows (ground squirrels, marmots, mole rats) and jump (jerboa, kangaroo rats). Most of the birds fly away for the winter. Steppe eagles, bustard, Pallid Harrier, Lesser Kestrel, a lark are common in the steppe. Reptiles and insects are numerous.

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### **The Ephemeral Creature of the British Cinematography (Эфемерное Создание Британского Кинематографа)**

Her name is synonymous with "beauty" and "fashion". Unique style of Audrey Hepburn became the benchmark for millions of female fans and the inspiration for fashion designers.

Audrey was born in Brussels on May 4, 1929. Blue blood ran through her veins - mother of the actress was a Dutch Baroness and her father was an English banker. After her parents' divorce Hepburn with her mother moved to London, where she studied at a private school for girls. Later, they returned to the Netherlands. When Audrey was vacationing with her mother in Arnhem, she had to go through difficult times of the Nazi occupation, but she was able to enjoy bright moments of childhood. In Arnhem the girl lay in bed, reading, trying to forget about hunger.

After the war Audrey with her mother moved to Amsterdam, where the girl continued her studies at the ballet school. Her mother worked in a flower shop, and later - in a beauty salon. To help pay for the ballet school, Audrey began to make hats and sold them to the salon clients. Even then, Audrey showed cheerfulness combined with intelligence. She began to receive invitations to work as a model for magazines and advertising agencies, danced on stage in London theaters. After her very first debut in the movie they started to offer her interesting roles. Fantastic success came to the actress after the film "Roman Holiday". The audience was admired by the appearance of the ephemeral creature, characterized by true talent and finesse. Thus, the style of Audrey Hepburn was born, millions of people were wild about her - blonde became brunettes, men froze from one sight of the huge eyes, and famous fashion designers developed new clothing line: the skirt emphasizing the wasp waist and sleeveless jacket.

During the following years the movie could no longer meet Hepburn's needs. But other people's sorrows always awakened her sympathy, so she became a UNICEF Goodwill Ambassador. Her trips were difficult: she selflessly travelled to outlying places of the world, where there was no water, food and electricity. It was a world of starving and dying children, whom she and her doctors tried to save.

In 1992, US President awarded her the Presidential Medal of Freedom in recognition of her work as part of UNICEF, and the American Film Academy awarded her the Humanitarian Prize for her help to humanity. This prize was awarded to her after her death and was presented to her son.

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## **Celebrations in the USA** **(Праздники в США)**

The population of the USA is made up of people of different nationalities. Centuries ago they brought with them their native celebrations. Some holidays which are marked in the United States originated in America. The number of holidays is different in different states – from 8 in the District of Columbia to 20 in Oklahoma. But the most important holidays are celebrated throughout the USA. They are: New Year's Day (January 1), Lincoln's Birthday (February 12), Washington's Birthday (February 22), Independence Day (July 4), Labour Day (the first Monday in September), Thanksgiving Day (the fourth Thursday in November), Christmas (December 25). Here are a few words about them.

On New Year's Day people see the old year off and the New Year in. Most people stay up all night, even children. At midnight many people go outside and shout «Happy New Year»! Some people set off fireworks and blow automobile horns which are heard everywhere. Everybody exchange presents and good wishes. Offices, factories, banks and stores do not work on this day.

Lincoln's birthday is celebrated every year on February 12. Abraham Lincoln was President during the Civil War (1861-1865). He led the fight to keep the nation together and to free the slaves. His life ended tragically. He was killed at the theatre during the performance soon after the victory of the North.

Washington's Birthday is marked on February 22. George Washington led the American Army to victory in the War for Independence. Later he was elected President of the United States and was in office for 8 years (1789 – 1797). The national capital of the United States, a state and several towns are named after George Washington.

One of the greatest holidays is Independence Day. On July 4, 1776, the Declaration of Independence was signed. It proclaimed independence of the thirteen British colonies from Great Britain.

Labour Day is celebrated on the first Monday in September. On this day workers make a public show with marches, meetings, etc. It also marks the beginning of the school year and the end of summer.

Thanksgiving Day is marked on the fourth Thursday of November. On this day the Americans honour the memory of the first settlers. People gather in the home of their parents for a large family dessert. The table is traditionally decorated with autumn fruits and flowers. After dinner Americans watch toy parades and football matches on TV which are arranged on Thursday and the weekend that follows.

Christmas is religious holiday which symbolizes the birth of Jesus Christ. By this day people decorate fir trees with toys and candies.

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### **The London Eye** **(Колесо обозрения «Лондонский глаз»)**

A modern but already very popular tourist attraction is the London Eye, a giant observation wheel located in the Jubilee Gardens on the South Bank. The structure was built as part of London's millennium celebrations. The London Eye is a giant Ferris wheel situated on the banks of the River Thames in London, England. The entire structure is 135 m tall and the wheel has a diameter of 120 m. Over 3.5 million people visit it annually.

The London Eye was designed by architects Frank Anatole, Nic Bailey, Steve Chilton, Malcolm Cook, Mark Sparrow hawk, and the husband-and-wife team of Julia Barfield and David Marks.

They submitted their idea for a large observation wheel as part of a competition to design a landmark for the new millennium. None of the entrants won the competition, but the couple pressed on and eventually got the support of British Airways, who sponsored the project.

The London Eye was formally opened by the then Prime Minister, Tony Blair, on the thirty first of December, 1999, although it was not opened to the public until nines of March, 2000 because of the technical problems. Since its opening, the Eye has become a major tourist attraction.

The wheel's 32 sealed and air-conditioned ovoidal passenger capsules are attached to the external circumference of the wheel and rotated by electric motors. Each of the 10-tonne capsules represents one of the London Boroughs, and holds up to 25 people, who are free to walk around inside the capsule, though seating is provided. The wheel rotates at 26 cm per second so that one revolution takes about 30 minutes.

Thanks to the construction of the glass capsules, the passengers have a great 360 degrees view over London. Many famous attractions are clearly visible, including Buckingham Palace, St. Paul's Cathedral, the Houses of Parliament etc.

Other then providing a great 360 degrees view of London the London Eye hosts many major events. Such as every year, the London Eye is part of London's New Year celebration and apparently used by small businesses for the conferences.

Since the attraction opened in 2000, there have been 5,000 proposals. Jagan Rao and Natasha Palmer from Marylebone, central London, decided to get married on the wheel on Saturday. The couple have now been given a complimentary "Cupid's Capsule" on the date of their proposal every year.

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### **Korean food** **(Корейская еда)**

A cuisine is a style of cooking characterized by distinctive ingredients, techniques and dishes, and usually associated with a specific culture or geographic region. A cuisine is primarily influenced by the ingredients that are available locally or through trade.

For centuries, the Koreans have eaten the products of the sea, the field, and the mountains because of the features of Korean peninsula and climate makes Korean food more abundant. Korean foods are very special, exotic, and particular. The most distinctive feature of the Korean food is the spiciness. The basic seasonings such as red pepper, green onion, soy sauce, bean paste, garlic, ginger, sesame, mustard, vinegar, wine have been combined in various ways to enhance Korean foods.

Korea has much in common with China and Japan in terms of dining style due to frequent cultural and historical exchanges. But over time, Korea has developed its own unique cuisines.

Korea was once a primarily agricultural nation, and boiled rice has become Koreans' staple food. Staple food and side dishes are clearly distinguished in Korean table settings. A traditional Korean meal consists of a bowl of rice and side dishes. Koreans use a wide range of ingredients such as meat, fish, vegetables and seafood with unique seasonings.

These days Korean cuisine also contains a large variety of meat and fish dishes along with wild greens and vegetables. Various preserved food, such as kimchi (fermented spicy cabbage), jeotgal (seafood fermented in salt) and doenjang (soy bean paste) are particularly popular due to their distinctive flavor and high nutritional value.

In Korean cuisine all the dishes are served at the same time. A typical meal normally includes rice, soup, and several side dishes, the number of which vary. Traditionally, lower classes had three side dishes, while royal families would have twelve.

In Korea, like in neighboring China and Japan, people eat with chopsticks. However, a spoon is used more often in Korea, especially when soups are served.

In conclusion, I'd like to say that Korean diet contains a lot of grains and vegetables which are rich in fiber and protein. Korean food is not high in calories and is low in fat and it has sweet taste and it is very healthy and well-balanced. The Korean diet is changing and the Korean food industry is developing as fast as the train speed. Even though the Western style and fast food diet are more and more famous in Korea in terms of curiosity and convenience, the basic diet remains.

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### **Gap Year** **(Академический отпуск)**

Every year hundreds of thousands of 18 year olds spend their last year of high school applying to college and deciding where they will end up continuing their education. While most people go straight to college there are a few people who choose to defer and take a gap year. A gap year is usually a year in between high school graduation and your first year of college however it can be taken any time. Most students choose to travel or work and take time to really think about what they want to study and do with the rest of their life. More students should take a gap year unless they are absolutely certain of what they want to do because it will help them decide what they want to do with the rest of their life. While it is the norm in America to go to college after high school there are many different countries where it is not. Many countries such as Denmark and Italy take up to three years before they choose to go to university. Gap years in the United States are a relatively new thing compared to countries like England; even Prince William took a gap year before continuing his education. In the country of Yemen it is required to take a year off after their secondary education before applying to college. There are many different colleges that have formally allowed gap year programs such as Harvard and NYU. By traveling and living in another country it is easier to pick up a foreign language and find out more about themselves. The Daily Nebraskan states that “going through the readmission process and getting back into a study routine after a year of not doing so can make the process of readjusting to college tough” but what most people tend to forget is that we do that after every summer break. Robin Pendoley, the Co-Founder of the gap year program said “Gap time is a chance to reconnect with a love of learning and a sense of curiosity about the world”. It can be argued that taking a gap year is just a waste of time and money but that is not always the case. Many students chose to take gap years and work full time to save money for college or spilt their time half and half by working for half the year and traveling for the other half. Also most full year gap-year programs cost \$10,000 which is roughly the same as just one semester of college. Pendoley also pointed out “Gap year students tend to own their learning and college experience, as a result, they get far more out of the time, energy, and money they invest in college.” Because these students were not forced to go to college right after high school and came to find their love of learning on their own, they tend to be the ones who take more out of their classes and the education that they are paying for. Studies show that as many as 30% of college students fail to graduate. Also the average length of time that people spend in the job they acquire through an undergraduate degree is over five years so no matter how long it takes you to graduate compared to others, the investment to continue to get an education is always

a good one. Currently 58% of students finish college in 6 years which shows that even with a gap year taken the “gappers” will still be well within the same time range that their peers finish. Taking a gap year can also help you pay for college. Even though it costs money to participate in a gap year program there are many scholarship opportunities. The Global Citizen Year program gives over one third of its participants scholarships for showing true leadership potential. Although it may take a lot of will power to actually go to school after the gap year, taking a year off can be one of the most positive experiences. Not only do you develop independence and gain new experiences, but you also gain a new love of knowledge and learning.

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### **Music in the USA**

#### **(Музыкальные течения в США в 20в.)**

Almost all American composers of note belong to the 20th century, and include such names as Charles Ives, Aaron Copland, Samuel Barber, Roger Sessions and Virgil Thomson. Edgard Varese and John Cage have gained fame as experimental composers. It is through the development of popular music in the 20th century that the USA has dominated the western world. Jazz, a style of music created at the end of the 19th century by black Americans out of their gospel and blues songs, was being played all over the USA by both black and white musicians by the 1920s, and influenced the development of both dance music and popular songs in the 1930s and 1940s.

After the Second World War jazz and popular music developed in separate directions. Black musicians created a more sophisticated style called bebop. The rhythm and blues music that derived from jazz, combined with aspects of country and western music, developed into rock-n-roll in the 1950s with the music of Bill Haley, Chuck Berry, Elvis Presley, Buddy Holly and others.

In the 1960s some British groups, especially the Beatles and the Rolling Stones, became internationally famous and for a brief period popular music was dominated by developments in Britain. Since that time, rock has incorporated folk music, soul music has developed, and many social phenomena, such as drug culture, the civil rights movement and the peace movement, have found their expression in rock music.

The musical has also made an important contribution to popular music. Developing from the British music hall and American vaudeville early in the 20th century, composers such as George Gershwin, Cole Porter, Rodgers and Hammerstein, Stephen Sondheim and Leonard Bernstein on Broadway, and Ivor Novello, Noel Coward and more recently Andrew Lloyd Webber in Britain, have made the musical into one of the most important forms of popular music.



## **The Beatles**

The Beatles were one of the most famous rock and pop groups in history. The “Fab Four”, as the Beatles were called, came from Liverpool, England. Most of the songs were written by John Lennon and Paul McCartney. George Harrison played the lead guitar and Ringo Starr played drums. In the past 50 years the Beatles have sold over a billion records and CDs. They had more number one hits than any other British pop group.

Towards the end of the 1950s John Lennon formed a group called the “Quarrymen”. Up to 1960 they changed their names a few times but finally called themselves the Beatles. In the early phase the Beatles were influenced by American rock and roll musicians like Chuck Berry and Elvis Presley. In 1961 a Liverpool record store owner, Brian Epstein, became their manager. The first hit single «Love Me Do» became an immediate success. Teenagers all over England went crazy when they saw and heard the new stars, not only because of the music but because of their personality and new hairstyle.

In 1964 the Beatles toured the United States for the first time. A TV appearance in the legendary Ed Sullivan Show, one of the most popular TV shows at that time, made them stars at once. Thousands of young Americans went to the concerts and mass panic broke out wherever the Beatles appeared. Beatlemania was born.

In the middle of 1960s the Beatles started changing their music. It became more poetic, melodic and meaningful. Lennon and McCartney started to write lyrics about many of society’s problems. The Beatles also started to experiment with electronic music and other instruments. In 1966 they played their last concert and concentrated on making music in a studio.

Although the second part of the 1960s was very successful and the Beatles released a number of hit singles, including «Hey Jude», «Let It Be» or «Get Back», the members of the band started to quarrel and pursue their own interests. In 1970 they finally broke up after 8 successful years. All of the Beatles started solo careers: John Lennon sang with his wife Yoko Ono, Paul McCartney started a new group called «The Wings». Ringo Starr and George Harrison also began to sing alone.

Fans around the world hoped for a reunion of the “Fab Four” but when John Lennon was shot to death by a fanatic outside his apartment in New York in 1980 the world knew that the Beatles would never perform together again. George Harrison died of cancer in 2001.

Even though their active career lasted only for a short time the legendary Beatles still live on in the hearts of millions of pop music fans around the world.

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### **State system of Great Britain (Государственная система Великобритании)**

The United Kingdom of Great Britain and Northern Ireland is a constitutional monarchy. Constitutional monarchy is a form of government that has a monarch, but his powers are limited by law or by a formal constitution. The constitution has three branches: Parliament, which makes laws, the government, which “executes” laws, i.e. puts them into effect, and the law courts, which interpret laws. Although the Queen is officially head of all three branches, she has little direct power.

Parliament is the most important authority in Britain. Technically Parliament is made up of three parts: the Monarch, the House of Lords, and the House of Commons.

In reality the House of Commons is the only one of the three which has true power. It represents the legislative power of the country. Members of the House of Commons are elected by the voters of 650 constituencies. The Prime Minister, or leader of the Government, is also an MP, usually the leader of the political party with a majority in the House of Commons.

When speaking about General Election, election to the House of Commons is meant. Of its 659 members 529 represent constituencies in England, 40 – in Wales, 72 – in Scotland and 18 – in Northern Ireland (119 MPs are women).

The House of Lords consists of the Lords Temporal and the Lords Spiritual.

The Lords Temporal consists of hereditary peers, life peers and the Lords of Appeal (Law Lords). Hereditary peers are those who have inherited their titles. Life peers are appointed by the Queen for various services to the nation. The Lords of Appeal become life peers on their judicial appointments. This appeal court consist of nine Law Lords presided over by the Lord Chancellor.

The present sovereign is Queen Elizabeth II. She was crowned in Westminster Abbey in 1953.

The most important function of the Queen is ceremonial. True power lies in the hands of the Prime Minister and his or her Cabinet.

The executive branch is represented by the Prime Minister and the Cabinet. The Cabinet includes 20 most important ministers. Among them are the Chancellor of the Exchequer, the Home and the Foreign Secretaries, the Minister of Defense etc.

These are the key Government Departments of the British Government: Her Majesty's Treasury, the Cabinet Office, the Home Office and the Ministry of Defense.

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## **The London Eye** **(Колесо обозрения «Глаз Лондона»).**

London is one of the most interesting cities in the world. There are so many things to see when visiting London that you cannot simply take in everything in just a couple of days or so.

If you are visiting London for the first time and you want to get a good idea of what the city really looks like, it's a great idea to take a trip on the London Eye, an enormous observation wheel which allows you to get a bird's eye view of the city.

Since it opened to the public on December 31, 1999, the Eye has become one of the most popular places to visit while in London.

Otherwise known as the Millennium Wheel, the London Eye stands about 135 meters high. Designed by architects Julia Barfield, David Marks, Mark Sparrowhawk, Malcolm Cook, Steven Chilton, Frank Anatole and Nic Bailey, the London Eye has 32 air-conditioned passenger capsules.

These sealed capsules are attached to the external circumference of the wheel and can hold about 25 people. Each capsule is big enough for its passengers to walk inside.

To give its passengers a chance to take in the scenery of the city, the capsules revolve very slowly at about 10 inches per second. A single wheel revolution takes about 30 minutes.

Since the wheel revolves slowly, it does not stop to take in new passengers (except for disabled passengers). People can just walk on and off the capsules when the capsules reach the ground level. However, for safety reasons the capsules are sealed as soon as it leaves the ground so no one can really leave the capsule once it is airborne.

### **Is The London Eye Safe?**

Safety was the primary consideration of the builders of this structure. The architects and the engineers took extra precautions to keep the people inside the capsules safe.

To secure the structure, the rim of the Eye is supported by strong and stable tie rods that resemble a huge spoke on a bicycle wheel. The wheel is made up of very strong materials.

The steel used in the Eye came from United Kingdom but it was the Dutch who fabricated the steel. The cables used in the London Eye were made in Italy and the bearings were from Germany. All of these construction materials underwent rigid quality control so you can be sure that the materials used in the London Eye are top of the line.

The lighting inside and outside the capsules were redone with LED lighting in December 2006. The LED lightings are digitally controlled so there is no need to manually change the lights every now and then.

If anything goes wrong with the lights, the managers of the London Eye can use the computers to work on the problem. As a whole, the London Eye is a very safe place to be.

### **Constructing the Eye**

Designing and constructing the London Eye was one of the most challenging architectural undertakings in the last millennium.

The sheer size of the Eye made it difficult for the builders to do everything onsite – so the wheel was constructed in sections and then shipped to the site via the River Thames on barges. The job took several months to complete.

Once all the pieces of the wheel were already onsite, the pieces were raised using huge cranes. The pieces of the wheel were lifted at about 2 degrees an hour until the pieces reached 65 degrees.

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### **The Peculiarities of American Cuisine (Особенности американской кухни)**

The cuisine of the United States has a history dating back before the colonial period when the American Indians had a rich and diverse cooking style. With European colonization, numerous new ingredients and cooking styles were introduced. As the melting pot of many different cultures, the US has also become the mixing pot for many different cuisines. Every single dish could be traced back to some group of immigrants or another.

American traditional dishes include fried chicken, meatloaf, baked potato, corn, baked beans and apple pie. As for drinks, American people consume a lot of juices and soda. In the morning they prefer to have cereal or scrambled eggs, milk or orange juice. The most common menu for lunch consists of chicken or fish, fried potatoes, vegetable salads, and desert. Dinner is the most popular meal of the day. For dinner Americans usually have meat, fried or baked potatoes with ketchup or sour cream, corn, peas, sometimes macaroni and cheese or spaghetti. Ice-cream, fruit or cake are eaten for dessert.

Ethnic foods of all sorts are popular everywhere in the US. Pasta and flat breads came over with Italians, tortillas, beans, and tamales arrived with northbound Mexicans, and Germans brought dark breads, along with a variety of fatty sausages.

Asian immigrants continued to eat rice as the basis of their diet. There is a great variety of Italian, Chinese, Mexican and some other restaurants in the country.

Fast Food is very popular all over the USA, however is not very healthy. There is a wide variety of fast food restaurants like McDonalds, Burger King and Wendy's serving all sorts of delicacies from American style hamburgers, hot dogs and fried chicken to Italian pizza, Mexican tacos, and Chinese egg rolls. The cost of the food in such restaurants is not expensive. Consequently, an entire family may frequently go to eat at fast food restaurants since it is more convenient and more economical.

Nowadays Americans care about what they eat. Meats, fish, fruits, vegetables, nuts, cereals from various parts of the nation are available throughout the country during any season of the year. If you prefer low fat, low calorie or vegetarian food, there is no trouble finding it. Salad bars are very common and many restaurants offer low calorie or low fat items on their menus.

A more recent development in the American food industry has been the demand for healthier foods. The food industry has made available a wide variety of low-fat dairy and meat products. Animals are now being scientifically bred to produce lean meat. Even low fat cheeses and ice creams are being produced. Vegetable, fruit and cereal production and consumption are increasing. Foods are grown and produced free of fertilizers, pesticides and herbicides that has led to the development of an organic food industry.

Some of the fast food is quite inexpensive.

Ethnic Foods of all sorts are popular everywhere in the US. There is a great variety of Italian, Chinese, Mexican and some other restaurants in the country.

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## **Celebrations in the USA** **(Праздники в США)**

The population of the USA is made up of people of different nationalities. Centuries ago they brought with them their native celebrations. The most important holidays are celebrated throughout the USA. They are: New Year's Day (January 1), Lincoln's Birthday (February 12), Washington's Birthday (February 22), Independence Day (July 4), Thanksgiving Day (fourth Thursday in November), Christmas (December 25).

On **New Year's Day** people see the old year off and the New Year in. Most people stay up all night, even children. At midnight many people go outside and shout "Happy New Year!" Some people set off fireworks and blow automobile horns which are heard everywhere. Everybody exchanges presents and good wishes.

**Lincoln's birthday** is celebrated every year on February 12. Abraham Lincoln was President during the Civil War (1861-1865). In honour of this great man a beautiful memorial has been built in Washington, D.C.

**Washington's birthday** is marked on February 22. George Washington led the American Army to victory in the War for Independence. Later he was elected President of the United States.

One of the greatest holidays is **Independence Day**. On July 4, 1776, the Declaration of Independence was signed. It proclaimed independence of the thirteen British colonies from Great Britain. In the past this day was marked with big parades and fireworks, but now it is celebrated more quietly. Cities and towns are decorated with flags on that day, there are parades in some places, but most people just go on picnics to the countryside.

**Thanksgiving Day** is marked on the fourth Thursday of November to honour the memory of the first settlers. It is a longstanding tradition to make a festive meal with a fried turkey on this day.

**Christmas** is a religious holiday which symbolizes the birth of Jesus Christ. Children wait for Santa Claus who comes to every house and brings them presents. Some people, especially young people, like to celebrate it in restaurants and cafes and pubs, but most people prefer to stay at home with their family on this day.

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## **Culture of Spain** **(Культура Испании)**

Spanish culture is rich, beautiful and mysterious. It is quite different from other European cultures. There are many differences in the nature of Spaniards that fundamentally distinguishes them from people in other European countries. Perhaps this is the special, unique beauty of this country!

Bullfighting was brought to Spain by the Greeks and Phoenicians. Today, bullfighting is a part of the Spanish culture. Initially it looked like a bullfight with a man on horseback, but then the man was left alone with the bull. Man, beating with a bull on the field, now referred to as the matador. Currently, bullfighting is a special tradition, a ritual in the culture of Spain.

Spanish culture is impossible to imagine without the fiery and passionate dance, Flamenco. Flamenco Dance is true manifestation of Spanish culture. This is what brings the culture of Spain in world culture. Flamenco is considered to be the soul of Spain and is a significant part of Spanish culture.

Another equally important part of the culture of Spain is a fiesta and festival that play an important role in the life of the local population. In Spain there are more than 3000 different fiestas and festivals celebrated each year. Each of them plays an important role in the social life of the Spaniards. Spaniards are cheerful people, accustomed to festivals and fiestas. Almost every town and village has its own festival which can last for several weeks. The largest festivals are accompanied by flamenco dance, fireworks, bullfights, music competitions and many other fascinating spectacle.

Spanish cuisine offers tourists delicious dishes of meat and fish, and, of course, birds. Among the most popular dishes can be identified paella. It is made from rice tinted with saffron, olive oil. Furthermore, various vegetables are added there. Hot chocolate is served for dessert in Spain. Spain is also known worldwide for its great wines made from specific grape varieties.

If you want to learn more about this beautiful country and get acquainted with the inhabitants of this country you should definitely visit it.

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### **Australia's unique history** **(Уникальная история Австралии)**

Australia is an island. In fact, it is the biggest island in the world. Apart from being an island, it is also a continent, but it is the smallest of all the continents in the world. It occupies the Island of Tasmania and some minor islands round the coast of the continent. It is washed by the Timor Sea in the north, by the Coral and Tasman Seas in the east and by the Indian Ocean in the south and west.

It is a highly developed industrial-agrarian country. Its area is about 8 million square km. From 1787 to 1867 Australia was a place where criminals were sent from Britain. That is why the official language of Australia is English.

The capital of Australia is Canberra. It is a young and quite small city. It was founded in the 20th century and now has a population of about 260,000 people. Canberra became the capital only in 1927.

Now the most important industries are oil, chemical, ore mining, radioelectronics, and food industry. The country exports agricultural products and raw materials.

Almost one half of Australian territory is occupied by deserts and semideserts. It is an extremely hot country. Summer months are December, January and February. Winter months are June, July and August. The most part of the territory lies in tropics.

Australia is a constitutional monarchy, with the Queen of Great Britain as its head. It consists of six states and two territories. The main legislative body in the country is Federal Parliament. In 1931 Australia became fully independent from Great Britain.

The isolation of Australia from other continents explains much of the unusualness of Australian plant and animal life. Australia has approximately 25,000 known species of plants but this number is still going up because new plants are still being discovered. It also has a number of plants that have been around since the days of the dinosaurs. There are a lot of unusual animals such as kangaroos, duckbills, koala-bears, and others.

Special charm is given to Canberra by an artificial lake in the centre of the city. A fountain is more than 100 metres high. At night powerful lights illuminate the water. It is the Captain Cook Fountain.

Melbourne is a beautiful city with numerous skyscrapers, straight boulevards and large parks and gardens. One of Melbourne's place of interest is the House of Captain Cook, the famous British navigator.



Sydney is Australia's largest and oldest city. It was the first British settlement. Sydney has the oldest botanical garden and the Zoo. The bridge over the Bay of Port Jackson and the Opera House are well known in the country.

Australia is one of the most unusual and exotic countries of the world. A significant feature of modern Australian society is the representation of a lot of cultures drawn from many lands by its people.

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### **Tales of the United Kingdom (Сказки Великобритании)**

The British Isles are two islands in the Atlantic Ocean, separated from Europe by the English Channel. One is called Britain, the other one Ireland. One is called the United Kingdom, the other - Ireland. Now there are two states - the United Kingdom and Ireland. Four groups of people live on these islands - the Irish, the Welsh (Wales), the Scots and the English. All of them have their own traditions, culture and tales.

Many tales are about such fabulous creatures as giants, leprechauns, elves and brownies. Wales and Scotland are covered by mountains. In Welsh and Scottish tales we often meet giants (usually strong, but stupid, because the mountains are not very wisely and clumsy) and shepherds (and as grain does not grow in the mountains, but grass does, the main occupation of these people is growing cattle). That's probably because the mountains remind those peoples of the mysterious giants.

Brownie is a creature, which can help in the house, or just the other way round destroy things. Brownie doesn't like to be noticed, so their work is done only at night, in exchange for small gifts or food.

Elves in British fairy tales are often evil and they love to steal. In some tales elves steal unbaptized newborn and instead enclose their own babies. But in some fairy tales we can meet good elves.

Leprechauns are small creatures resembling gnomes who live in the hills of Ireland, they are usually shoemakers. They are constantly doing the same shoe. It is said that each of leprechauns have a pot of gold. If you are lucky and caught a leprechaun, you can make it to show you the place where he hid his gold.

Another very interesting character in the Irish tales is Dark Patrick. He is poor and very wise. Probably he is called Dark because of the color of his hair, and also because of his humble birth.

In the UK you can find tales about King Arthur and the Knights of the Round Table. They are warriors of noble birth.

In British national fairy tales, as in the fairy tales of other nations, kindness and courage and triumph of justice are the key concepts and always overcome everything.

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### **Corporate social responsibility (Корпоративная социальная ответственность)**

Corporate social responsibility (CSR) is an important part of modern business. Like every branch of business, oil and gas industry requires correct development. Why CSR is important in oil and gas industry? CSR is known as a necessary tool-kit for successful development of companies and industry in general. The aim of the report is to explain the importance of CSR for oil and gas industry.

Companies are increasingly expected to assist in addressing many of the world's pressing problems including climate change, poverty and HIV/AIDS. Corporate social responsibility (CSR) has emerged as a business approach for addressing the social and environmental impact of company activities. Companies from the oil and gas sector have been at the centre of CSR development. With increased expectations placed on business, one needs to ask if CSR is able to fulfil these larger expectations.

In oil and gas industry there are such important issues of CSR as:

Local social license to operate, environmental problems, local content and growing demands for benefit sharing, labor relations and regaining workers trust, Industrial safety.

First of all, companies in the oil and gas industry have to realize main issues linked with oil extraction from business point of view. After that they should create a CSR strategy, which will be an important step for successful business.

More than 20 annual reports of 4 oil and gas companies have been analyzed. They are: ExxonMobil, Bashneft, Shell and Heritage Oil. From these reports one can understand that all modern companies use CSR in their economic strategies. All of 4 companies have chosen their own paths of development. For example, the Shellcompany used CSR couple of years ago for solving their problems with local social license to operate, and at present it uses a wide range of educational programs, including a scholarship program. The Bashneftcompany organizes charity, educational and environmental protection programs. According to annual reports of the other two companies, they are using CSR successfully as well.

Moreover, some social experiments concerning CSR have been carried out and about 150 students from different universities have been interviewed.

From our point of view, oil companies should be a part of special programs to help younger generations of specialists to understand the significance of CSR activities.

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### **English people as they are (Англичане как они есть)**

One of the most striking features of English life is the self-discipline and courtesy of people of all classes. There is little noisy behaviour, and practically no loud disputing in the street. People do not rush excitedly for seats in buses or trains, but take their seats in queues at bus stops in a quiet and orderly manner.

Englishmen are naturally polite and are never tired in saying "Thank you," "I'm sorry," "Beg your pardon," If you follow anyone who is entering a building or a room, he will hold a door open for you. Many foreigners have commented on a remarkable politeness of the English people.

English people don't like displaying their emotions even in dangerous and tragic situations, and ordinary people seem to remain good-tempered and cheerful under difficulties. The Englishman does not like any boasting or showing off in manners, dress or speech. Sometimes he conceals his knowledge: a linguist, for example, may not mention his understanding of a foreigner's language.

The Englishman prefers his own house to an apartment in a block of flats, because he doesn't wish his doing to be overlooked by his neighbours. "An Englishman's house is his castle."

Many Englishmen are very good to their wives at home. They help their wives in many ways. They clean the windows when they are at home on Saturday afternoon. They often wash up the dishes after supper in the evening.

Sunday is a very quiet day in London. All the shops are closed, and so are the theatres and most of the cinemas. Londoners like to get out of town on Sundays. The sea is not far - only fifty or sixty miles away and people like to go down to the sea in summer or somewhere to the country for skiing in winter.

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### **Mardi Gras in England (Масленица в Англии)**

Mardi Gras is celebrated in England less luxuriantly than in other European countries. The fact is that in the Middle Ages, in the XIV-XVI centuries. It was distributed widely and noted revelry, various competitions and Maslenitsa dish -

pancakes. But the Reformation stifled this holiday: gradually narrowed the timing of its celebration, associated practices have been transferred to other national holidays, and the XIX century. Essentially a celebration of carnival lasts no week and one day, although that day and now remains one of the most popular folk holidays - a "penitential Tuesday."

On this day, the popularity of various kinds of competition, fight, fist fights. The most popular men's match is still the football, which used to be not only fun, but also an important religious ritual. It is played in even the clergy and religious buildings.

The history of this interesting tradition of Pancake Day in England goes far in 1445. It is believed that the "ancestor" of this tradition has become a forgetful citizen who has forgotten about the celebratory service and jumped out into the street in what was - in a kitchen apron with a frying pan, on which ruddy pancake lay.

And now the last days of the Anglican and Catholic Maslenitsa in London and other British cities are traditional "pancake races." In the British capital popular comic competitions on the last day before Lent are usually at the Protestant Church of All Saints, located near the Tower of London. Teams of four have to run relay race on a given route. Each participant will be holding a frying pan with a pancake, which should throw on the run and try not to drop on the ground.

As a rule, members of the teams "pancake race" wear original costumes. Here you can see housewives in starched aprons, and office clerks in white-collars, and clowns. Once the winner of this race was a group of firefighters from one of London's fire stations, which appeared in the competition in full "combat" outfit.

The winners of the "pancake race" traditionally treated to champagne, and then all competitors gathered for a dinner party in the Church of All Saints.

In the town of Olney Buckinghamshire, in the famous race only women involved. The competition starts on ringing the bell pancake at 11 am. 55 min. Every woman is running hot frying pan and pancake on it. Developed special rules for such events: first, the participants should not be less than 18 years; secondly, women should be wearing an apron and kerchief on her head; Thirdly, during the run one need to throw and catch a pancake at least three times - at the start, during the run and at the finish. The reward for the winner, which will be able to reach the finish line first and not to drop while the pancake on the ground, are kissing Anglican clergymen and priests, and is considered to be the champion of pancake races this year.

However, somewhere in England Pancake such entertainment is prohibited. For example, residents of the small town of Ripon in the north-east of the country to hold pancake races no longer work. It happened after the insurance companies assess the risk of the race, and were horrified by the amount of possible payments to victims. The administration of the city believes that running hot pans through the narrow streets of English is extremely dangerous to the health of citizens.

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### **Guy Fawkes Night** **(Ночь Гая Фокса)**

I like to learn foreign traditions and culture. One of my favourite holidays is Guy Fawkes Night which is celebrated in the UK and in some former colonies (New Zealand, Australia, and Canada).

Every year, the 5th of November the UK celebrates one of the traditional British holidays, *Guy Fawkes Night* also known as *Bonfire Night* or *Night fireworks*. The history of this folk festival begins in 1605, when the Gunpowder Plot was revealed and prevented the murder of King James 1. According to the plan of the conspirators powder kegs had been hidden under the building of the Houses of Parliament. The explosion was to occur the 5<sup>th</sup> of November while pronouncing king throne speech. As a result of the betrayal of one of the participants in the conspiracy Guy Fawkes was caught in the moment when he was going to set fire to the wick.

The day when the conspirators were executed, joyful royal subjects have become bonfires in the streets, burning them stuffed Guy Fawkes. The authorities took up this custom and from 1605 to 1959 all subjects of the Kingdom of Great Britain were to participate in the official events of the holiday. Celebrating the “Night Guy Fawkes” symbolized the loyalty to the king and the Protestant faith, contempt for treason.

Now it's noisy and cheerful carnival with bonfires and fireworks. Typically, the celebration is not limited to just one day. During the weekend before November 5 and after fireworks, costume balls and shows are launching in the city parks. On the eve of the holiday kids ask passersby coins for Guy Fawkes for buying then fireworks and firecrackers.

The apogee of fun becomes the night of 4 to 5 November. Participants of the show in ancient costumes and masks are in the night streets and they carry a burning cross on a cart with an effigy of Guy Fawkes. On this day, the children enjoy the full right to stay without sleep all night and have fun with their parents. It is better to dress warmly and go to the streets and squares filled with a noisy crowd, with painted faces or wearing masks, dancing around the fire, a burning effigy of Guy Fawkes, and launch fireworks. The sky rumbles and blooms colorful fireworks. During the holiday they burned several million pounds. Usually on this day there are many holiday meals in English cuisine traditions such as mashed potatoes with grilled sausages or chicken legs, salad of carrots and cabbage with mayonnaise and sweet pudding for dessert.

In my opinion this holiday is very interesting and funny. I would like to visit England for seeing and taking part in this festival. Sure, after this celebration I'd like to get much wonderful emotions and glorious memories in my mind.

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### **The Chelsea Apothecary Garden** (Аптекарский сад Челси)

The Chelsea Apothecary Garden was founded in London's Chelsea in 1673. It is the second oldest botanical garden in Great Britain after Oxford University's botanical garden, which was founded in 1621.

The oldest rockery garden in England is the rockery garden in Chelsea. There is the largest olive tree of Great Britain in the garden, it is protected by a high brick walls of the garden that hold the heat; also there is the world's northernmost grapefruit tree growing outdoors.

In 1983, the garden was registrated as a nonprofit organization and was opened for the public for the first time. It is a member of Society Museum of Health and Medicine in London.

In 1722 Dr. Hans Sloane purchased from Charles Cheyne the adjacent Manor of Chelsea for rent to Apothecary Society for £5 a year for unlimited term, requiring only that the Garden should provide for 50 herbarium specimens per year, as long as the total number of copies reaches two thousand for the Royal Society of London, of which he was the head.

This was the beginning of the golden age of Chelsea's Apothecary Garden led by Philip Miller from 1722 to 1770, when it became the world's richest filled botanical garden. Seed exchange program began with the visit of Professor Herman, a Dutch botanist, in 1682, he has collaborated with Hortus Botanicus garden in Leiden and continues to this days.

The Elizabeth Blackwell's book "A Curious Herbal", published in the years 1737-1739 was partially illustrated with the help of the samples from Chelsea's Apothecary Garden. Parts of the garden were used for development of the city - on the north bank of the River Thames in 1874 was built

New for 2015 is the World Woodland Garden, which celebrates useful and medicinal plants from the Americas, Europe and East Asia. The half-acre garden is home to more than 150 species of plant and visitors can weave through it on a serpentine path or learn more about the collection from garden volunteers in one of the woodland clearings.

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### **Comparison: Original Sherlock vs BBC Sherlock** **(Сравнение оригинального Шерлока Холмса и Шерлока BBC)**

In July 2010, the BBC released a new adaptation of the books of Sir Arthur Conan Doyle, Sherlock. Instead of being another copy of the adventures of the famous detective, Mark Gatiss and Steven Moffat wrote a slightly different story.

Gatiss and Moffat kept the main characteristics of the original story: a duet composed of a detective and a doctor solving very mysterious crimes. The action takes place in London. The two protagonists meet to share a flat together. They also make reference to the original in the evocation of Sherlock's studies, about "The Different Types of Ashes", and the traditional hat appears. Sherlock's drugs problems are not too much referenced in the TV show, just a scene about Sherlock trying to quit smoking by sticking a lot of nicotine patches on his arm.

If the action takes place in the same city, the era is different: if the original Sherlock is living during the 19<sup>th</sup> century, the second one is more contemporary. This main difference changes entirely the way of investigating: when the "old" Sherlock relies on his brain, the "young" one combines this with the new technologies like Internet and never separates from his mobile phone. He is really close to Lestrade, the detective inspector from Scotland Yard, and also uses the «homeless network» to find information the police don't have. There is another reference of a book Sherlock is supposed to be the author in the books series, "The Science of Deduction", which is the name of the website of the contemporary detective.

Sir Arthur Conan Doyle's Sherlock Holmes is a kind man who always welcomes his clients warmly, listens at them patiently and is more looking for the welfare of them than any recognition. However, modern Sherlock is a rough man, completely selfish, quite show-off, he only chooses his surveys depending on his own desire and the complexity of it, or if he needs money. In the third episode, he describes himself as a "*high-functioning sociopath*." It is not possible for him to accept he is wrong, and he is able to affirm, after playing a game "*Well then the rules are wrong!*"

Even though Gatiss and Moffat kept the essential from the original story, their TV show is really different in many ways, even their Sherlock's attitude is excessive, marginal but we still appreciate his rudeness because he is brilliant, and because he changed since Watson started living with him. I like the way they adapted Sherlock, avoiding a dull copy-paste of the books. The way they make references to Doyle's oeuvre is smart and quite discrete.

## **What you always wanted to know about Ireland** **(То, что вы всегда хотели знать об Ирландии)**

### **Lifestyle**

The people of Ireland are known to be very hospitable and friendly in nature. Having a family life is considered of great importance in Ireland. The traditional ways of the Irish people can be seen more commonly in the rural areas of Ireland. Here, a lot of traditional customs are followed which is quite a contrast to the modern life that is led in the urban areas of Ireland.

The homes in Ireland still follow the same rules and are built in a similar fashion, as was the pattern of the olden days. Bright and cheerful colors can be seen splashed on the walls of most homes with colorful doors. Homes of Ireland are generally terrace houses with the central heating system having replaced the traditional fireplace.

### **Sports**

Ireland has actively followed and developed their sporting culture in various games such as hockey, rowing, golf, cricket, rugby, shooting, etc. However, traditionally, the major sports played and followed by enthusiasts all over the country are Gaelic Football and Hurling, which contribute to over half of the match attendance in the country. Gaelic football is very similar to Australian football or rugby. Hurling has its roots in hockey, though there are many significant differences.

### **Arts**

Ireland boasts the finest writers of all times. Ireland even has 4 winners of the Nobel Prize for literature (20th century). Writers such as Oscar Wilde and William Butler Yeats have made major contributions in the literary world. Visual and graphic arts also have a strong foothold here. Some of the early associations of art is seen in the carvings that were found at sites at Newgrange and illuminated manuscripts that belonged to the medieval period.

### **Food**

Stories related to the old Irish culture mention honey being widely used especially to make mead. Meat was widely eaten along with poultry products. The potato formed a major part of the food in Ireland amongst the labor class. Today, the food habits have influences from all over the world. Although meat has always been the main item in Irish food, fast food has also taken over. New Irish dishes are being churned out to maintain some healthy eating habits; these focus mainly on fresh vegetables.



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### **Sport in Ireland** **(Спорт в Ирландии)**

In Ireland, sport is popular and widespread. There is a large varied choice of sports here, the most popular of them are Gaelic football and boxing: 34% of the athletes play football, 23% of them do boxing. Gaelic football and boxing are believed to be the national sport of Ireland.

Traditional Irish sports are governed by the Gaelic Athletic Association, the largest organization of amateur athletes in Ireland, uniting 2,500 branches and 800,000 non-professional athletes. The main objective of the association is the management and promotion of sports such as Gaelic football, hurling, camogie, Gaelic handball and rounders.

Rugby is popular everywhere in Ireland, but is especially popular in Munster, Ulster and Dublin. In Ireland, there are schools of rugby: Blackrock College, Rockwell College, Castleknock College that engage children in this sport. The strong team and professional clubs attract people's interest to this game and every year the amount of "rugbists" becomes larger.

Gaelic football is a variation of rugby. When the most important games of the national championship take place, up to 80 million viewers gather at the matches of this sport that makes it popular according to the match attendance.

In Ireland, the growing popularity also belongs to extreme sports, such as skateboarding, roller skating, surfing, BMX biking, mauntibord (a board that resembles snowboard and skateboard designed for driving on rough terrain in the summer time), kite surfing (sport, which is based on the moving by the force of traction, developed by the controllable kite held by the athlete), wakeboarding (extreme sport that combines elements of slalom waterskiing, acrobatics and jumping).

But there are some sports that are not so much popular in Ireland. They are basketball, handball. The interesting thing is that when there are no Gaelic football matches, basketball matches are on TV. This sport is not popular in the country, but is widespread among students in schools and colleges. Handball in Ireland is called Olympic handball, in order to distinguish it from the Gaelic handball. This sport is not popular, but interest in it is growing, especially in primary and secondary schools.

There are new sports, such as baseball, softball among mature sports in Ireland.

It is interesting that newspapers and television in Ireland pay much attention to such sports as Gaelic football, horse racing.

In Ireland, there is a wide variety of sports, but the most popular is Gaelic football.

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### **Sherlock Holmes and Dr. Watson** **(Шерлок Холмс и Доктор Ватсон)**

Arthur Conan Doyle wrote his first novel about detective Sherlock Holmes and his friend and biographer Dr. John Watson "A Study in Scarlet" in 1887. Holmes was featured in four novels and 56 short stories. Amazingly, but "A Study..." didn't impress English public of the time. But the same can't be said about readers of USA. Exactly thanks to them Doyle received a request to write the sequels. And after that adventures of Holmes and Watson won all hearts around the world.

Sherlock Holmes is a highly peculiar character, he is a professional in his work, but at the same time you get the impression that he is slightly defective. He only has a certain knowledge and totally ignores those that distinguish an educated man from an ignoramus. Doyle said that Holmes was inspired by Joseph Bell, a surgeon at the Royal Infirmary of Edinburgh for whom he had worked as a clerk. Bell was noted for drawing broad conclusions from minute observations.

John Watson is a retired military doctor, Sherlock Holmes' friend, an assistant and sometimes a flatmate, and the first person narrator of all but four of these stories. Osteopath from Lundy William Smith and the doctor from Southsea John Watson, as well as military surgeon Alexander Francis Preston, could be possible prototypes of him.

A lot of other adventures of favorite characters were created by third-party writers. Many of them carry the heroes over to imaginable and unimaginable places and had the quality comparable to the original.

Some of readers considered them real people and Doyle was the only literary agent of the biographer of the great detective. Letters with requests for assistance were sent to heroes' address (Baker Street, 221b) as well as to Doyle's. Never before had fictional characters been so realistic!

Stories about this glorious duo have dozens of film and TV adaptations. For viewers from former Soviet Union it's wonderful Soviet detective series directed by Igor Maslennikov with Vasily Livanov as Sherlock and Vitaly Solomin as Watson in the first place. Also enormous popularity was achieved by Steven Moffat's modern adaptation starring Benedict Cumberbatch and Martin Freeman .

Sherlock Holmes and Dr. Watson are known to almost everyone, even those who haven't read anything about their adventures. And endless streams of fans are still visiting the museums. So we can say that now Sherlock Holmes and his friend Dr. Watson are very much alive to the very day.

**ИНОСТРАННЫЙ ЯЗЫК В СФЕРЕ  
ПРОФЕССИОНАЛЬНОЙ КОММУНИКАЦИИ**

**АГРАРНЫЕ НАУКИ**

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**Die Forschung und die Schaffung von Molke-Desserts  
(Исследование и создание сывороточного десерта)**

Wie meinen Sie, was ist Milch? Alle wissen, dass die Milch ein nützliches Getränk ist. Die Milch ist eine Quelle der Mehrheit von Nährstoffen sowie auch Vitaminen A und B, Calcium, Sauerstoff, Phosphor, Magnesium, Eiweiß, Zink und so weiter. Wie bekannt, sind auch Sauermilchprodukte beliebt und nützlich wie die Milch. Darunter auch Molke.

Molke gibt es als Nebenprodukt aus Milch, aber dieses Produkt ist sehr wertvoll. Molke besteht von 93,7 % aus Wasser und der Rest enthält viele Vitamine und Mineralien wie auch die Milch.

Energie-Stoffe und verschiedene Mineralien ergänzen die Palette der Molke-Komponenten, so dass der Körper bei jeder Diät normal funktionieren kann. In diesem Zusammenhang entstand am Lehrstuhl für Technologie der Fleisch- und Milchproduktion der Baschkirischen Staatlichen Agraruniversität die Idee der Herstellung von Molke-Dessert mit Obst-Füllungen.

Die Molke-Schicht besteht aus dem wiederaufbereiteten trockenen Molkepulver mit dem Zusatz von Gallert. Die Grundlage bei der Herstellung des Obstgelees bildete der Aufguss aus Früchten von Hagebutten, Aronia und Dost.

Die Hagebutten sind an Ascorbinsäure reich und ein Multivitamin-Mittel. In den Beeren von Hagebutten gibt es mehr Vitamin C als in den schwarzen Johannisbeeren und Zitronen.

Der Geschmack von Aronia ist angenehm sauer –süß, herb und der Aronia-Saft hat eine dunkle rubinrote Farbe. Aronia hat viel Vitamin P, Ascorbinsäure, organische Säuren, Carotin. Aronia enthält viel Jod, so hilft sie bei einigen Erkrankungen der Schilddrüse.

Im Bestande von Dost gibt es eine hohe Dosis Vitamin K. Er beteiligt sich an der Arbeit des Stoffwechsels, ist für den Aufbau der Knochendichte, für Blutgerinnung, funktionale Arbeit der Leber und der Nieren verantwortlich. Es gibt ziemlich viel Eisen, Zellgewebe und Mangan. Dost gilt als eine ausgezeichnete Quelle von Ascorbinsäure. Eine Menge von Vitamin C gibt es in frischen Blättern.

Molke-Dessert ist ein neues Milch-Produkt mit Diät-Eigenschaften. Das Dessert besteht aus zwei Schichten: Molke und Obst-Gelee. Dicke sanfte Molke-Schicht kombiniert sich gut mit Gelee aus Früchten, die einen eigentümlichen Geschmack haben. Der Produktionsprozess besteht aus zwei parallelen Phasen der Herausbildung der Molke-Grundlage und der Frucht-Gelee-Phase. Die Phase der Herstellung der Molke-Grundlage umfasst eine Operation der Wiederherstellung der trockenen Molke, der Bestimmung der Dosis und Art der Einbringung in die Molke der Geleezusätze. Die Phase der Erzeugung von Obst-Gelee enthält eine Erhaltung der Tinktur aus Früchten mit der nachfolgenden Zugabe von Gelatine. Nach Abschluss der Prozesse werden zwei Phasen in eine vereinigt. Beide Phasen verschmelzen sich nicht durch Gelee-Konsistenz, sondern bilden eine klare Linie. In der Tabelle können Sie die organoleptischen Eigenschaften des Desserts sehen: Geschmack und Geruch, die Konsistenz, die Farbe.

Tabelle 1 Organoleptische Eigenschaften des Milch-Desserts.

| Bezeichnung der Kennzahl | Eigenschaft                     |                                                 |
|--------------------------|---------------------------------|-------------------------------------------------|
|                          | Molke                           | Tinktur                                         |
| Konsistenz               | Dick, ziemlich klebrig, homogen | Dick                                            |
| Geschmack und Geruch     | Klar, ohne Gerüche.             | Sauber, mit leichter Süße der Früchtengeschmack |
| Farbe                    | Cremeweiß                       | Rosa                                            |

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### **Marine geodesy (Морская геодезия)**

This work aims at providing a brief description of Marine Geodesy, its purposes and techniques. The analysis of the instruments used in this field proves important as some of the techniques employed in Marine Geodesy can also be used in other types of surveying.

Since geodesy is the science of the measurement and mapping of the Earth's surface, this definition includes the determination of the surface of the ocean floor and the Earth's external gravity field [2].

Geodesy for sea areas is called "Marine Geodesy" and it is related to hydrography and to geodesy too. So Marine Geodesy acts as a bridge between hydrography and geodesy. Marine Geodesy determines the shape of the earth's surface and the gravitational field in the oceans and seas [2].

Hydrographic surveying is the measurement of bodies of water and coast lines, configuration of seas, rivers, and other bodies of water, their geographical relationship to the landmass, and their characteristics and dynamics [2].

The aim of Marine Geodesy is exploration and exploitation of natural resources, construction of hydraulic structures, surveying and mapping of the seafloor, laying of cables and pipelines, well-boring, measurement of the height of waves, currents; searching for underwater objects. Mariners in all the seas of the world use the data for the safety of navigation. Also, the Hydrographic measurements help to illustrate the unique situation of planet Earth [3].

As for the techniques used in Marine Geodesy, modern surveying relies as much on software as hardware. Traditionally, surveying is conducted with Echo sounding, with the aid of aircraft and electronic sensor systems [1]. After data is collected, it has to be processed. Depending on the final use this data must be corrected. It must be corrected for the effects of stream waves, water level and water temperature differences. Final charts of survey can be created in a combination of special charting software or a CAD package, usually Autocad.

The results of the marine geodesy include nautical charts and bathymetric maps [1]. They contribute to understanding of our planet, as well as to illustrating the unique situation of planet Earth and taking care of its rich and limited resources.

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### **The zoonoses (Зооантропонозы)**

Animals, domesticated or wild, can be a source of human illness. Zoonoses (the list of which contains more than 150 infections) are diseases that transmitted between animals and man.

The most terrible disease that animals can transmit is rabies. The rabies attacks the nervous system. Source of infection is saliva of infected animals. Saliva contains the deadly virus and comes to us through a bite, open sore or wound.

Brucellosis afflicts cattle, goats and swine. The bacterium of brucellosis can transmit from infected animals to man through raw milk, meat, wound, at birth and abortion of fetus. Brucellosis is not deadly dangerous, but can cause disability.

Undulant fever is a severe disease. You avoid infection, if you have a good sanitation and management. Animals should be tested regularly and removed if infected.

Bovine tuberculosis is a fearsome virus, affected a respiratory system. Bovine tuberculosis is not so dangerous through rigorous testing and elimination of infected animals. Vaccination of animals prevents the loss of livestock and economic loss. Protective measures are regular testing, vaccination and pasteurization of milk.

Salmonellosis is an acute infectious intestinal disease. Salmonella organisms are found in both animals and poultry. The disease causes severe gastrointestinal distress and fever. If you want to avoid a dangerous disease, you must observe zoohygienic veterinary and sanitary measures, vaccinate animals and isolate sick ones.

Tetanus is a bacterial acute infection disease. Exciter of tetanus attacks nervous system. Tetanus is a horrible disease with a high fatality rate. All people should be vaccinated.

Leptospirosis is an acute infectious disease. Leptospirosis can be a serious ailment. Carriers are domestic animals, rats and rodents. Sources of infection are infected urine, soil and water. Preventive measures are health education in agriculture; work with animals in protective clothing, vaccinations.

Veterinary public health is therefore concerned with such activities as the control and eradication of zoonoses; the development and supervision of food hygiene practices; laboratory and research activities in such fields as disease diagnosis, production of biological products, zootechnics, microbiology, epidemiology and all aspects of comparative pathology and medicine (oncology, therapeutics, surgery, nutrition and so on); and the education and training of professional and auxiliary health workers in veterinary aspects of public health. Harmony between man and animals in the context of health means the safe and effective application of sanitary and veterinary measures in wildlife, domestic animals and man. These measures are essential to avoid serious diseases in man and animals (domestic and wild), to obtain energy, food and by-products from healthy animals, and to avoid polluting the environment.

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### **Production of the new building material (Производство нового строительного материала)**

Reed is common name for several tall, grass-like plants of wetlands. The common reed is used in many areas for thatching roofs and walls.

Water reed is the grass most commonly used for thatching material in Europe primarily because it is durable, but also because it grows in dense stands in marshy areas where other crops are not viable.

Thatching is the craft of building a roof and also walls with water reed and other types of dry vegetation – other than wood. Thatching is a modern craft, although it has very ancient origins. It is a very old method and has been used in both tropical and temperate climates. Thatch is still employed by builders in developing countries, usually with low-cost, local vegetation. By contrast in some developed countries (such as the UK, Germany, the Netherlands, etc.) it is now a symbol of wealth, because reed houses are more ecologically friendly.

Of course, it has pros and cons. It is naturally weather-resistant, and does not absorb a lot of water. It is readily available. Thatch is a versatile material when it comes to covering irregular structures. It is cost effective. It is environmentally friendly. It provides good insulation since it doesn't need to be ventilated. It is a sustainable and original building material.

In accord with business plan of the innovation project "Reed mats production in the Republic of Bashkortostan", outward investments will be needed for the implementation of the innovative project. It's planned to take out a medium-term (5 year) working capital loan in access of 400 thousand rubles. The payback period is about 5 years.

It's planned to produce single-layer reed mats 6 meters wide, 1 meter long and 7 centimeters thick.

The project investment costs involves buying farm machinery for the production of reed mats, such as boat-mower LK-12, tractor Belarus 80.1 and two-axle trailer Dolphin 6.5.

The cost of the machine MHC-150ph for making reed mats is 160 000 rubles, the cost of the mowers LC-12 is 450 000 rubles, cost of tractor Belarus is 650 000 rubles and the cost of the trailer Dolphin 6.5 is 122,500 rubles.

The prime cost for the production of reed mats is 615.84 rubles. The final product price is 1300 rubles.

In Russia single-layer reed mats are sold. They are used as wallpapers in decoration. The cost of the mats is about three thousand rubles. So, the innovation project will be excellent problem solving.

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### **The Industrial Production of Pasta**

#### **(Промышленное производство макаронных изделий)**

Pasta is a versatile product around the world. Though pasta is Chinese in origin to the 15<sup>th</sup> century it occupied a prime position in Italian cooking thanks to Marco Polo who brought it to Venice in 1295.

A quality pasta product begins with high quality raw material. Durum wheat is ideally suited for pasta because of its unique colour, flavour and cooking qualities. Mainly only two ingredients are necessary for making pasta: semolina and water. Sometimes pasta is made with egg, and flavored with different ingredients.

The production of pasta includes six stages: grain acceptance, milling, mixing, formation, dehydration (or drying) and packaging.

Pasta has a great variety of shapes and sizes from alphabeto, cannelloni, farfalle or fusilli to ravioli, tagliatelli, tortellini and ziti. Pasta shapes stimulate culinary creativity because they are themselves the outcome of a creative process.

When cooking pasta one should bear in mind that there are some important hints to make best of your pasta. The time of cooking depends on type of pasta, its shape and size and the dish you cook. The same thing is the sauce to pasta. The main rule is the following thin and long pasta suits oily, liquid sauces, and for pasta of more complicated shapes (like hollow, curved or twisted) thicker, chunkier sauces are the best.

Storing and freezing of pasta are other important factors. Its shelf life depends on whether pasta is fresh or dried. It can be kept from couple of days to couple of years respectively.

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**Klinische Diagnostik der inneren Krankheiten der Nutztiere**  
**(Клиническая диагностика внутренних болезней**  
**сельскохозяйственных животных)**

1. Die Klinische Diagnostik beschäftigt sich mit der Art und Weise der Krankenuntersuchung und mit den aus dem Untersuchungsbefund ableitbaren ärztlichen Folgerungen. Das Ziel jeder Krankenuntersuchung ist die Feststellung der Art, Erscheinungsform und Bedeutung der Krankheit (Diagnose), auch in Abhängigkeit von den Umweltverhältnissen.

2. Eine erfolgsversprechende und wirklich ärztliche Behandlung oder Verhütung einer Krankheit ist nur in dem Fall möglich, wenn dem Tierarzt nicht nur die Art der Krankheit bekannt ist, sondern auch sämtliche Teilerscheinungen, die Entwicklung der Erkrankung und die Gestaltung der Lebensverhältnisse erforscht sind.

3. Die Grundbedingung für eine richtige klinische Diagnose ist eine gründliche und planmäßige Krankenuntersuchung. In manchen Fällen bzw. bei manchen Tiergattungen und Krankheitsformen wird man zwar auch mit einer abgekürzten Untersuchung auskommen, als Regel gilt aber das Gegenteil.



4. Die Fähigkeit zu einer genauen Krankenuntersuchung lässt sich nur durch Angewöhnung an eine stets alle Organe umfassende und in derselben Reihenfolge durchgeführte Untersuchung erwerben, weil nur eine solche dafür bürgt, dass keine Krankheitserscheinungen übersehen bleiben und kein Organ sich der Prüfung entzieht. Eine gründliche Untersuchung stets nach demselben Plan bietet auch den Vorteil, dass man sich in dieser Weise in kurzer Zeit die Fähigkeit aneignet, richtig und alles zu sehen, zu fühlen und zu hören und die normalen Verhältnisse von den krankhaften zu unterscheiden.

5. Unter Berücksichtigung der anatomischen und physiologischen Verhältnisse empfiehlt es sich, die einzelnen Organe in solcher Reihenfolge zu untersuchen, die das Bekanntsein des Zustandes irgendeines Organes bei der Prüfung der nächstfolgenden Organe ermöglicht.

6. Die Untersuchung ergibt gewisse Funktionsstörungen, anatomische, chemische oder physiologische Veränderungen: die Krankheitszeichen oder Krankheitserscheinungen. Dem erkrankten Organ oder Körperteil selbst angehörende Krankheitszeichen nennt man örtliche Symptome im Gegensatz zu den Allgemeinsymptomen, die der Mitleidenschaft des Gesamtorganismus ihre Entstehung verdanken.

## **БИОЛОГИЧЕСКИЕ НАУКИ**

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### **Production wastes of gas transmission companies (Отходы производства газотранспортных предприятий)**

As a result of production and economic activity of a gas transmission company 3–5 thousand tons of wastes are formed annually. The main technological processes leading to the formation of wastes are processing of gas at compressor stations and gas-distributing ones, and transportation of gas through the main gas pipelines.

In the course of mechanical cleaning, drying and cooling of gas at compressor stations the wastes of oil products, compressor oils, synthetic and mineral oils, the cleaning material polluted by oils etc. are formed.

In the course of repair and technological service of the gas pipeline the wastes of oil products, the slime of cleaning of pipelines and capacities are formed.

At auxiliary production objects during the operation of the metal-cutting, boring, turning and tool-grinding machines located in mechanical repairing shops, the wastes in the form of scrap of ferrous metals are formed, while carrying out welding works — the remains and candle ends of steel welding electrodes.

At all the objects the wastes in the form of metal scrap, and also garbage from household rooms and cleaning of territories are produced.

The considerable mass of the wastes of auxiliary production includes the scrap of ferrous metals, the slime of petroprocessing installations.

More than half of the wastes which are formed at a gas transmission company belongs to the least dangerous fourth and fifth classes of danger, 30–40% are the wastes of the third class of danger and less than 10% are the wastes of the first and second classes of danger.

The main part of the wastes (more than 90%) which are formed at the objects of a gas transmission company is transferred to other organizations for use, neutralization and burial, 4,5% of the wastes are used at the objects.

The wastes which are formed as a result of the production activity are only temporarily collected on the territories of branches before their transferring to other organizations for processing, neutralization, burial. All places of temporary storage of the wastes correspond to nature protection requirements.

Large-size the wastes are located in places of temporary storage on specially equipped concreted platforms. Small size solid wastes are temporarily stored in containers. Luminescent lamps are stored in specially equipped closed box in certain rooms.

Household wastes are gathered in metal containers and are regularly taken out to solid wastes landfills or the authorized dumps.

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### **Vitamin D – calciferol (Витамин Д - кальциферол)**

Vitamins are necessary for our body organic substance, which cannot be synthesized (with rare exception) and come with food. Vitamins provide the vital processes in the body that affect our overall health. The purpose of our study is vitamin D.

**Description.** Vitamins D are formed by the action of ultraviolet radiation in the tissues of animals and plants of the sterols. Today vitamin D is subdivided into two types – D2 and D3 – cholecalciferol and ergocalciferol – colorless and odorless, resistant to high temperatures. These vitamins are fat-soluble, soluble in fats and organic compounds, and insoluble in water.

**Sources.** Vegetables: alfalfa, horsetail, nettle, parsley. Animals: egg yolk, butter, cheese, fish oil, eggs. Dairy products: holekaltsiferol synthesis in the body is formed in the skin when exposed to ultraviolet rays of sunlight.

**Action.** The main function of vitamin D is to ensure normal growth and bone development, prevention of rickets and osteoporosis. It regulates the mineral metabolism and promotes the deposition of calcium in bone and dentin, thereby preventing osteomalacia (softening) of bones.

In the body, vitamin D is absorbed in the proximal part of the small intestine, and optionally in the presence of bile. Part of it is absorbed in the middle of the small intestine, a small part – in the ileum. After absorption detected calciferol consisting of chylomicrons in free form and partially in the form of an ester. Bioavailability is 60-90%.

**Conclusion.** Vitamin D is fat-soluble. It tends to accumulate in the body and in excess to act contrary – to the detriment. The guiding principle: less sun – more products. Raw materials are good for the synthesis of vitamin D. More sun reduces but does not exclude these products from the diet.

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#### **Mammals are more like their fathers**

**(Млекопитающие больше похожи на своих отцов)**

You might resemble or act more like your mother, but a novel research study from University of North Carolina School of Medicine researchers reveals that mammals are genetically more like their dads. Specifically, the research shows that although we inherit equal amounts of genetic mutations from our parents we actually "use" more of the DNA that we inherit from our dads.

In many mouse models researchers typically don't take into account whether specific genetic expression originates from mothers or fathers. But research shows that inheriting a mutation has different consequences in mammals, depending on whether the genetic variant is inherited from the mother or father.

We've known that there are 95 genes that are subject to this parent-of-origin effect. They're called imprinted genes, and they can play roles in diseases, depending on whether the genetic mutation came from the father or the mother.

Genetic mutations that are handed down from parents show up in many common but complex diseases that involve many genes, such as type-2 diabetes, heart disease, schizophrenia, obesity, and cancers.

The key to this research is the Collaborative Cross the most genetically diverse mouse population in the world, which is generated, housed, and distributed from University of North Carolina.

Experimental mice were bred to create nine different types of hybrid offspring in which each strain was used as both father and mother. When the mice reached adulthood, the researchers measured gene expression in four different kinds of tissue, including RNA sequencing in the brain. They then quantified how much gene expression was derived from the mother and the father for every single gene in the genome.

Scientists found that the vast majority of genes (about 80 percent) possessed variants that altered gene expression. And that was when scientists discovered a new, genome-wide expression imbalance in favor of the dad in several hundred genes. This imbalance resulted in offspring whose brain gene expression was significantly more like their father's.

This expression level is dependent on the mother or the father. We now know that mammals express more genetic variance from the father. So imagine that a certain kind of mutation is bad. If inherited from the mother, the gene wouldn't be expressed as much as it would be if it were inherited from the father. So, the same bad mutation would have different consequences in disease if it were inherited from the mother or from the father. All things considered, I can say that mammals are more like their fathers.

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### **The problem of utilization of foundry wastes (Проблема утилизации отходов литейного производства)**

The rapid development of production, factories, industries is accompanied by the rapid growth of negative human impact on the environment, which consequently leads to the destruction of the biosphere. The issues relating to the protection of the environment, providing favorable conditions for human habitation, minimizing the harm caused by industrial enterprises, are discussed today at the highest level.

Foundry, along with other industrial enterprises is one of the sources of environmental pollution. The importance of foundry is high, as almost all the machines and devices havecasting parts. It is characterized by diversity and complexity of the casting processes, manufacturing processes, the materials used, which results to the emission of dust, aerosols and gases.

The solid waste is generated in the course of production in the form of chips, slag, dust, sludge, etc. The most dangerous wastes are emissions of gases and dust,

due to the difficulty of collecting, disposal and removal. Dust is released in thermal, chemical and physical processes.

To remove dust in production the extractors and cyclones with a high degree of purification are used. The re-use of sand leads to minimal losses - only 0.5-1% (dust quartz sand).

Waste slag has a complex chemical composition. It contains a variety of contaminants from the metal. They may be about 25% by weight of solid waste from the foundry. Slag usually includes metal oxides, melted refractories, sand. Slag can be dangerous if it contains lead, cadmium or chromium from molten steel or non-ferrous metals. To prevent pollution by wastes slag must be re-used and valuable metals that can be used for the production of blocks employed as the road material, must be removed from it.

Thus, the most important issue of modern foundry is the problem of waste disposal, which has not been solved. The discussed environmental protection measures are costly. So, first of all we have to fight not the consequences, but the causes of harmful emissions.

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### **The problem of industrial pollution of the environment (Проблема промышленного загрязнения окружающей среды)**

With the advent of the Industrial Revolution, technologies are rapidly evolving, science becomes advanced. All these brought, one more effect, industrial pollution. Previously industries were small factories, which produced smoke as a major pollutant. But when these plants became full-scale commercial and production units, the issue of industrial pollution began to gain more importance.

Any form of pollution whose immediate source is known, is industrial pollution. Most of the pollution on the planet can be traced back to industries of some kind. Actually, the issue of industrial pollution has serious importance for agencies that are trying to fight against environmental degradation. Countries, when faced with an unexpected and rapid growth of such industries, are also faced with a serious problem that needs to be brought under control immediately.

Industrial pollution has many forms. It infects sources of drinking water, produces unwanted toxins in the air and reduces the quality of the soil worldwide. Major environmental disasters are caused by industrial failures that have not been brought under control. Here are a few causes of industrial pollution, which led to degradation of the environment. 1. The lack of policies for pollution control. 2. Unplanned industrial growth: in most industrial towns, unplanned growth took place because the companies violated the rules and regulations. 3. The use of outdated

technologies. 4. The presence of a large number of small businesses. 5. Ineffective waste management. 6. Leaching resources from our natural world. Mining can cause soil contamination.

The consequences of air pollution are obvious. Ozone holes are formed, the greenhouse effect takes place, the percentage of serious diseases, caused by emissions, is growing. Among these are cancers, all kinds of allergies, asthma syndrome, cardiovascular activity, a general decrease in immunity. Much attention should be paid to chemical pollution of water. The main inorganic pollutants of sea and fresh water basins are compounds of lead, mercury, cadmium, arsenic, copper, chromium, fluoride. Heavy metals are absorbed by plankton and enter the food chain on the table of the consumer. Organic pollution of the ocean by sewage is 300-380 mln. t. / year. Dissolved organic matter adversely affects the status of water bodies, killing the microorganisms that contribute to the process of self-purification of water. Formation of hydrogen sulfide occurs through the decay of the bottom sediments of organic substances, which leads to the complete contamination of the reservoir.

The problem of industrial pollution concerns every nation on the planet, many steps have been taken to solve it, but industrial pollution is still thriving and will take many years to be brought under control.

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### **One gen determines the appearance of butterflies (Один ген определяет внешний вид бабочек)**

Butterfly genus *Papilio* are of different imitative coloring, while males have personally the same color, and females simulate different images of poisonous butterflies. This is called the Batesian mimicry when the edible kind imitates inedible one. This complex trait responsible for mimicry is inherited without intermediate forms, that is strictly according to Mendelian splitting but there are cases of recombination trait, so this trait is responsible for one group of linked genes that pass on to offspring, together the so-called supergen.

How many one supergene appear in the same type of one sex and the other have different shapes? This problem occupied experts in the National Center for Biological Studies in Chicago, Boston and Cornell University.

Deciphering the genetic mechanism that determines mimicry they found that this group of linked genes includes five genes one of which is doublesex gen, responsible for the traits associated with the sex and traits controlling encoding proteins with different combinations of nucleotides.

Thus a variety expression of gene according to sex has been produced. In this way one supergene is a regulator trait that controls a different mimicry in females and the same kind in males of butterflies.

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### **The ecological path «Blue valley» (Экотропа «Голубая долина»)**

An ecological path is a demonstrational specially equipped route in nature which passes through various objects and is used for environmental education.

The Black Sea is the first camp of the ecological path. A distinctive feature of the Black Sea is the complete (except for certain anaerobic bacteria) absence of life at depths greater than 150-200 m due to saturation of deep layers of water with hydrogen sulfide. The flora of the Black Sea includes 270 species of multicellular algae. The fauna – 2,5 thousand of species of animals.

A relatively small river Sukko is the second camp. It belongs to the water basin of the Black Sea. The picturesque valley of the river is located on the Abrau Peninsula. This valley differs from other neighboring valleys as that it has the status of the area, protected by the state.

The third camp is chestnuts. A sweet chestnut is a tree species of the genus Chesnut, beech family. According to the legend the chestnut was brought to the Caucasus by ancient Greeks, who established many colonies on the Black Sea coast. Chestnut has entered local ecosystem.

At the next camp in Utrish and Sukko the main wealth is the relict forest of junipers, officially declared natural monuments and listed in the Red Book. Three types of juniper grow in Anapa: tree-like or tall, reddish, malodorous (smelly).

The next camp is Pitsunda pine which grows only in the area from Anapa to the Pitsunda Cape in Abrau. Its feature is long needles-15 sm in length. This pine is protected by the state.

The next camp is high deciduous trees with thick broad crown. Sycamore has always been valued due to its physical and mechanical properties and is used for the production of valuable furniture. Sycamores live for more than 2300 years.

Then comes the next camp – European which ash can be found almost everywhere in the forests and parks, along roads and railways. It prefers moist, fertile soil, height is 30 meters, and in the south-up to 60 meters.

Anapa, as any others city, has it is ecological problems. First of all it is the pollution of the Black Sea. It happens first of all because of violation of the bottom topography. In other words, shallow sea water stagnates due to the lack of underwater currents and a lot of green algae appear in sea water.

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### **Fighting with Sosnowsky's Hogweed (Борьба с борщевиком Сосновского)**

As is known, Sosnowsky's Hogweed is a plurannual of the Family Apiaceae, since the fifties of the last century was grown in many regions of Russia, including north-west of European part. It was used as forage (silage) plants. A few years later began his active dissemination to the various categories of land and ousting their local species of herbaceous plants. But, because of the content in it furanocoumarins, causing contact with the human skin hard dermatitis, similar to burns, hogweed stopped to cultivate more than 30 years ago. Also proved his genotoxicity. The juice can cause serious violations of chromosome structure - chromosomal aberrations, mostly through damage of cleavage spindle.

Today, the area occupied by hogweed, continue to actively grow. Thickets of hogweed on farms, along roads, on uncultivated fields, human settlements are a serious danger to human health. This aggressive species intensely propagated by seeds and settles, seizing new territory. So the problem of the destruction of this species is very topical. There are many ways to destroy the hogweed, but not one of them is not safe for human health. For instance, the mechanical control of this plant includes a number of activities such as:

- pruning flowers when sending out buds and beginning of flowering
- burning of plants
- mowing
- agrotechnical measures

However, all these methods are ineffective and not safe.

An alternative to these methods can serve as another way to fight - processing plants with herbicides. Referring to on a number of works of authoritative researchers, we suggest using the following herbicides: glyphosate and sulfometuron-methyl, namely their mixtures. The combination of certain concentrations of these herbicides can give a significant result, preventing further growth of hogweed. First we need to say about the relative harmfulness of these drugs. Impossible to argue that they are not dangerous, although their application does not entail a number of destructive processes for ecological systems.

Introduce these herbicides necessary in 2 periods: I- beginning of the vegetative phase (first half of May), II- end of the vegetative and beginning generative phases (the second half of June and first week of July). Observed 100% efficiency, and the result is stored until the next growing season, but a year later after the first treatment, the event must be repeated in order to prevent germination Hogweed.



## **Placebo-Effekt (Эффект плацебо)**

Es wird gegenwärtig Placebo-Effekt sehr oft erwähnt. Welche Kenntnisse haben die Wissenschaftler davon? Die Ärzte haben wenige alternative Verfahren, die den Patienten helfen, obwohl nachgewiesenermaßen keinerlei Wirkung von ihnen ausgehen kann. Fachleute sprechen dabei vom Placebo-Effekt.

Placebos gibt es schon seit der Antike. Damals wandte der griechische Arzt Hippokrates Methoden an, die eigentlich wirkungslos waren und trotzdem halfen. Auch im Mittelalter arbeiteten die Heiler mit solchen Verfahren. Die wissenschaftliche Beschäftigung mit dem Thema begann im Zweiten Weltkrieg. Auslöser war eine Beobachtung des Militärarztes Henry Beecher. Er sah, wie eine Krankenschwester einem verwundeten Soldaten eine Kochsalzlösung spritzte, weil das Morphin knapp geworden war. Dem Kranken ging es trotzdem besser.

Das Prinzip des Placebo-Effekts besteht darin, dass der Patient überzeugt von der Besserung sein muss. Placebo-Effekt kann mit einfachen Verfahren verbessert werden. Zum Beispiel, die Wirksamkeit des Placebos kann erhöht werden, wenn der Patient zuversichtlich ist, dass er ein teures Heilmittel nimmt. Die Einführungsmethoden des Arzneimittels spielen auch eine wichtige Rolle. Niederländische Wissenschaftler haben gezeigt, dass die analgetische Wirkung von Placebo bei Migräne um knapp 7% höher ist, wenn die Kranken eine Spritze anstatt der Tabletten bekommen.

Einige Menschen sind mehr als andere dem Placebo-Effekt ausgesetzt. Je mehr man infantil ist, desto besser ist die Wirkung des Placebo-Effekts. Und da die Kranken mit Psychosomatischen Störungen häufig infantil und leicht beeinflussbar sind, sind solche Krankheiten wie Migräne, Depression, Gedächtnisschwäche und beeinträchtigte Aufmerksamkeit mit Hilfe des Placebos ziemlich effektiv heilbar.

Nach einigen Angaben bestimmen die genetischen Merkmale die Anfälligkeit dem Placebo-Effekt. Im Jahr 2012 stellten Forscher aus Harvard Medical School und Beth Israel Medical Center fest, dass Patienten mit einer bestimmten Variante eines Gens für das Enzym Catechol-O-Methyltransferase (COMT), stärker als die anderen auf Placebo reagieren. Dieses Enzym ist für den Abbau von Dopamin im Gehirn verantwortlich.

Placebo ist ein aussichtsreiches Phänomen. Werden die Wissenschaftler herausfinden, wie der Placebo-Effekt auftritt, werden sie in der Lage sein, die Reservepotenziale des Organismus finden, die das Gehirn bewirkt um Opiate herzustellen und der Körper um das Immunsystem zu aktivieren. Das ist ein direkter Weg zu neuen wirksamen Medikamenten, die das innere Potenzial unseres Körpers benutzen.

### **Was ist Recycling?** **(Что такое вторичная переработка?)**

Recycling (engl. = Rückführung), streng genommen versteht man unter Recycling, dass ein Stoff ohne neuen Rohstoffeinsatz und ohne einen sehr hohen Verbrauch von Energie wieder genau zu dem Stoff wird, der er früher war. Recycling ist im idealsten Fall: Das Wiederverwenden von Kunststoff, wobei der Stoff in der gleichen Weise wie neuer Kunststoff eingesetzt werden kann.

Im allgemeinen Sprachgebrauch verstehen wir jedoch unter Recycling die Wiederverwertung von Müll. Bei der Produktion und beim Verbrauch von Gütern entstehen Abfälle. Die Rückführung dieser Abfälle in den Stoffkreislauf durch Verwertung nennt man Recycling. Beim Recycling wird unterschieden zwischen der wiederholten Benutzung, wie sie bei Pfandflaschen verbreitet ist, der Wiederverwendung in der Produktion, der Weiterverwertung in anderen Produktionsprozessen (Herstellung von Stahl aus Schrott) und schließlich der Weiterverwendung in neuen Anwendungsbereichen (Verwendung von Altpapier als Dämmmaterial). Um die großen Müllberge zu verringern und um die immer knapper werdenden Rohstoffe und Energiequellen zu schonen, ist es wichtig, benutzte Materialien wieder zu verwerten. Am günstigsten ist es allerdings, Müll zu vermeiden. So wird die Umwelt am wenigsten belastet.

Kunststoffe zersetzen sich auch nicht in Millionen von Jahren vollständig, deshalb werden auch unsere Nachfahren noch Spaß mit unserem Müll haben. Ein großer Teil der produzierten Kunststoffe fällt schon nach relativ kurzer Zeit als Abfall zur Entsorgung oder Wiederverwertung an. Kunststoffabfall auf Deponien zu lagern ist allerdings die schlechteste Lösung, denn das Material wird dann jeder weiteren Nutzung entzogen. In den Verbrennungsanlagen dient der Kunststoffabfall als Ersatz für Primärbrennstoffe (Kohle, Erdöl, Gas). Die entstehende Verbrennungswärme wird als Fernwärme, zur Dampfproduktion oder zur Stromerzeugung genutzt.

Das Wiederverwerten kann in zwei Bereiche unterteilt werden: materielles oder werkstoffliches Recycling, rohstoffliches Recycling. Bei der rohstofflichen Verwertung werden die Kunststoffe chemisch oder thermisch aufgespalten, so dass Erdöl entsteht. Daraus lässt sich wieder Kunststoff machen. Allerdings muss man bedenken, dass für den erneuten Herstellungsprozess 50 % des Erdöls als Energie verbraucht wird. Da kann man kaum vom Kreislauf reden.

Im Moment werden Kunststoffe getrennt, so dass entstehende Kunststoffabfallströme separat weiter verarbeitet werden können. Ein Problem hierbei ist, dass es viele verschiedene Kunststoffe gibt, wodurch verschiedene Abfallströme entstehen. Für viele Kunststoffe wie Polyethylen ist das kein Problem,

da das Totalvolumen für weitere Verarbeitung ausreichend ist, bei anderen lohnt sich die Weiterverarbeitung wegen der geringen Menge allerdings nicht.

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### **Der Nocebo-Effekt (Эффект носебо)**

Ein unschädliches Präparat mit schädlichen Nebenwirkungen. Nocebo ist lateinisch für "Ich werde schaden". Der Begriff Nocebo wird erst seit einigen Jahren verwendet – das Phänomen ist aber schon viel länger bekannt. Und zwar weniger aus der Medizin als vielmehr im anthropologischen Kontext, vor allem aus dem Voodoo. So gibt es Berichte vom Anfang des 20. Jahrhunderts, denen zufolge jemand glaubte, sterben zu müssen, weil ein anderer mit einem Knochen auf ihn gezeigt hat. Dieses Phänomen nennen Experten den Nocebo-Effekt. Er ist der negative Pendant zum Placebo-Effekt. Was dabei im Körper vor sich geht, das wissen Ärzte und Forscher noch nicht so genau. Ein paar Erklärungsansätze für das Nocebo-Phänomen haben die Experten aber durchaus. Eine Idee ist: Ein Patient bekommt ein Medikament und erwartet Nebenwirkungen oder dass die Symptome sich verschlechtern. Diese negativen Erwartungen senken den Spiegel an Endorphinen – und weniger von diesen sogenannten Glückshormonen im Blut kann in der Tat dazu führen, dass sich der Patient schlechter fühlt und schmerzempfindlicher ist. Zugleich schüttet der Körper, wenn er etwas Negatives erwartet, mitunter den Botenstoff Cholecystokinin aus. Das ist ein Hormon, das im Gehirn als Neurotransmitter wirkt und beteiligt sein kann, wenn sich ein Gefühl von Angst oder Panik entwickelt. Außerdem haben Studien mit Hirnscans ergeben: Die schmerzverarbeitenden Hirnregionen sind aktiviert – so, als ob das Gehirn Schmerz "spürt", auch wenn keine Schmerzrezeptoren gereizt wurden.

Nocebo-Effekte sollten vermieden werden, fordert das Kompetenznetzwerk Placebo. Dazu müsste medizinisches Personal zunächst einmal mehr Bewusstsein entwickeln für den Nocebo-Effekt im Alltag zwischen Praxis und Krankenhaus, zwischen Apotheke und Naturheilkundezentrum. Um den Nocebo-Effekt zu vermeiden, sollte die Arzt-Patient-Kommunikation also mit einem gewissen rhetorischen Geschick stattfinden: Statt zu sagen "Fünf Prozent der Patienten vertragen dieses Medikament nicht", sei es besser zu sagen: "95 Prozent vertragen dieses Medikament sehr gut." Außerdem ist es sinnvoll, eher den Nutzen eines Medikaments oder einer Therapie hervorzuheben, statt eventuell auftretende Nebenwirkungen zu erläutern. Ärzte können ihre Patienten sogar fragen, ob sie überhaupt über jede noch so unwahrscheinliche Nebenwirkung aufgeklärt werden wollen. Oder sie erklären den Patienten, was die Angaben auf dem Beipackzettel

bedeuten: "Sehr selten" zum Beispiel heißt nach einer internationalen Konvention "höchstens ein Betroffener unter 10.000, die das Produkt anwenden".

Durch bestimmten Satz lenkt der Arzt die Wahrnehmung auf das Heilungsgeschehen und weg von den Beschwerden. Auch die Verknüpfung mit heilenden Berührungen kann sinnvoll sein. Durch diese kurze Verwirrung kann die Suggestion "Morgen fühlen Sie sich besser" tiefer wirken.

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### **Müll - das Gold von morgen? (Мусор - золото завтрашнего дня?)**

Die Abfälle unserer Konsumgesellschaft werden gesammelt, getrennt, verwertet oder vernichtet. Lange Zeit galt Müll als Entsorgungsproblem. Dabei werden die Rohstoffe im Abfall immer kostbarer. Müll ist längst zum Multi-Milliarden-Euro-Geschäft geworden. Unternehmer konkurrieren inzwischen weltweit um alles, was uns wertlos geworden ist. Und Forscher arbeiten daran, den Müll in feinste Bestandteile zu zerlegen. Lassen sich unsere Abfälle künftig vollständig wiederverwerten? Ist Müll in Zukunft unsere wichtigste Rohstoffquelle? Strenge Gesetze schreiben in Deutschland die Wiederaufbereitung vor. Aus der Wegwerfgesellschaft ist längst eine Recycling-Nation geworden. Das Ziel: eine vollständige Wiederverwertung. Ohne Müll-Trennung funktioniert das allerdings nicht. Jeder Müll in die richtige Tonne: Papier, Plastik, Glas und Küchenabfall. Unser Abfall hat ein Leben nach dem Leben. Energie und Wertstoffe aus Abfall wecken Begehrlichkeiten. Es tobt ein Verteilungskampf um den Müll. Der Bedarf ist enorm. In den letzten drei Jahrzehnten ist der Verbrauch von Energie weltweit um mehr als zwei Drittel gestiegen. Bald könnten wir alle davon profitieren. Vielleicht werden wir schon bald für unseren Müll bezahlt.

Für eine Wiederverwertung ist die Trennung ein wichtiger Schritt. Die Suche nach neuen Ressourcen wird immer dringlicher. Forscher meinen: Aus den Müllbergen lassen sich noch viel mehr Roh- und Brennstoffe gewinnen, die uns von Kohle, Gas und Öl unabhängiger machen. Kritiker halten Müllverbrennung für Verschwendung. Aus dem Abfall ließe sich vieles noch verwerten. Andererseits: Aus einer Tonne Restmüll lässt sich immerhin der gleiche Brennwert wie aus 200 Litern Öl gewinnen. Das Ziel für die Zukunft ist eine vollständige Wiederverwertung von Müll. Die Institute für Recyclingforschung und Abfallmanagement arbeiten an den Möglichkeiten von morgen. Weltweit forschen Wissenschaftler an der Rückgewinnung von Rohstoffen. Denn Wiederverwertung ist mehr als praktizierter Umweltschutz. Sie könnte der Schlüssel dazu sein, unseren Lebensstandard zu halten. Eine hundertprozentige Wiederverwertung aber bleibt vorerst Vision.

Vielfach wird die Wiederverwertung der Idee des Kreislaufes aber nicht gerecht, denn die Rohstoffe, die aus dem Kunststoffabfall gewonnen werden, haben eine deutlich geringere Qualität als das Ausgangsmaterial. Flammgeschützte Kunststoffe enthalten giftige Dioxine und Furane. Damit dieser Kunststoffabfall nicht in den Verbrennungsanlagen oder auf den Deponien endet, entwickelt das Fraunhofer Institut ein Verfahren, mit dem der Kunststoff zurückgewonnen werden kann, die giftigen Stoffe bleiben dabei in einer Lösung und werden entsorgt.

Allerdings bemüht sich die Forschung Verfahren zu entwickeln, um auch Problemabfälle, Kunststoffe mit Farbe oder Zusätzen oder Verunreinigungen kostengünstig und qualitativ gut zu recyceln.

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**Antibiotics give rise to new communities of harmful bacteria**  
**(Антибиотики приводят к возникновению новых сообществ**  
**вредных бактерий)**

Most people have taken an antibiotic to treat a bacterial infection. Now researchers from the University of North Carolina and the University of San Diego, reveal that the way we often think about antibiotics - as straightforward killing machines - needs to be revised. The work, led by Elizabeth Shank, an assistant professor of biology in the UNC as well as microbiology and immunology, not only adds a new dimension to how we treat infections, but also might change our understanding of why bacteria produce antibiotics in the first place.

Shank, whose work appears in the February 23 Early Edition of the Proceedings of the National Academy of Sciences, said that for a long time we've thought that bacteria make antibiotics for the same reasons that we love them - because they kill other bacteria, however, we've also known that antibiotics can sometimes have pesky side-effects, like stimulating biofilm formation.

Shank and her team now show that this side-effect - the production of biofilms - is not a side-effect after all, suggesting that bacteria may have evolved to produce antibiotics in order to produce biofilms and not only for their killing abilities.

Biofilms are communities of bacteria that form on surfaces, a phenomenon dentists usually refer to as plaque. Biofilms are everywhere. In many cases, biofilms can be beneficial, such as when they protect plant roots from pathogens. But they can also harm, for instance when they form on medical catheters or feeding tubes in patients, causing disease.

It was never that surprising that many bacteria form biofilms in response to antibiotics: it helps them survive an attack. But it's always been thought that this was a general stress response, a kind of non-specific side-effect of antibiotics. Their

findings indicate that this isn't true. The team has discovered an antibiotic that very specifically activates biofilm formation, and does so in a way that has nothing to do with its ability to kill.

Shank and her team previously reported that the soil bacterium *Bacillus cereus* could stimulate the bacterium *Bacillus subtilis* to form a biofilm in response to an unknown secreted signal. *Bacillus subtilis* is found in soil and the gastrointestinal tract of humans.

Using imaging mass spectrometry, they subsequently identified the signaling compound that induced biofilm production as thiocillin, a member of a class of antibiotics called thiazolyl peptide antibiotics, which are produced by a range of bacteria.

At that point, Shank and her colleagues knew thiocillin had two very specific and different functions, but they didn't know why - and wanted to know how it worked. That's when they modified thiocillin's structure in a way that eliminated thiocillin's antibiotic activity, but did not halt biofilm production.

That suggests that antibiotics can independently and simultaneously induce potentially dangerous biofilm formation in other bacteria and that these activities may be acting through specific signaling pathways. It has generated further discussion about the evolution of antibiotic activity, and the fact that some antibiotics being used therapeutically may induce biofilm formation in a strong and specific way, which has broad implications for human health.

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### **Biological Weapons (Биологическое оружие)**

Biological warfare is the use of any bacteria, virus or other disease-causing organism or toxin found in nature, as a weapon of war to incapacitate or kill an adversary.

The use of biological agents for military purposes is not new, but before the 20th century, biological warfare took two main forms. The first is deliberate poisoning of food and water with infectious material and the second is the use of microorganisms, toxins or animals, living or dead, in a weapon system.

Biological warfare has been practised repeatedly throughout human history. During the 6th Century B. C., the Assyrians poisoned enemy wells with a fungus that would make the enemy delusional. In 184 BC, Hannibal of Carthage had clay pots filled with poisonous snakes and instructed his soldiers to throw the pots onto the decks of enemy ships, etc.

Historical accounts from medieval Europe detail the use of infected animal carcasses by Mongols, Turks and others, to infect enemy water supplies. During the Middle Ages, victims of the bubonic plague were used for biological attacks, often by flinging their corpses and excrement over castle walls using catapults.

Modern research and production of such weapons include human experimentation on thousands, mostly Chinese led by the Japanese army during the Second World War. They used biological weapons on Chinese soldiers and civilians. This employment was largely viewed as ineffective due to inefficient delivery systems. There is a report of over 600,000 victims, largely due to plague and cholera outbreaks.

In response to suspected biological weapons development in Germany and Japan, the United States, United Kingdom, and Canada initiated a biological weapon development programme in 1941 that resulted in the weaponization of anthrax, brucellosis, and botulinum toxin. Considerable research on the topic was performed by the Soviet Union. China and North Korea accused the United States of large-scale field testing of biological weapons against them during the Korean War in 1950-53.

In 1972, two superpowers — the U.S. and the USSR — signed the Biological and Toxic Weapons Convention, which banned development, production and stockpiling of microbes or their poisonous products except in amounts necessary for protective and peaceful research.

So, the creation and stockpiling of biological weapons is outlawed by the 1972 Convention, signed by over 100 states, because a successful attack could conceivably result in thousands, possibly even millions, of deaths and could cause severe disruptions to societies and economies. Oddly enough, the convention prohibits only creation and storage, but not usage, of these weapons.

The main problem for those who'd like to use such weapons in military purposes is that a biological warfare attack would take days to implement, and therefore, unlike a nuclear or chemical attack, would not immediately stop an advancing army.

As a strategic weapon, biological warfare is again militarily problematic, because unless it is used to poison enemy civilian towns, it is difficult to prevent the attack from spreading, either to allies or to the attacker, and a biological warfare attack invites immediate massive retaliation, usually in the same form.

That is why biological weapon is militarily of little use except in the context of bioterrorism. And that is the main concern nowadays.

The most common diseases known to be weaponized are anthrax, Ebola, bubonic plague, cholera, tularaemia, brucellosis, Q fever, glanders, melioidosis, Rocky Mountain spotted fever, typhus, psittacosis, yellow fever, Japanese B encephalitis, and smallpox. Naturally-occurring toxins that can be used as weapons include Ricin, SEB, Botulism toxin, and many Mycotoxins, etc.

### **Sleep deprivation for the benefit (Недосыпание во благо)**

Sleep restriction and violation of daily routine are associated with metabolic disorders such as insulin resistance, diabetes and adiposity. The metabolic ways involved in human sleep, though, have yet to be investigated with the use of a metabolomics access.

In this case scientists have used targeted and non-targeted fluid chromatography (LC)/MS metabolomics to study the effect of acute sleep deprivation on plasma metabolite rhythms[1].

Twelve strong, young healthy men stayed in controlled laboratory conditions with respect to environmental meals, sleep, light and posture during a 24-h wake/sleep cycle, followed by 24 h of wakefulness. Two-hourly plasma specimen received over the 48 h period were analyzed by LC/MS[2].

Principal component analysis revealed a clear time of day variation with a significant cosine fit during the wake/sleep cycle and during 24 h of wakefulness in untargeted and targeted analysis. Of 171 metabolites quantified, daily rhythms were observed in the majority (n = 109), with 78 of these maintaining their rhythmicity during 24 h of wakefulness, most with reduced amplitude (n = 66).

During sleep deprivation 27 metabolites (tryptophan, serotonin, taurine, 8 acylcarnitines, 13 glycerophospholipids, and 3 sphingolipids) exhibited significantly increased levels compared with during sleep.[3] The increased levels of serotonin, tryptophan, and taurine may explain the antidepressive effect of acute sleep deprivation and deserve further study. This report, to scientists knowledge the first of metabolic profiling during sleep and sleep deprivation and characterization of 24 h rhythms under these conditions, offers a novel view of human sleep/wake regulation.

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### **The species brown bear** **(Вид бурого медведя)**

Brown bears are omnivorous mammals of the bear family, one of the largest and most dangerous of ground-dwelling predators. The most numerous group of these animals are found in Western Canada, Alaska, and in the forest zone of Russia. It should be noted that in North America the brown bear is called "grizzly", but there is a subspecies of the brown bear – a gray bear.

The brown bear is a large animal, covered with dense, uniformly colored coat, with a powerful head, small eyes and rounded ears. The bear has four strong legs. The animal moves on feet. The coat of the animal consists of hair of different thickness and length. Paws and head are covered with short hair, and the back of the body with longer one. The density of the fur depends on such factors as gender, age and habitat of the animal.

The largest brown bears are found in Kamchatka and Alaska. They weigh more than 500 kg. The length of the body of brown bears living in Alaska and Kamchatka is up to 2.5 meters, and the height is 1.3 m, sometimes up to 3 m.

The fur color of the brown bear has a variety of options. The typical color is brown. The color range includes dozens of shades from yellow-brown to blue-black. For example, bears in Syria are reddish-brown, and in the Himalayas are grayish-white. Once a year brown bears change their hair. The molt begins in May and ends in November or December, when the animal lies down for hibernation.

The traditional habitat of the brown bear is a dense forest. The bears are loners. Males live alone, and females with cubs. Hibernation of the brown bear is a shallow sleep period. Hibernation begins in the fall and continues from seventy-five to one hundred ninety-five days, depending on climate and other factors. In the southern regions bears do not hibernate at all. Bears wake up when their nutrient reserves are depleted. Bears live in the wild maximum for thirty years, and in captivity - twenty years longer.

About 75% percent of a bear's diet is plant food. In addition, the menu of the brown bear includes beetles, ants, worms, and other insects. A special place in the diet of brown bears belongs to fish. Hunting for large animals is not typical for the bears, but it does happen.

The mating season of brown bears lasts for two months - from May to June. Babies are born completely helpless: blind, deaf, with sparse hair. Bears come out of the shelter in about three months after birth. Care of posterity is taken by female, the male does not help. An average number of cubs is three.

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### **Environmental awareness for citizens of Ufa (Экологическая грамотность)**

To help nature and minimize harmful effects on the environment, use these helpful advices. Think about it, and maybe some advices will become your habits.

1. Choose products suitable for reuse: fabric instead of paper towels, reusable utensils instead of disposable. According to statistics, the average person uses six paper napkins per day. If everyone decrease the number to five at least annually less than 500 thousand napkins cans will end up in trash.

2. Recycling glass decreases air pollution by 20% and at least 50% water pollution. If you often buy magazines, printer paper, juice in tetrapac, take it to the reception points every two months. There are a few receiving stations where they take paper, metal and rag. You can find your nearest and deliver the garbage there.

3. Do not operate electrical appliances, if you can do without them. Turn off appliances rather than leaving them in "sleep mode". Do not forget to turn off the light when leaving the room, even if you're going to come back in 10 minutes.

4. Turn off the water tap when you brush your teeth. So you can save 5 liters of water a day. Cut on bath in favor of shower at least once a week.

5. When washing dishes by hand, do it in a water-filled sink instead of running water. Open the water tap when you need to rinse it.

6. Detergents are disaster for the environment: their composition is often not environmentally friendly, and they fall into the water or soil when flushing water from the washing machine. Use less toxic means for washing.

7. Plant a tree. This is useful for atmosphere and soil. In addition, you will be delighted to see how it grows.

8. Dry clothes on ropes. You will save a lot of electricity.

9. If it possible walk, ride a bicycle or use public transport rather than a car. At least 20% of car trips are usually done at a distance of no more than 3-5 km.

10. Make your menu more vegetarian. Try to eat more fruits, vegetables and grains. Do not forget that the protein can be obtained not only from meat but from plants too. All eight amino acids are also included in the composition of plants.

11. Watch your diet, accounting for approximately menu for the week. When you buy the products through the list, you can avoid excess spending.

12. Switch to energy saving light bulbs.

You can start small. Try to follow these simple but important rules and thank nature for what it does for us.

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### **Ecological Problems** **(Экологические проблемы)**

Since ancient times Nature has served Man, being the source of his life. For thousands of years people lived in harmony with environment and it seemed to them that natural riches were unlimited. But with the development of civilization man's interference in nature began to increase.

Large cities with thousands of smoky industrial enterprises appear all over the world today. The by-products of their activity pollute the air we breathe, the water we drink, the land we grow grain and vegetables on.

Every year world industry pollutes the atmosphere with about 1000 million tons of dust and other harmful substances. Many cities suffer from smog. Vast forests are cut and burn in fire. Their disappearance upsets the oxygen balance. As a result some rare species of animals, birds, fish and plants disappear forever, a number of rivers and lakes dry up.

The pollution of air and the world's ocean, destruction of the ozone layer is the result of man's careless interaction with nature, a sign of the ecological crises.

The most horrible ecological disaster befell Ukraine and its people after the Chernobyl tragedy in April 1986. About 18 percent of the territory of Byelarus was also polluted with radioactive substances. A great damage has been done to the agriculture, forests and people's health. The consequences of this explosion at the atomic power-station are tragic for the Ukrainian, Byelorussian and other nations.

Environmental protection is of a universal concern. That is why serious measures to create a system of ecological security should be taken.

Some progress has been already made in this direction. As many as 159 countries — members of the UNO — have set up environmental protection agencies. Numerous conferences have been held by these agencies to discuss problems facing ecologically poor regions including the Aral Sea, the South Urals, Kuzbass, Donbass, Semipalatinsk and Chernobyl.

An international environmental research centre has been set up on Lake Baikal. The international organisation Greenpeace is also doing much to preserve the environment.

But these are only the initial steps and they must be carried onward to protect nature, to save life on the planet not only for the sake of the present but also for the future generations.

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### **GMO pros and cons (ГМО плюсы и минусы)**

GMOs are organisms with changed genetic makeup. They are widely discussed nowadays, as it is still unknown whether they are healthy or not. These organisms include various microorganisms, such as bacteria and yeast. They are the source of GM food. Genetically-modified organisms go through mutation of genes, their insertion or deletion. Humans have been practicing genetic modifications since they first domesticated animals and plants.

In the 20th century genetic engineering has reached its peak, thanks to modern technology. Today, GMOs are used in medicine, research, pharmaceutical sphere, agriculture. Speaking of genetically-modified food, people show different opinions. Some say they should be banned as they are unhealthy, others state that they are safe for human consumption.

Supporters of genetic engineering are convinced that GMO have the same breeding, but is much faster to derive. Besides, it promises to cure some inherited diseases. However, critics are against GMO, as its effect hasn't been studied long enough. Some studies have shown that GM food is bad for human liver and kidney, because of antibiotics and hormones, which are given to cows and chickens. Moreover, genetic engineering might use allergens in food, which can result into allergic reactions in people. Another argument against GMO is the desire of large corporations to make money. They don't care about human health, they just work on making modified fruit and vegetables to look better, which doesn't add to its taste or freshness. Thus, the problem of GMO still remains unsolved and controversial.

Personally, I try not to buy GM food as there is no scientific conclusion so far to prove its safety for human consumption. We don't know what unforeseen consequences there might be. I prefer not to risk my health because scientists are not sure if GM food is absolutely harmless or not.

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### **Die modulare Biobatterie verarbeitet die Biomasse in die Energiequelle**

### **(Модульная биобатарея перерабатывает биомассу в источник энергии)**

Die Forscher aus dem Fraunhofer Institut haben nach dem Studium der Umwelt, der Energetik und der Technologien der Sicherheit "die Biobatterie" in Form von der hocheffektiven Anlage für die Produktion des Biogases entwickelt, die die unverarbeiteten Materialien, solche wie das Stroh, die Abfälle des Holzes, sowie den

Schlamm, in verschiedene nützliche Quellen der Energie, einschließlich die Elektrizität, das gereinigte Gas und das motorische Öl umwandeln kann.

Die projektierte Kapazität solcher Anlage wird mit Hilfe des Prototyps im Betrieb in Deutschland zurzeit erforscht. Laut den bekommenen Informationen ist die modulare Batterie sogar in den kleinen Maßstäben ökonomisch rentabel.

Die Produktion des Biogases - des Gases, das beim Zerfall der organischen Stoffe gebildet ist, mittels der Fermentation oder unter der Handlung der Anerobbakterien ist eine interessante Ergänzung zu anderen Quellen der erneuerten Energie, da es nicht nur die Elektroenergie mit dem minimalen Einfluss auf die Umwelt produzieren kann, sondern auch den Biobrennstoff, den Dünger und das motorische Öl schaffen. Eins der Probleme ist jedoch, dass solche Überarbeitung nur mit einigen Arten der organischen Stoffe als Ausgangsmaterialien möglich ist.

Die neue Technologie des Biogases, die im Fraunhofer Institut entwickelt ist, kann dieses Problem lösen, mit der Reihe der Materialien, bei denen in der Regel der Wert der Überarbeitung sehr hoch ist (zum Beispiel, die Industrieabfälle der Biomasse, die Abwässer, das Stroh, die Abfälle des Holzes oder den Mistbearbeitend und sie mit der hohen Effektivität ins nützlichere Produkt verwandelnd), geschieht das alles mit Hilfe der modularen, flexiblen Konstruktion.

Die Ausgangsmaterialien gelangen durch die Schleuse in luftleeren Raum und geraten in ständig sich drehende Schneckenpresse. Dort wird das Material erwärmt und zerfällt in Biokohle und flüchtige Gase. Gase werden teilweise gereinigt und bewahrt und teilweise werden sie in Form von der Flüssigkeit verdichtet, die eine Mischung von Wasser und hochwertigem Öl enthält.

Die Endprodukte können in verschiedenen Weisen verwendet werden: das Öl kann in den Brennstoff für Schiffe und Flugzeuge umgewandelt werden; die Gase werden für die Produktion der Elektroenergie von den kombinierten Kraftwerken verwendet, die sowohl die Elektrizität, als auch Wärme erzeugen, und die Biokohle kann als Dünger verwendet werden.

Außerdem sind die Mobilität und die Betriebsflexibilität noch ein wichtiger Vorteil für die Biobatterie. Die Finanzanalyse zeigt, dass die Anlage sogar für das Kleinunternehmen finanziell vorteilhaft ist.

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### **Environmental problems in the story by V. G. Rasputin «To the Same Land...» (Экологические проблемы в рассказе В.Г.Распутина «В ту же землю»)**

The Russian history of the XX century sets new tasks and problems for Russian literature. And an important place in ontologic literature belongs to environmental problems and to the traditionally Russian problem of the relationship of the man and

the mother land. The famous writer V. G. Rasputin often turned to this problem. For more detailed analysis we can discuss his work "To the Same Land ..." written in 1995.

In the centre of the story "To the Same Land ..." is the funeral of Aksinya Egorovna, an elderly woman. Her native village suffers from the loss of the owner. The village doesn't belong to any state or to anyone, there is no opportunity for Aksinya Egorovna to receive a place to be buried in but she doesn't want to leave the native village, to move away from native nature.

The nature accompanies the heroes from the very beginning of the story, all their life develops on this background. And the key problem is an environmental one which is shown in the first lines of the story. The nature surrounding the city was entirely processed by hands of the man, however here it is left untouched.

During the funeral the nature also shows its attitude to what is happening, it shows that not all the rules are observed during the last minutes of Aksinya Egorovna on this land.

The separation of the man from the earth, his moving to the city where all primordial traditions are lost and connection between people is broken becomes the cause of all events. The author also suggests the reader to think about the life in the city and allows us to compare it with the country life. The author puts forward the idea that the registration isn't necessary for a man to be buried at a city cemetery — the earth is ready to take the person without it.

The environmental problem is at the same time a large-scale exposition of the story. In general, we can feel the hope of the author for bright future: the nature is able to transform and return into its place everything that was destroyed by man. The author believes that "the nature is not the temple, but a workshop". In the story we see to what results can such an attitude of a man to his mother land bring. Metaphorically the earth also gets the image of the dying one.

Life in the city couldn't attract Aksinya Egorovna who had lived all her life in the village. Despite coldness and loneliness, she was born there, she was pulled by the earth.

The author in the story shows the simplicity of the funeral in the village, the support of the wood, wind, grass, unlike the city conditions under which it is very difficult to bury a person without money and communications.

Thus, in the story "To the Same Land..." V. G. Rasputin shows us the deserted earth without the owner and the person who remains without home. It is necessary for them to find each other and to live as they lived before, but perestroika dictates absolutely other rules from which the souls of people suffer. However, the author gives us the hope for Revival and reunion of the Russian man and his mother land.

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### **Genetics is the science of future (Генетика- это наука будущего)**

Genetics is the science of inheritance. It studies the cells and the anatomical and functional characteristics transmitted from parents to children.

A cell is an intelligent organism made from atoms. We are made from more than sixty billion cells. There are cells to make bones, muscles, blood and so on. In the nucleus of every cell there are twenty-three pairs of chromosomes, half of them are from the father. Chromosomes are made of DNA (deoxyribonucleic acid) and protein. Each chromosome contains many genes in its DNA. The DNA carries the instructions to construct a human being.

Each species has its own set of genes. The different combinations of genes determine the characteristics of each individual. With the exception of identical twins, nobody in the world has the same combination of genes and this is what makes everyone a unique individual. What all humans have in common is the genome, that is, we all have the same number of chromosomes and the same genetic material. There are no superior or inferior genes.

Genetic manipulation refers to human intervention in the design or function of the cells. Many people oppose it. They argue that the main problem is that man can be both a master and a monster. At an institute of pharmaceutical engineering in Virginia, USA, scientists injected pigs with a human gene that produces a protein called Factor VIII. This protein makes the blood thicker and helps patients with hemophilia. The fourth generation of these pigs will possibly produce enough Factor VIII in their milk to supply the worlds demand.

Cloning is another important topic. From a few cells scientists can produce cartilage. This will probably soon help people who don't have a part of their face, like an ear, after an accident. But in the future we could clone and manipulate people.

Our problem is always the same. People disagree about what is ethical and what is not.

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### **Conservation of rare animals (Охрана редких видов животных)**

Since ancient times Nature has served man, being the source of his life. For thousands of years people lived in harmony with environment and it seemed to them

that natural riches were unlimited. But with the development of civilization man's interference in nature began to increase.

Every year world industry pollutes the atmosphere with about 1000 million tons of dust and other things. As a result many species of plants and animals on our planet are at risk. The balance of nature is upset by activities such as overfishing, overhunting, and cutting down too many trees. Human activity has strong influence on the process of animal extinction. There are many reasons for rare species' conservation. Firstly, they have aesthetic value. Secondly, they are useful from medical point of view. And, finally, the ecology of our planet literally depends on them.

There are many rare animals around the world. These animals are called threatened species. People hunt them and kill them for leather, meat and fur. Except of this, the natural habitat of rare animals is destroyed. So they can't breed.

For example, among the rare animals there is a sloth, an anteater, a duckbill, a Tibetan fox etc. All rare animals do exist but there is a real threat of their disappearance. We must protect them to keep these species for next generations.

There are many other examples: the giant panda has been pushed out of large areas of its natural habitat in the North; the ploughing of the North American prairies has deprived the black-footed ferret of its home; and the Californian condor is being hunted to extinction by farmers.

Not all the news is bad, though; there is some success in conservation. A few years ago, the numbers of both elephants and rhinos in Africa were falling fast as a result of poaching. Now, thanks to better protection for the animals and the ban on the trade in rhino horn and elephant ivory, there are many more of them.

One more animal that has been saved from extinction is Przewalski's horse — the only remaining wild horse. There were only a few of them left when Prague Zoo began breeding them. Now their future is much more certain.

There are also such organizations as World Society for the Protection of Animals, which try to protect the animals around the globe. Their main mission is exposing cruelty and pioneering sustainable methods to avoid animal suffering.

The global problems can't be solved in one day and require organized efforts from the world community. If people leave these problems unsettled, it may lead to serious consequences in the future.

In my opinion, environmental protection should become of a global concern and serious measures should be taken to create ecological security.



**Formaldehyde, its sources and its effect on living organisms**  
**(Формальдегид, его источники и его воздействие на живые организмы)**

Formaldehyde ( $\text{CH}_2\text{O}$ ) is an oxygenated volatile organic compound (VOC) that plays an important role in the formation of ozone pollution in urban areas. The sources of  $\text{CH}_2\text{O}$  are divided into natural and man-made, which in turn are divided into primary and secondary. The primary sources include the direct emissions from production and industrial use, the secondary ones-organic compounds from which  $\text{CH}_2\text{O}$  may be formed under certain conditions, oxidation of hydrocarbons emitted from stationary and mobile sources. Both primary sources (i.e. direct emissions from anthropogenic sources) and secondary ones (i.e. production in the atmosphere during oxidation of other, directly emitted VOCs) contribute to atmospheric concentrations of  $\text{CH}_2\text{O}$ .  $\text{CH}_2\text{O}$ , in turn, reacts with the impurities present in the air, forming a more toxic compound or eventually being transformed to carbon oxide (II) and water. Most secondary production of  $\text{CH}_2\text{O}$  is expected to occur during the atmospheric oxidation of ethene, propene and higher terminal alkenes but  $\text{CH}_2\text{O}$  is additionally formed more slowly from the oxidation of alkanes and aromatic compounds.  $\text{CH}_2\text{O}$  is lost from the atmosphere through photolysis, reaction with the hydroxyl radical ( $\text{OH}$ ) and deposition.

$\text{CH}_2\text{O}$  is a gas with a sharp odor, soluble in water and in alcohol. The chemical formula of formaldehyde is  $\text{CH}_2 = \text{O}$ . The historical name of the substance is formic aldehyde, and the international one is methanal. This is a very toxic compound which negatively affects the respiratory system, eyes, nervous system, skin and the genetic apparatus of living organisms.

$\text{CH}_2\text{O}$  is listed as a carcinogenic compound, at prolonged or improper storage it can be polymerized to form paraformaldehyde precipitates. The solution of  $\text{CH}_2\text{O}$  is a transparent colorless liquid with a sharp peculiar odor.

This toxic substance causes various diseases. The main route of  $\text{CH}_2\text{O}$  entering the human body is by inhalation. Constant exposure to highly concentrated substance is harmful for the organism. Mutation of organs can occur. This has the side effect on the kidney and liver, as well as the central nervous system, causing headaches and fatigue. Potentially, it can cause asthma and asthma attacks.  $\text{CH}_2\text{O}$  is accumulated in the body and it is difficult to be removed. The harmful effects of  $\text{CH}_2\text{O}$  can be manifested in different period of time depending on the human immune system.

$\text{CH}_2\text{O}$  is fed into the aqueous medium resulting from the discharge of municipal and industrial wastewater in rainwater, as well as during its elution from the atmospheric air. In cities  $\text{CH}_2\text{O}$  is also present. To reduce the  $\text{CH}_2\text{O}$  effect is difficult. The action of the gas is very strong due to its toxicity as well as the toxicity of its metabolites, because when it enters the body it is either oxidized to formic acid, or is reduced to methanol.

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### **Vitamins for dogs** **(Витамины для собак)**

Vitamins are complex chemical compounds, which, although having no energy value, are essential in small quantities for the chemical activities of the body. Fifteen or more vitamins have been isolated and they act as catalysts in essential chemical changes within an organism.

All vitamins are indispensable regulators of metabolism in an animal's organism. If some types of feed lack the necessary vitamins, animals can get different diseases. Dogs as any domestic animals do require vitamins as part of their diet just as people do. In most cases, dogs are in need of vitamins in the period of their growth, development, reproduction.

Vitamin A is necessary for puppies and young dogs in general. This vitamin supports such vital function as sight, normal functioning of kidneys, the state of hair and mucous membranes, regulates functioning of lachrymal and salivary glands. The sufficient quantity of this vitamin in dog's organism increases the resistance to diseases and infections. The main source of this vitamin is milk, blood, yolk of egg, maize, carrot, liver and cod liver oil.

Vitamins of group B, such as B1, B2, B6, and B12 are the most important ones. To prevent anaemia it is necessary to use vitamin B12. Brewer's yeast contains vitamin B1 that treats such diseases as neurosis or beriberi. Vitamin B2 has some effect on skin and mucous membranes of dogs. This vitamin is contained in liver, whey and mutton. Other vitamins of group B have effect on the nervous system.

Vitamin C is effective in treating infections. In general, it is contained in vegetables, fruits and nuts.

Vitamin D is necessary for growth and development of the animal's skeleton. This vitamin protects them from rickets. The first months of their lives puppies of middle size must have 500 ME of vitamin D daily. Vitamin D is contained in cod liver, oil, liver.

Vitamin E is necessary for reproduction of animals. The sufficient quantity of it is contained in wheat germs and butter.

Vitamins F and H improve the state of skin. Vitamin F is contained in linseed oil, vitamin H is contained in liver and molasses.

The analysis of main vitamins let us draw a conclusion that various feed is very expensive. Therefore, vets recommend using ready preparations, which contain all above mentioned vitamins with taking into account age, weight and physiological peculiarities of animals.

When choosing vitamins it is necessary to pay attention to their content, price and producers. It is very useful to consult together on various questions with an expert. There is no any need to overpay for a well-known trademark. As a rule medicines have an identical content but the prices differ sufficiently.

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### **Environmental aspects of the use of greenhouses (Экологические аспекты использования закрытого грунта)**

In Russia, the cultivation of vegetable and even melons in greenhouses (protected ground) has been practiced for more than 500 years. But it should be noted that the rate of development of vegetable-covered ground in Russia over the past 20 years has been extremely low due to objective reasons of economic development and transition to the new market economy. The world trends in greenhouse horticulture indicates almost universal shift to intensive technologies and methods of growing plants indoors, using the latest, equipment, materials and energy-saving technologies. Intensification and modernization to the industry of protected ground horticulture is currently the main task, which requires quick and qualified decisions. That is why Russian businessmen have all the chances to take the right niche without much competition on the side of foreign manufacturers. The main reason for the growth of imports is growing consumption. The rate of growth consumption of vegetables in Russia is ahead of the growth of the volume of domestic production. Russia's membership in WTO accession stimulated the growth of imports. However, the increased domestic production results in the increase of competition, which will lead to lower rates of increase in imports.

Currently, all the greenhouse complexes of the Russian Federation are facing some challenges. The wear of cultivation structures built 30-35 years ago is more than 80-85%. Analyzing the structure of the cost of production of greenhouse vegetables and considering advanced growth in energy prices compared with an increase in selling prices for greenhouse vegetables, the main task of reconstruction and modernization of greenhouses, the construction of new greenhouses is to reduce energy consumption per unit of production and increasing the yield of vegetables. The main goal of the state agrarian policy is meeting the needs of population in agricultural products and foodstuffs produced in Russia, improving the competitiveness of Russian agricultural complex, efficient import substitution in vegetables market. To satisfy the needs of population during the cold season domestic greenhouse farms need to bring to the annual production of 1820 thousand tons. Construction of modern greenhouses, among others, should reduce the retail price of vegetables.

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### **Anatomic variations and normal visual acuity**

#### **(Вариации анатомических параметров и острота зрения в норме)**

The eyeball size is one of important characteristics of anatomic-optical system of an eye. High correlation between the length of an axis and the refraction of eyes has been noted by many researchers. It has been proved that the axial length of an eye is connected with the refraction, the average size of length of an eye is increased from hypermetropiya to myopia.

Normally, the morphofunctional organization of the visual system has a rather wide range of variations. Its average size is approximately identical in the anteroposterior, cross and vertical directions and is equal 24 mm. The anteroposterior size can vary from 21 to 26 mm. At hypermetropiya (longsighted) it can be less than 20 mm and more than 29 mm at myopia (short-sightedness).

The anatomic-functional norm of visual acuity is considered to be equal to 1,0 at an emmetropia in the conditions of the natural width of a pupil. The visual acuity of 1,0 is not a limit, and it characterizes the lower bound of the norm, but people can have visual acuity of 1,5; 2,0; 3,0 and more. The concept and the term "norm" is used in clinical trials, as the characteristic of the control group of patients. On its basis the schemes of the structure of an eye having important fundamental and clinical value are constructed.

In clinical practice, in the analysis of optical systems of an eye the determination of the length of an eye and the refracting force of optical surfaces is of great importance. A number of authors in their researches have established that the size of these components varies in a wide range. So, according to E.Zh.Trön, the refracting force of a cornea ranges from 37,0 to 48,98 diopters, a crystalline lens — from 12,9 to 33,8 diopters, eyes in general — from 52,59 to 71,3 diopters, the axis length — from 20,54 to 38,18 mm. The refracting force of the crystalline lens and the length of a anteroposterior axis of an eye are most changeable.

Until recently, specific features of the morphofunctional organization of the visual system at various size of an eyeball weren't a subject of serious researches, and the interrelation of morphological parameters and physiological characteristics wasn't considered to be a possible diagnostic criterion of the research of the visual system. The detailed research in this direction is of interest as it can expand our knowledge of the interrelations of anatomic-optical parameters of an eye, visual acuity and electric activity of a retina in norm, and also can be used for development of modern diagnostic criteria in the research of visual system.

### **Die nützlichen Eigenschaften der Pflanzen (Полезные свойства растений)**

Hippokrates hat gesagt, dass Nahrungsmittel Heilmittel und Heilmittel Nahrungsmittel sein sollen. Die Natur hat für die Gesundheit solche Pflanzen geschaffen, die eine Menge von nützlichen Eigenschaften enthalten. Diese Eigenschaften werden durch das Vorhandensein dieser oder jener Stoffe bedingt. Die Wissenschaft untersuchte die pharmakologische Wirkung der sekundären Pflanzenstoffe - SPS.

Zu dieser Gruppe gehören die Carotinoide, Phytoöstrogene und Polyphenole. Carotinoide gehören zur Klasse der natürlichen Pigmente. Carotinoide schützen vor Herz- und Kreislauferkrankungen, wirken krebshemmend und immunstimulierend. Phytoöstrogene stellen polyzyklische Polyterpene dar. Die Phytosterine dienen der Pflanze vorwiegend als Botenstoffe. Sie sind die natürlichen Gegenspieler des tierischen Cholesterins. Zu den Polyphenolen gehört eine Menge verschiedener Verbindungen, die unterschiedliche Aufgaben in den Pflanzen erfüllen. Polyphenole schützen vor Infektionen. Sie schützen damit vor Herzinfarkt und können das Krebsrisiko vermindern.

Flavonoide ist eine Gruppe der Pflanzenstoffe, die die Aktivität vieler Fermente beeinflussen. Sie können der Krebsentstehung vorbeugen. Saponine senken den Cholesterinspiegel, beugen Dickdarmkrebs vor und stärken das Immunsystem durch die Förderung von Antikörperbildung. Sulfide sind schwefelhaltige Verbindungen, die vor allem in Pflanzen der Familie der Zwiebelgewächse vorkommen. Sulfide sind immunstärkend, beugen Krebs vor und wirken als natürliches Antibiotikum. Sie senken den Cholesterinspiegel und reduzieren das Risiko für Herz- und Gefäßkrankheiten. Zu Terpenen gehören Vereinigungen, die die ganze Zahl  $C_5H_8$  enthalten und für das charakteristische Aroma vieler Pflanzen verantwortlich sind. Sie sind fähig, das Risiko der Entwicklung von Krebs zu verringern.

Die Teilnahme der sekundären Pflanzenstoffe an der Ausführung der lebenswichtigen Funktionen, zum Beispiel, die Teilnahme an den Prozessen der Atmung, der hormonalen Regelung der Prozesse der Lebenstätigkeit ist sehr wichtig. Obst und Gemüse warten mit einer besonderen Geheimwaffe gegen Krebs und eine Vielzahl anderer Erkrankungen auf.

Die sekundären Pflanzenstoffe, die Obst und Gemüse zu ihrem eigenen Schutz bilden, können auch uns Menschen vor Erkrankungen schützen. Zahlreiche wissenschaftliche Untersuchungen belegen, dass sie die Abwehrkräfte steigern, vor Infektionen mit Pilzen, Bakterien oder Viren schützen, den Cholesterinspiegel senken, einen günstigen Einfluss auf die Blutzuckerwerte und den Blutdruck haben

und Gefäßverstopfung verhindern können. Unsere Aufgabe besteht darin, gründlich die Einwirkung dieser Pflanzenstoffe zu studieren.

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### **Der 3-D Biodrucker hat vielfältige Möglichkeiten (3Д-биопринтер имеет разнообразные возможности)**

Die Chirurgen, die sich mit der Transplantation der menschlichen Organe beschäftigen, hoffen, dass sie einmal nach der ersten Anfrage alle für die Transplantation notwendigen Organe bekommen können. Dank den künstlichen Organen wäre es möglich, nicht nur die Leiden der Patienten zu erleichtern, sondern auch die Menschenleben zu retten. Jetzt, mit dem Erscheinen des 3D-Biodruckers, kann diese Möglichkeit Realität für die ganze Welt werden. Solcher Drucker war infolge der Zusammenarbeit zweier Gesellschaften aus Sankt-Diego und Melbourne entwickelt.

Später soll die Technik es ermöglichen, ganze Organe oder sogar synthetische Lebewesen herzustellen. Bioprinter könnten in der Medizin, in der synthetischen Biologie und in der Lebensmittelindustrie zum Einsatz kommen. 3D-bioprinting ist die Technologie der Bildung der räumlichen Zellenmodelle unter Ausnutzung der 3D-Presse, bei der die Funktionen und die Lebensfähigkeit der Zelle erhalten bleiben. Die Technologie für die Herstellung der biologischen Konstruktionen schließt die Unterbringung der Zelle auf der Biogrundlage unter Ausnutzung der Schichtmethode der Erzeugung von dreidimensionalen Strukturen der biologischen Stoffe ein. Dank der 3D-Drucktechnik und des künstlichen Schädels konnte das Leben der Patientin gerettet werden. Drei Monate nach der Operation konnte man wieder sehen und ins Arbeitsleben zurückkehren. In Großbritannien gelang es bis zu 150 Augenprothesen herzustellen. Jedes Auge kann individuell für jeden Patienten gedruckt werden, und er kann die Augenfarbe und die Genauigkeit der Sehkraft auch wählen. In Kooperation mit der Universität Sheffield arbeitet Fripp Design an der Entwicklung von Gesichtsprothesen wie Ohren oder Nasen aus dem 3D-Drucker. Mit 3D-Gesichtscans können die Gesichter von Patienten gescannt und anschließend Prothesen aus Pigmenten, Stärkepulver und Silikon hergestellt werden. Der Vorteil ist die Kostenersparnis. Der Drucker kann Haut direkt auf die Verletzungen von Verbrennungsopferten auftragen. Die Tinte setzt sich aus Enzymen und Kollagen zusammen.

Neben den genannten Körperteilen arbeiten Wissenschaftler, Ärzte und Techniker überall in der Welt an der Entwicklung künstlicher Glieder und Knochen. Die Entwicklung der 3D-Drucktechnik kann Bereiche der Medizin revolutionieren und zur Kostensenkung unterschiedlicher Behandlungen führen. Aktuell müssen

Prothesen noch mit einem hohen Zeitaufwand meist per Hand hergestellt werden. Der Einsatz von 3D-Druckern entlastet die Ärzte, weil weniger Arbeitsschritte erforderlich sind und andererseits verringert sich die Aufenthaltszeit der Patienten in den Krankenhäusern.

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### **A Dolphin's Sonar Abilities (Способности сонара дельфина)**

Sonar refers to sound navigation ranging. It involves using and interpreting sounds to detect something's location underwater and is especially handy for two reasons: Bodies of water are often far too murky for sight, and sound actually travels quickly underwater, much faster than it does in air. Remarkably, with sonar, we can interpret vital information, such as exactly how far away enemy submarines are.

Unlike humans, however, dolphins have been using this skill, known as biosonar, for millennia. So they're pretty darn good at it. The tricks of sonar are built into their DNA, so much so that they can tell the difference between a BB gun pellet and a kernel of corn from 50 feet away. If you've ever heard a dolphin, you'll immediately recognize its characteristic clicks and squeaks. But there's more than meets the ear: Many of the clicks are simply at frequencies too high for the human ear to detect. Essentially, dolphins use these clicks as active sonar mechanisms.

The dolphin's amazing biosonar allows it to distinguish a quarter from a dime while blindfolded.

The dolphin's echolocation process goes like this:

The dolphin uses nasal passages to make a click and sends it through its forehead, which focuses the sounds together into a beam before sending it into the water. When the sound hits an object in the water, it bounces back to the dolphin as an echo. The dolphin absorbs this returning echo through its jaw. A passage of fat from the jaw conducts the sound to the dolphin's inner ear, which exchanges nerve impulses with its brain to interpret the object's characteristics, such as size, shape and material.

One way to think about the echolocation process is to imagine you're in a pitch-black room with only a flickering flashlight to guide you. To help understand an object, a dolphin will move around and read it from multiple points of view, as you might in the dark room, as well as with varying kinds of clicks. They'll even adapt for noisy environments by adjusting the frequency of their clicks. Using this process, dolphins can determine the size and shape of objects and even, in some cases, distinguish different metals, such as brass and copper, from far away, which assists them in finding mines.

Dolphins are so exceptionally good with sonar, studying them hopefully will help us improve our own sonar technology. Until then, however, we can certainly use the dolphins themselves to find dangerous underwater objects.

## **МЕДИЦИНА И ПСИХОЛОГИЯ**

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### **Neurosurgery today (Нейрохирургия сегодня)**

Your brain and spinal cord, which make up your central nervous system, are in charge of your body. When you walk across the street or pet a soft kitten or take a test - nearly everything you consciously do your central nervous system is at work. But what happens when the central nervous system has a problem? When injuries and diseases, some of which are inherited, affect the brain and spine, all sorts of unwanted symptoms can take place. Some are psychological such extremely short attention span. Some might seem minor, such as a tremor that can come with Parkinson's disease. Others are life-threatening. Many get worse over time; these are called neurodegenerative. Using biotechnology, people are working to figure out the cause of these neurological problems — and looking for ways to fix them. In this issue, we discuss diseases of the central nervous system. We also take a closer look at a sample of the tools and technology scientists are using today to address the various ways your brain and spinal cord can go haywire. We hope you'll find this issue interesting and perhaps interesting enough to consider a career in the field!

What is a Neurosurgeon?

A neurosurgeon is a physician who specializes in the diagnosis and surgical treatment of disorders of the central and peripheral nervous system including congenital anomalies, trauma, tumors, vascular disorders, infections of the brain or spine, stroke, or degenerative diseases of the spine. The education and training to become a neurosurgeon is rigorous and extensive and includes the completion of:

- Four years of pre-medical education at a college or university
- Four years of medical school resulting in an M.D. or D.O. degree
- One year internship in general surgery
- Five to seven years in a neurosurgery residency program
- Some neurosurgeons complete a fellowship after residency to specialize in a particular area

What Is A Neurologist?



Neurologists treat patients with complex disorders of the nervous system such as stroke, multiple sclerosis, Parkinson's disease, Alzheimer's disease, Lou Gehrig's disease, epilepsy, headache disorders, infections of the brain and peripheral nervous system. Neurologists often work closely with neurosurgeons, but do not perform surgery.

What Is Neuromedicine?

Neuromedicine describes a practice at Highland Hospital where neurosurgeons, neurologists, and other medical professionals work together to provide comprehensive inpatient care for patients with complex neurological disorders.

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### **Memory and attention** **(Память и внимание)**

Memory. A mysterious ability of the human mind, which helps us remember the most important information in our lives. It is based on our knowledge, skills, almost all our personality. Every day a person is faced with such a huge amount of information that is impossible to remember. How do we manage to remember the most important things, omitting unnecessary trifles? It is the memory responsible for it.

Both memory and attention are universal mental processes (UMP). If the memory is responsible for storing, preservation and reproduction of information, the main function of the memory is focussing attention on the important material, on its selection. The combination of these functions is necessary characteristics for any activity. This is a necessary condition for the learning process. Thanks to this man keeps the unity of oneself, preserves the past experience and retains the continuing relevance.

S.L. Rubinstein singled out 3 functions of memory:

- 1) The acquisition, storage and use of personal experience;
- 2) Assignment, conservation and use of socio-historical experience;
- 3) Memory is condition of the unity of personal consciousness or personal identity.

Functions of attention are;

- 1) Selection of information (selectivity);
- 2) Concentration;
- 3) Choice of priorities.

Lack of causes its information overflow occurs, there is no prioritization of activities.

The two-way link of attention and memory:

1. One remembers what he pays attention to;

2. Memory and involuntary attention, for example, in case of our professional attention we pay attention to the thing associated with the past experience;

3. Memory and involuntary attention. For example, preperceptsiya associations in the memory system.

4. Memorizing is impossible in conditions of distraction.

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### **The term "Machiavellianism" in psychology (Термин «макиавеллизм» в психологии)**

The concept of "Machiavellianism" has its origin in the way of thinking, attitudes towards people, actions and behaviors in interpersonal communication, as they were described by the famous Italian diplomat, writer and historian Niccolo Machiavelli (16th century).

Four centuries later (1970), R. Christie and F. Geis (American social psychologists) published a monograph to present the concept of Machiavellianism and methods developed by them for its assessment (Mach-IV and Mach-V). The underlying assumptions for the concept and methods are some of those set forth by N. Machiavelli: acceptance and use of such manipulative tactics as flattery and deception in interpersonal relationships; a cynical view of human nature when others are treated as weak, untrustworthy and selfish; disregard for conventional morality. The concept of Machiavellianism and its scale development attracted widespread attention in the scientific world. There is a great number of studies conducted abroad on the subject in the field of social psychology, personality psychology, etc. (Skinner, Hornstein, Weinstock, Fehr, Paulhus, McLeod and others).

In Russia the Russian version of the Mach-IV scale was adapted by V.V. Znakov (2000) who introduced the concept of "Machiavellianism" into the field of experimental practice and the list of concepts widely used in Russian psychology. According to Znakov, Machiavellian is a subject who manipulates other people on the basis of his creed and main life principles used as a justification for his manipulative behavior, the success of such manipulation being guaranteed by his skillful concealing his true intentions, motives and long-term aspirations.

In general, Machiavellianism as a personal characteristic shows a person's firm disbelief that human beings can be trusted. Of special interest in this context is that Machiavellians successfully deceive others and often resort to flattery. In interpersonal relationships high Mach individuals keep emotionally aloof, prefer to dominate the interlocutor without taking care of him. They are ambitious, competitive and they are aimed at achieving the goal, rather than at the interaction with a partner. To describe a high Mach individual researchers use such attributes as smart, bold,

ambitious, dominant, persistent and selfish, whereas a low Mach individual is described as being cowardly, indecisive, honest, sentimental and reliable.

It should be noted in conclusion that the present problem is of current topical significance and is being actively developed indifferent fields of psychology (social psychology, clinical psychology, sports psychology, etc.), as well as in medicine, politics and economy both in Russia and abroad.

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**The incidence of parasitogenic invasions among the population of the city of Ufa (Распространенность паразитарных заболеваний среди населения города Уфа)**

According to the data of the World Health Organization (WHO) more than 4.5 million people are infected with parasitogenic diseases. Out of 50 million people, who die annually in the world 16 million people die of infections and parasitogenic invasions. According to the findings of Hygiene and Epidemiology Centre of the Republic of Bashkortostan children under to 14 years of age make up 93% and adults older than 14 years of age make up 7% out of the total number of subjects infected with parasites. The aim of the study was to analyze the incidence of parasitogenic invasions among the population of the Republic of Bashkortostan and to examine the population of Ufa for the parasitogenic infections.

The study was performed with use of Krasilnikov precipitation method. The excrements of the infected subjects were microscopically examined. Previously data related to *anamnesis vitae* and *anamnesis morbi* were collected. The most common invasions registered on the territory of Bashkortostan have been found to be enterobiosis, ascaridiasis, echinococcosis. The great majority of subject infected with enterobiosis were children under 14 years of age, most of them were children from 3 to 6 years of age. This is explained by the fact that contagious helminthiasis is mostly transmitted by direct contact with infected children and contact with hands, toys, personal belongings. The second prevailing type of helminthiasis among the population of Bashkortostan is giardiasis. Giardiasis and subjects infected with giardiasis are frequently recorded in all areas of Bashkortostan. The frequency and severity of the invasions depend on the sanitary and hygienic culture of the population, water supply quality and nutrition conditions.

115 subjects were examined for parasitogenic infections. Among them there were 30 children from 3 up to 18 years of age and 85 adult subjects who were older than 18 years of age. Parasitogenic invasions have been revealed in 11 subjects (9.5%).

Among the examined children there were two cases of *Blastocystishominis* (6.7%), in the adult group 4 subjects had *Blastocystis hominis* (4.7%) and 5 individuals had cysts of *Giardiasis intestinalis* (5.8%).

It may be concluded that painful conditions characteristic for parasitogenic infections result in the occurrence of allergic reactions that are triggered by intoxication with metabolism and waste products of parasites that affect host organs and tissues. The final diagnosis must be made on the basis of analysis for the presence of eggs, cysts and mature parasites.

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### **Epigenetics and epigenetics mechanisms**

#### **(Эпигенетика и эпигенетические механизмы)**

The English geneticist Conrad Waddington in the 40-ies to describe gene expression during the experiment on cell differentiation and development has introduced the term “epigenetics”. The objective of epigenetics is to study mechanisms controlling gene expression and cell differentiation. [1]

The history of epigenetics started in 1941 with the research conducted by Hermann Muller who discovered such phenomenon as “position effect variegation”. This is a phenomenon of large chromosome transformation [3]. In 1961, Mary Lyon put forward a hypothesis of X-chromosome inactivation in mammal females [5]. Later two important discoveries in epigenetic have been made: the first discovery was the discovery of RNA-interference and mechanisms based on the RNA regulation. The term “RNA-interference” was introduced by Andrew Fire and Craig Mello in 1998 [6]. The second discovery was the discovery of prions - specific protein agents causing slow-developing infection. The discovery belonged to American biochemist Stanley B. Prusiner [3].

Further development and study of mechanisms for epigenetic regulation was continued and the main branches of the research have been formed, these were: the hypothesis of histone code and chromatin role in epigenetic heredity; DNA methylation and demethylation; prionisation; nucleus structure; dynamically “silent” chromatin [3].

All these suggestions consider mechanisms regulating gene expressing that not occur separately but they are interrelated and are represented by the following epigenetic phenomena: position effect variegation (PEV), chromatic remodelling, RNA-interference and gene silencing, genome imprinting, X-chromosome inactivation, prionisation and others.

Position effect variegation is a phenomenon of the change in the euchromatin gene expression due to change of the gene position into the heterochromatine genome

region. This definition implies that phenotypical gene manifestation changes depending on the location of the adjacent genes [2].

**Histone code.** Chromatin remodeling. Histone code is believed to be the central epigenetic function because histones take part in the assembling of chromatin structure elements such as euchromatin and heterochromatin. This transformation takes place because of posttranslational modification of aminoterminal histone “tails” (acetylation, phosphorylation, ubiquitination) which are bound to chromatin protein and regulate the activity of the adjacent genes [7].

**DNA methylation and demethylation.** Currently this is the most studied mechanisms of regulating gene expression. These phenomena take place by catalyzing enzyme – DNA-methyltransferase (DNMT). DNMTs transports S-adenosil methylenemethyl group to cytosine, which is placed in front of guanine. Therefore methylation process occurs only on CpG nucleotide regions [4].

In conclusion, it may be said that the study of epigenetics is very important for understanding the mechanisms regulating gene expression, cell differentiation in embryogenesis. Such diseases as Prader–Willi syndrome, Angelman syndrome and Russell-Silver syndrome have been found to be caused not only by the impairment in gene activity regulation, but by the impairment of chromatin remodeling and DNA methylation which may be hereditary as well as acquired, i.e. occurring de novo, as well as they may be caused by genome mutations.

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#### **Bracket system: advantages and shortcomings (Брекет-система: достоинства и недостатки)**

All inhabitants of the Earth want to be beautiful and healthy and recently people have begun to give more attention to their teeth. It is difficult to say whether the world is becoming kinder. But it is necessary to recognize that it is becoming more smiling. It is one of the factors which predetermine the future of orthodontics.

The orthodontics is one of the fields of stomatology whose tasks include correction of the abnormal arrangement of teeth. There are some reasons why the teeth alignment can be incorrect. In most cases such problems are connected with genetic anomalies which children inherit from their parents.

Orthodontics as a science has been known since time immemorial. Among the remains of the ancient pyramids in Egypt the fragments of gold wire fixed on teeth were found. They were used for correction of teeth alignment at representatives of notable families.

Some people live with this problem for years because they are afraid of the alignment of teeth by means of brackets.

However, the modern medicine has made great progress. It offers patients invisible brackets. Transparent products qualitatively correct the bite, and they aren't noticed by people around. Besides, the price of transparent brackets isn't too high and the results are good.

The brackets vary extremely in materials of which they are made, in pressure exerted on teeth, in the place of fastening and in many other parameters.

They may be made of gold and diamond, ceramics and titanium, sapphire and metal, of polycrystalline aluminum oxide and of medical polyurethane, and every one has its advantages.

Some can be almost invisible on teeth, thanks to transparency of material (sapphire), some can have an opening for convenience of twisting, some can have no friction force at all (due to special polishing). Thus, practically all of them don't prevent speaking and don't make the life of the patient inconvenient.

So, the advantages of bracket system are good efficiency and versatility.

Among the drawbacks of brackets one can note restrictions in food, complexity of carrying out hygienic procedures, and possible complications in the form of demineralization, inflammations of gums.

I took this subjects not only because I have been carrying metal brackets for 1,5 years. I want to warn at once that to get used to them is a very painful process. But in general, everything depends on one's readiness to overcome difficulties. A dazzling smile is one more step to perfection which is available to each of us by means of bracket system.

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**Medical phraseological units as a part of English culture**  
**(Медицинские фразеологические единицы как часть**  
**английской культуры)**

British medicine is one of the most developed in the world. English is of great importance in medicine. We'll prove this assertion on the material related to the parts of the body.

1. The word “heart” in both cultures is connected with soul, feelings, kindness, love. But Russian people, in most cases, use the word “soul” and English people use the word “heart”. Perhaps this is due to a national trait, such as the “Russian soul”. Examples of such expressions: One’s heart isn’t it – Душа не лежит. Interestingly, when a person is very frightened, the Russians say “soul goes into the heels” and British people say “In the mouth or throat”. For example: “To have one’s heart in one’s mouth”.

2. The word “hands” in English has the meanings: “hard work, ability, skill” as hands are associated with physical work. Examples of such expressions: A safe pair of hands – Умелые руки. Conversely, “idleness” in the Russian language means “сидеть сложа руки” and in English “to sit twiddling one’s thumbs”. Apparently, it is national specific feature.

3. Phraseological expressions with the word “neck” are associated with the process of execution, so they mean “risk”. For example: “to risk one’s neck; to stick one’s neck out”. It is noteworthy that in the Russian language the word “head” is more often used for expressing such meaning. For example: “head of risk”, “give head on the block” (рисковать головой, дать голову на отсечение).

4. The word “eyes” received a meaning for the main function of this organ “look, notice, observe”. Examples: To keep an eye on. – Следить за кем-либо.

5. “Back” has the meaning associated with hard work: “to break one’s back”. The meaning of “being in a difficult situation” is connected with the back leaning against the wall: “have one’s back to the wall”.

6. The main function of the ears is to hear. Hence its basic meaning: “Be all ears. It means to listen with great attention”. Interestingly. The meaning “to be careful, vigilant” in the Russian language means “держат ухо в остро” and the British – to keep one’s eyes peeled (to clean up the eyes from the husk).

7. The word “tongue” has meanings associated with its function. Examples of such expressions: To bite one’s tongue – Закусить язык. To give a tongue. - Говорить. Negative traits are associated with excessive talkativeness, insincerity, flattery: To oil one’s tongue – Лстить.

Medical phraseological units demonstrate the national character of British and Russian people and give specific features in medical language.

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### **Professional medical language: fascinating evolution (Профессиональный медицинский язык: увлекательная эволюция)**

#### **BACKGROUND:**

Language has been existing as an important part of our life for many years. There are different theories about origins of the language. But we cannot deny the

fact that the language is a very significant phenomena in human history. Over millions of years lexicon develops very slowly and brings us to the modern structure of the language which keeps us together, helps us to make new discoveries and gives us opportunity to learn. Nowadays, a lot of professions have different methods of communications. And what do we know about them? Although we are engaged in different scopes and need special skills and qualifications where there are a lot of other types of professional languages. I fully associate with the view that everybody should learn special vocabulary. Thus, I see necessity to tell about modern medical language. To my pity, there is no recognized discipline called medical linguistics, but perhaps it may appear. The language of medicine offers intriguing challenges both to medical historians as well to linguists. But can we investigate and compare the appearance and applying of medicine language?

So our goal is to make a brief overview of the history of medical language, to see the impact of technology among other languages, and create links to the integration of medical language with other professional languages.

#### **METHODS:**

Study work on the problem of research, study and analysis of teaching materials, articles (using PubMed, eLIBRARY.ru).

#### **RESULTS:**

Advanced trends indicate that place of the main language of professional medicine is taken by English: most modern progressive journals are published in English; also English is essential for international conferences.

After that, of course, medical language is integrated by titles of new technologies, new diseases that have emerged medicine last century.

Finally, medicine language is a language that has links with biologists, physicists and chemists.

#### **CONCLUSIONS:**

This material will be useful both for linguists who study professional languages, as well as for doctors, for whom it opens the origins of terms and new opportunities in their professional language.

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### **The role of Greek and Latin suffixes in English medical terminology (Роль греческих и латинских суффиксов в медицинской терминологии)**

Medical terms of Greek and Latin origin make up the centre of the medical terminological system and the English cluster is considered to be its periphery. The



“pure centre” of Greek and Latin terminology is made up of the terms that have not undergone any phonetic or morphological changes. **e.g.:** *Latin-cortex=English-cortex*

The adjacent layer of these terms is made up of the terms that were coined to denote new words with the use of Greek and Latin term elements. **e.g.:** *Latin-cilia=English-ciliary*.

The next stratum comprises international and national lexis. **e.g.:** *Latin glossal=English-larynx*

Greek and Latin term elements have a variety of specificities. As they are derived from classical languages their meanings have not changed for a long time. The etiological aspect in their interpretation becomes not so important compared to the semantics of these term elements (TE). Greek and Latin TE are very suitable for the formation of multi-componential terms. For example: “**etiology**” means the branch of the medicine that studies causes and conditions of disease occurrence. The prominent feature of most TE in the term composition is their semantic transparency. This feature allows them to be easily remembered and reproduced. According to Shvetsova’s research about 500 TE serve the basis for the formation 15000 medical terms. For example, Greek suffix ‘**-itis**’ forms a microsystem of the names of inflammatory diseases: 1) dermat-**itis** -inflammation of the skin 2) conjunctivit-**itis** -inflammation of conjunctiva 3) gastrit-**itis** -inflammation of the stomach

TE of Greek and Latin origin are easily adapted in many national languages and make up the foundation for international medical terminology.

Some Greek and Latin suffixes are used in medicine to denote methods of diagnostics, therapeutic and surgical treatment.

The most widely used suffixes of Latin and Greek origin are the following:

| Suffix                  | Meaning                               | Example(s)               |
|-------------------------|---------------------------------------|--------------------------|
| <b>-cyte</b>            | cell                                  | erythrocyte              |
| <b>-ectomy</b>          | removal                               | laryngectomy             |
| <b>-trophy</b>          | nourishment, development              | <u>pseudohypertrophy</u> |
| <b>-lysis</b>           | destruction, separation               | <u>paralysis</u>         |
| <b>-oma</b>             | <u>tumor</u> , mass, fluid collection | <u>sarcoma</u>           |
| <b>-scopy</b>           | use of instrument for viewing         | endoscopy                |
| <b>-graphy</b>          | process of recording                  | <u>angiography</u>       |
| <b>-algia, alg(i)o-</b> | pain                                  | <u>myalgia</u>           |
| <b>-plasia</b>          | formation, development                | <u>achondroplasia</u>    |

Thus, the suffixal way of word formation is most productive and wide spread English medical terminology.

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### **Peculiarities of medical terms (Особенности медицинских терминов)**

Every profession and every science builds up its own specialized language use and terminology. Scientific terminology differs from the terminology of professions in being more systematic and based on taxonomy. One of the most important battles medicine has ever had was its striving to turn, from *ars mechnica* i.e. profession into *ars liberalis*, i.e. science. With the advent of medicine as science, it had to implement a more regulated and systematic terminology and conceptual framework.

Among the most important ways of creating medical terms are narrowing and extension of meaning, (*auscultation, pelvis*), word creation (*enzyme*, created based on the Greek word *enzyme*, *tuberculosis*, created from the Latin *tuberculum* and the Greek ending *-is* or the term *gas* created and introduced by the Flemish scientist Van Helmont). Another way of creating medical terms is through eponyms, i.e. using proper names to create common nouns. Thus, there are names of illnesses and syndromes or other common nouns like *roentgen*. Another, less common means is the creation of metaphorical terms that rely on the similarities of objects or phenomena (*elephantiasis, cancer*).

Medical terms present a wide range of types: disease processes, anatomy, physiology, medication names. Magyar refers to six main groups of medical terms:

1. anatomical terms (*cranium, mandibulum, mamma*)
2. names of symptoms and syndromes (*apoplexia, fibbrillation*)
3. names of illnesses (*influenza, typhus*)
4. names of materia medica, i.e. medical materials (*bolus armenicus, theriaca, opium*)
5. tools and instruments used in medical procedures (*forceps, gastroscope*)
6. verbs connects with medical activities, processes, and physiological phenomena (*collapsus, exitus, palpatio*).

In the writings of Hippocrates and Galenus, the most frequent terms belong to the 2nd, 3rd, 4th and 6th groups. Yet, it must be said that the percentage of terms related to surgical instruments and tools was far poorer in their time than it is today, as the number of referents was significantly smaller. Because of this, today, the words related to the physiology and/or pathology of the human body are of Greek origin, while the anatomical terms and names of medical instruments were created in the 14th century or after, and are of Latin origin.

Every profession and every science builds up its own specialized language use and terminology. Scientific terminology differs from the terminology of professions in being more systematic and based on taxonomy. One of the most important battles medicine has ever had was its striving to turn, from *ars mechnica* i.e. profession into *ars liberalis*, i.e. science. With the advent of medicine as science, it had to implement a more regulated and systematic terminology and conceptual framework.

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### **Нemophilia (Гемофилия)**

Until recently it was believed that severe hereditary diseases can not be prevented or fully cured, so the fight was mostly with symptoms. However, over the last decades there was a completely new approach to the treatment of diseases. This approach is called gene therapy. The main difference from the old methods of treatment is that it is aimed at addressing the root causes of disease, not its consequences. The successful use of gene therapy began in 1990, when American Dr. W. French Anderson cured a girl Ashanti de Silva from a severe combined immunodeficiency using gene therapy. Since that time a number of genetic diseases have been tested for the use of gene therapy and hemophilia, a very serious disease is among them.

Hemophilia is a hereditary pathology of the blood coagulation system, a form of the state of bleeding disorders. As an independent disease hemophilia was described in 1803 by J. C. Otto and the term was coined by F. Hopff in 1828. 13 plasma factors participate in the multistage process of blood clotting, which are synthesized in the hepar. The deficiency or absence of factor VIII or IX causes the development of hemophilia A or B, respectively. Hemophilia A and b is characterized by the violation of plasma thromboplastin. As a result even the minimum injuries give rise to painful bleeding, which sometimes cannot be stopped for several hours. Until recently, patients with hemophilia were forced to make regular expensive injections of factor VIII or IX depending on the type of the disease.

A new method of treating hemophilia proposed in California by a team of scientists led by Adi Barzel at the head can radically change the quality of life of such patients. The essence of this method is to introduce into the genome of the patient normal gene F9, which is embedded in another gene encoding the major plasma protein - albumin. For this purpose scientists amplified section of albumin gene containing approximately the stop codon in the middle. After that the human gene F9 was introduced immediately before the stop codon of albumin and in front of it a DNA fragment was introduced encoding 2A peptide, which is responsible for the separate simultaneous translation from one mRNA. This design provides a consistent

transcription and translation of albumin and Factor IX from a single promoter, which is physically separated. This vector was injected to the mice with hemophilia. After a few weeks they observed increased levels of factor IX and normalization of coagulation time of blood.

A large international group of scientists has conducted a clinical study on the basis of this method of treatment of hemophilia B at the London Royal Free Hospital. The results of the study were published in The New England Journal of Medicine. In this clinical study, it was shown that administering an AAV vector resulted in prolonged expression of Factor IX. It gave the possibility to reduce the probability of bleeding significantly and reduce the necessity of injecting factor IX. This study is the first clinical observation, in which it was able to replace the time-consuming and costly replacement therapy with factor IX by means of gene therapy in patients with hemophilia B. The same technology can be used for the treatment of a number of other serious hereditary diseases.

## **МАТЕМАТИЧЕСКИЕ НАУКИ**

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### **Game theory (Теория игр)**

Game theory is the study of strategic decision making. Specifically, it is "the study of mathematical models of conflict and cooperation between intelligent rational decision-makers." An alternative term suggested "as a more descriptive name for the discipline" is interactive decision theory. Game theory is mainly used in economics, political science, and psychology, as well as logic, computer science, and biology. The subject first addressed zero-sum games, such that one person's gains exactly equal net losses of the other participant or participants. Today, however, game theory applies to a wide range of behavioral relations, and has developed into an umbrella term for the logical side of decision science, including both humans and non-humans (e.g. computers, animals).

Modern game theory began with the idea regarding the existence of mixed-strategy equilibria in two-person zero-sum games and its proof by John von Neumann. Von Neumann's original proof used Brouwer fixed-point theorem on continuous mappings into compact convex sets, which became a standard method in game theory and mathematical economics. His paper was followed by the 1944 book Theory of Games and Economic Behavior, co-written with Oskar Morgenstern, which considered cooperative games of several players. The second edition of this

book provided an axiomatic theory of expected utility, which allowed mathematical statisticians and economists to treat decision-making under uncertainty.

The games studied in game theory are well-defined mathematical objects. To be fully defined, a game must specify the following elements: the players of the game, the information and actions available to each player at each decision point, and the payoffs for each outcome. A game theorist typically uses these elements, along with a solution concept of their choosing, to deduce a set of equilibrium strategies for each player such that, when these strategies are employed, no player can profit by unilaterally deviating from their strategy. These equilibrium strategies determine an equilibrium to the game - stable state in which either one outcome occurs or a set of outcomes occur with known probability.

Game theory has come to play an increasingly important role in logic and in computer science. Several logical theories have a basis in game semantics. In addition, computer scientists have used games to model interactive computations. Moreover, game theory provides a theoretical basis to the field of multi-agent systems.

Separately, game theory has played a role in online algorithms. In particular, the k-server problem, which has in the past been referred to as games with moving costs and request-answer games.

The emergence of the internet has motivated the development of algorithms for finding equilibria in games, markets, computational auctions, peer-to-peer systems, and security and information markets.

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### **Logique floue (Нечеткая логика)**

Aujourd'hui la logique floue est de grande actualité. En effet, les bases théoriques de la logique floue ont été établies en 1995 par le professeur Zadeh de l'université de Californie de Berkeley. A cette époque, la théorie de la logique floue n'a pas été prise au sérieux. En effet, les ordinateurs avec leur fonctionnement exact par tout ou rien (1 et 0) ont commencé à se répondre sur large échelle. Par contre, la logique floue permet de traiter des variables non exactes dont la valeur peut varier entre 1 et 0. Initialement, cette théorie a été appliquée dans des domaines non techniques, comme le commerce, les jurys-prudence ou la médecine.

A partir de 1985 environ les Japonais commencent à utiliser la logique floue dans des produits industriels pour résoudre des problèmes de réglage et de commande.

Utilisée à côté d'autres techniques de contrôle avancé, elle fait une entrée discrète mais appréciée dans les automatismes de contrôle industriel. Cette technique associe les notions de «sous-ensemble flou» et de «théorie des possibilités». Il s'agit d'une approche calquée sur le raisonnement humain plutôt que sur des calculs rigides. Pour des problèmes mal définis l'être humain est irremplaçable.

En effet, le mode de raisonnement en logique floue est plus intuitif que la logique classique. Il permet aux concepteurs de mieux apprendre les phénomènes naturels, imprécis et difficilement modélisables en s'appuyant sur la définition de règles et de fonctions d'appartenance à des ensembles dits «ensembles flous». Cette méthode permet d'obtenir une loi de commande souvent efficace, sans devoir faire appel à des développements théoriques importants.

Comparativement à la logique classique, les bases théoriques de la logique floue sont établies de manière à pouvoir traiter des variables inexactes de valeurs comprises entre 0 et 1, par contre la logique de Boole dont les variables ne peuvent prendre que les valeurs 0 et 1.

A titre d'exemple la classification des personnes à travers leur âge fait apparaître que: la logique classique (logique de Boole) n'admet pour les variables que les valeurs 0 et 1, qui font que les personnes âgées de moins de 30 ans sont systématiquement jeunes et les plus de 50 ans sont âgées.

Alors que la logique floue, dont les variables peuvent prendre n'importe quelle valeur comprise entre 0 et 1, permet de tenir compte du passage progressif de l'individu d'un âge à un autre, on parle alors, de fonction d'appartenance.

Tout récemment aussi en Europe une intense activité de recherche a débuté afin d'introduire le principe du réglage par logique floue. Maintenant la logique floue est largement utilisée.

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### **Demographic situation in the country nowadays (Демографическая ситуация в стране в наше время)**

Currently, any state wishes to constantly develop, to keep up with the leading countries of the world, to be a leader on the world stage. To achieve these results it is necessary to take into account many factors. One of such factors is the country's population. True picture of the demographic situation in the country enables to make right decisions in predicting the structure and dynamics of economic and social processes.

Considering the demographics of Russia in the global context it is necessary to focus on three issues that are, in particular, highlighted in the message of President Vladimir Putin to the Federal Assembly in 2006. The first issue, according to the president, is the crisis of birth rate, which is determined by the fact that on average one woman has 1.3 children - almost one child less than necessary. With this birth rate the country cannot even maintain its population, which is annually reducing by 700 000 people in Russia.

The present paper is devoted to the demographic situation of our region and its influence on the overall demographics of the country.

#### Demographic indicators for cities and regions of Bashkortostan for 2009

|          | Born  |                          | Died  |                          | natural increase, decrease (-) |                          | Migration |           |                        |
|----------|-------|--------------------------|-------|--------------------------|--------------------------------|--------------------------|-----------|-----------|------------------------|
|          | men   | in calculating per 1,000 | men   | in calculating per 1,000 | men                            | in calculating per 1,000 | arrived   | Went away | increase, decrease (-) |
| Republic | 55587 | 13,7                     | 53227 | 13,1                     | 2360                           | 0,6                      | 91048     | 84707     | 6341                   |
| Ufa      | 13961 | 13,5                     | 12007 | 11,6                     | 1954                           | 1,9                      | 29176     | 25081     | 4095                   |

#### Demographic indicators for cities and regions of Bashkortostan for 2013

|          | Born  |                          | Died  |                          | natural increase, decrease (-) |                          | Migration |           |                        |
|----------|-------|--------------------------|-------|--------------------------|--------------------------------|--------------------------|-----------|-----------|------------------------|
|          | men   | in calculating per 1,000 | men   | in calculating per 1,000 | men                            | in calculating per 1,000 | arrived   | Went away | increase, decrease (-) |
| Republic | 59260 | 14,6                     | 53346 | 13,1                     | 5914                           | 1,5                      | 151321    | 148494    | 2827                   |
| Ufa      | 17188 | 15,7                     | 12447 | 11,3                     | 4741                           | 4,4                      | 35514     | 20790     | 14724                  |

Our republic appeared to be though slightly but still developing in demographic aspect. However, there are some sad points to this.

#### The balance of males and females over the years in Bashkortostan

| Year | All population | men     | women   | % men | % women |
|------|----------------|---------|---------|-------|---------|
| 2009 | 4059373        | 1897820 | 2161553 | 46,8  | 53,2    |
| 2010 | 4068545        | 1902118 | 2166427 | 46,8  | 53,2    |
| 2011 | 4072085        | 1903662 | 2168423 | 46,7  | 53,3    |
| 2012 | 4064245        | 1900338 | 2163907 | 46,8  | 53,2    |
| 2013 | 4060957        | 1898851 | 2162106 | 46,8  | 53,2    |

## Dynamics of registered documentary records of marriage and divorce in Bashkortostan

| Year   | Registered marriages | Registered divorces | Marriages per 1000 people | Divorces per 1000 people |
|--------|----------------------|---------------------|---------------------------|--------------------------|
| 2010r. | 34801                | 16607               | 8,5                       | 4,1                      |
| 2011r. | 38175                | 17977               | 9,4                       | 4,4                      |
| 2012r. | 34215                | 17854               | 8,4                       | 4,4                      |
| 2013r. | 35527                | 18250               | 8,7                       | 4,5                      |

Half of marriages end in divorces. Besides, the number of men is less than the number of women. It means that even under ideal circumstances a number of females stays without partners. But we must also take into consideration the role of moral factors in the process of reducing the value of human life in public consciousness, accompanied by increasing alcoholism in its most dangerous forms, smoking, drugs, and, not least, the impossibility of self-actualization in adapting to new socio-economic conditions. The consequences of these factors have become family breakdown, the growing number of street children which is catastrophic for the history of Russia.

Having studied the causes of high and rising mortality level in Russia and some factors which contribute to the improvement of the demographic situation, we can conclude that there are several ways out in the crisis of the demographic situation in Russia: the development of new and the refinement of existing legal acts in light of demography; the provision of young families who have two children with accommodation under very favorable conditions different from all other mortgage programs; increase in material incentives for the second child and subsequent; more balanced migration policies towards attracting Russian speaking population. The question of birth control should become a private matter of every citizen and only then Russia will be able to overcome the demographic crisis.

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### **The elements of a giant mathematical object** **(Элементы гигантского математического объекта)**

Galileo said that the universe is a “great book” written in the language of mathematics. Why our universe seems like mathematical? What does it mean?

Scientists explain that the universe is not just described with the aid of mathematics, but she is a mathematician in the sense that we all are elements of a giant mathematical object, which in turn is part of a Multiverse – so gigantic that,



compared with it the rest of the Multiverse, referred to in the last few years, look small. Around one math!

Does mathematics study only numbers? If you look around you, you will probably be able to see anywhere a small amount of what some numbers (for example, number of pages in the latest issue of the magazine «Scientific American»), but these figures are only characters invented and printed by people, so when we say that the universe is inherently mathematical object, we don't mean these figures.

Many people equate mathematics to arithmetic. It is the influence of our education system. However, contrary to popular belief, the study of mathematics and other abstract structures is much more diverse than numbers including *geometric objects*. For example, we are constantly surrounded by all sorts of geometric shapes. Throw a stone parallel to the ground, and you will see how perfect line trajectories, created by nature! Trajectory abandoned bodies are varieties inverted *parabola*.

Ask another question: on what orbit moving cosmic bodies? And here we find different types of the same shape – *the ellipse*. It is interesting to note that the parabola and ellipse related to each other. If the major axis of the ellipse is pulled strongly, the ellipse, more and more will seek a parabola. Thus, all paths are variations in the approximation of the ellipse.

Gradually, people have found many other *forms* and *shapes* in nature, not only while driving or under the influence of gravity, but also in the study of other phenomena such as electricity, magnetism, light, heat, chemical processes, radioactivity and subatomic particles. It is these forms just embodied in the laws of physics, which can be described by mathematical equations as we describe the shape of an ellipse.

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### **The origin of internet terms (Происхождение интернет-терминов)**

Whether you are brand new to using the Web and the Internet, or you have been using both for years, it is interesting to trace back the most widespread computer related words to their creators or first use in the computing world.

Cookies are used to save a user's information and relay this information between a website and a browser. The word cookie comes from a comparison to fortune cookies. Early internet programmers were overwhelmed by the similarities of a program that saves information within its code and the treats that save fortune within their cookie walls.

Google's origin is not very surprising. The name came forward as a boast about how much information the new search engine would be able to index and provide.

Google is a misspelling of “googol,” which is a number notated by a 1 followed by 100 zeros.

A wiki on the internet is a group of interconnected sites that is built from user interaction. Wikipedia, Encyclopedia Dramatica, WikiLeaks, and Metapedia are all examples of this “wiki” model. In Hawaiian, “wiki wiki” means “quick.” The creator Ward Cunningham decided that a “wiki” online would be a quick, easy way to access and manipulate multiple sites and information.

A firewall is a device that protects networks from unauthorized access or manipulation. In real life, firewalls are structures that are built to prevent the spread of fires or similarly destructive forces. Firewalls protect against viruses, hackers and worms.

A computer virus is very similar to a biological virus. Both insert their own code into normally functioning systems in order to disrupt the system and reproduce themselves. Academically, the word virus was used as a computer term by Fred Cohen in 1984. However, the word had been used by science-fiction writer David Gerrold in the 1970s (in which a computer program called VIRUS enters a computer). Also, the word appeared in an X-Men comic published in 1982.

The computer spam actually derives its name from a Monty Python sketch set in a café with an entirely Spam-centric menu. While the sketch was a commentary on the influx of commercially available canned meats, the word made its way into the computer world as the annoying and excessive influx of unwanted mail or advertisements.

Trolls are ugly, annoying monsters of Norse mythology. The verb “to troll” refers to a fishing technique. Obviously, this is similar to the way an internet troll will feed out “bait” for other users to react to, and then reel them in with further inflammatory or offensive remarks.

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### **Mobile applications** **(Мобильные приложения)**

An application is a computer program designed to run on smartphones, tablet computers and other mobile devices. Apps are usually available through application distribution platform, such as the Apple App Store, Google Play, Windows Phone Store etc. Some applications are free, while others must be bought.

Mobile applications are different: from virtual lighters up to high-precision navigators. Some applications help in business, some suggest recipes for cooking etc. Also a lot of applications are created for entertainment, including games, puzzles, all kinds of casual applications, etc.

The five most necessary applications, in my opinion, are:

1. Shazam
2. Messengers (WhatsApp, Viber, Skype, etc.)
3. Weather
4. Wunderlist
5. 2GIS

Shazam is a British application, which is best known for its music identification capabilities. Shazam uses a smartphone to gather a brief sample of audio being played. It creates an acoustic fingerprint based on the sample, and compares it against a central database for a match. If it finds a match, it sends information such as the name of the artist, song title, and album back to the user.

Shazam offers two types of applications: a free application simply called Shazam and a paid application called Shazam Encore. Extended version provides features for social networking users.

Messengers allow you to instantly send and receive text, audio, video, etc. When connected to Wi-Fi, you can exchange messages via the network for free. This is very fast and convenient.

Leaving home we often do not know what the weather is like outdoors. Weather forecast application can solve this problem.

Wunderlist is a very simple, well designed and easy-to-use task management tool. You can create to-dos from jobs that fill your daily life and assign them to certain lists. It also allows you to create groups of tasks, sync them on different devices and share them with friends. It is absolutely free.

2GIS is a free navigation of any city of the Russian Federation. It includes the location of the organizations, public transport routes, traffic jams indicators, etc.

It has a very handy map. It is possible to search by company name or the desired street name. 2GIS can also calculate a route from point A to point B, for car and public transport, with the possible transfers along the way.

These mobile applications are necessary in everyday life and make our lives easier.

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**Verallgemeinerung des Theorems von Riemann für eine bedingt  
konvergente Reihe komplexer Zahlen (Обобщение теоремы Римана для  
комплексных условно сходящихся рядов)**

**Definition 1.** Die Reihe  $\sum_{n=1}^{\infty} a_n$  heißt bedingt konvergent, wenn die Reihe  $\sum_{n=1}^{\infty} a_n$  konvergiert, und die Reihe  $\sum_{n=1}^{\infty} |a_n|$  divergiert.

Für eine bedingt konvergente Reihe reeller Zahlen gilt folgendes *klassisches* Theorem.

**Theorem 1** (Bernhard Riemann). Ist  $\sum_{n=1}^{\infty} a_n$  - eine bedingt konvergente Reihe reeller Zahlen, dann existiert zu jeder beliebig vorgegebenen reellen Zahl  $S$  eine Umordnung  $\sigma$  der Reihenglieder  $a_n$ , so dass die umgeordnete Reihe  $\sum_{n=1}^{\infty} a_{\sigma(n)}$  gegen  $S$  konvergiert.

Unter der Umordnung  $\sigma$  versteht man eine bijektive Abbildung  $\sigma: \mathbb{N} \rightarrow \mathbb{N}$  der Menge der natürlichen Zahlen auf sich selbst (eine Permutation).

Daraus folgt, dass die Summe von bedingt konvergenter Reihe von der Reihenfolge deren Mitglieder abhängt. Man kann nicht sicher sein, dass, wenn wir die Reihenfolge der Reihenglieder ändern, die Summe dieselbe bleibt, wie sie vor der Änderung der Reihenfolge war.

Im Fall von komplexen Reihen ist die Situation etwas anders. Zunächst erinnern wir an ein paar Definitionen.

**Definition 2.** Die Reihe

$$\begin{aligned} & \sum_{n=1}^{\infty} z_n \\ &= \sum_{n=1}^{\infty} (x_n + iy_n) \end{aligned} \quad (1)$$

komplexer Zahlen heißt konvergent, wenn die Reihen  $\sum_{n=1}^{\infty} x_n$  und  $\sum_{n=1}^{\infty} y_n$  konvergieren.

**Definition 3.** Die Zahl  $\alpha \in (-\pi; \pi]$  heißt die Richtung der absoluten Divergenz für die Reihe (1), wenn für jedes beliebige  $\varepsilon > 0$  die Reihe aus absoluten Werten der Reihe (1), die in der Ecke  $\{z \in \mathbb{C} : \alpha - \varepsilon < \arg z < \alpha + \varepsilon\}$  eingefangen sind, divergiert.

Betrachtet man die Reihe komplexer Zahlen, dann wird das obige Theorem von Riemann wie folgt verallgemeinert.

**Theorem 2.** Ist (1) - eine bedingt konvergente Reihe komplexer Zahlen, dann existiert zu jeder beliebig vorgegebenen komplexen Zahl  $W$ , welche zu einer geraden Linie gehört, eine Umordnung  $\sigma$  der Reihenglieder  $z_n$ , so dass die umgeordnete Reihe  $\sum_{n=1}^{\infty} z_{\sigma(n)}$  gegen  $W$  konvergiert.

Dabei hat die Gleichung für die gegebene Gerade folgende Form:

$$y = x \cdot \tan \alpha + y_0,$$

wobei  $\alpha$  - Richtung der absoluten Divergenz ist, und  $y_0$  - die Summe des imaginären Teils der Ausgangsreihe.

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### **Защита информации (Information protection)**

Rapid development of automation processes and the penetration of the computers in all fields of life have lead to appearance of a range of peculiar problems. One of these problems is the necessity of providing effective protection to information and means of its processing.

The problem of information security is relatively new. Not all problems, connected with it have been figured out and solved up to now. The fact of great number of computer systems users means the definite risk to security because not all clients will carry out the requirements of its providing.

A lot of ways to access information, considerable quantity of qualified specialists, and vast use of special technical equipment in social production make it possible for violators practically at any moment and in any place carry out the actions, which represent a threat to information safety.

Particular role in this process has been played by appearance of personal computer (PC), which has made computers, software and other informational technologies available to general public. Wide distribution of PC and impossibility of conducting effective control of their use have resulted in the decreasing security level of information systems.

The lack of appropriate registration and control, low level of work and production personnel discipline, the access of an unauthorized persons to the computing sources create conditions for abusing and cause difficulties to their detection. In every computing center it is usual to set and strictly follow the regulations of the access to different official rooms for employees of any categories.

The main purpose of information protection is preventing from the leak, theft, distortion, counterfeit of information; preventing the threat to person's life and social safety, protection of the constitution and so on. The information is subjected to protection, when it may cause the harm for its owner, user or other person.

In the current situation, data processing has moved the problems of information security forward to the rank of most important problems of national economy. Solving the problem of poor information security presupposes a complex of measures. First of all, such actions of government as development of classification system, documentation of information and protection methods, data access regulations and punishing measures against information security violators.

## **Equation différentielle** **(Дифференциальное уравнение)**

L'équation différentielle est une équation qui concerne la valeur de la fonction dérivée de la fonction, les valeurs des nombres variables indépendantes (paramètres). L'ordre des dérivées de l'équation peut être différent (officiellement il n'est pas limité). Les dérivées des fonctions de variables indépendantes et les paramètres peuvent être inclus dans l'équation de différentes combinaisons. Pas n'importe quelle équation contenant des dérivées de la fonction inconnue est une équation différentielle.

L'équation différentielle d'ordre supérieur peut être transformé en un système d'équations du premier ordre, dans lequel le nombre d'équations est égal à l'ordre de l'équation d'origine.

Le processus de résolution d'une équation différentielle est appelé l'intégration. Toutes les équations différentielles peuvent être divisées en ordinaire, qui ne comprennent que les fonctions (et leurs dérivées) d'un argument, et les équations aux dérivées partielles, qui comprennent les fonctions dépendant de nombreuses variables. Il y a aussi des équations différentielles stochastiques, y compris les processus aléatoires.

Du point de vue des combinaisons des dérivées de fonctions les équations différentielles variables indépendantes sont divisées en linéaires et non linéaires, avec des coefficients constants ou variables, homogènes ou hétérogènes. Les solutions des équations différentielles sont divisées en solutions générales et spécifiques.

Les équations différentielles ordinaires sont des équations qui dépendent d'une variable indépendante. Le nombre est appelé l'ordre de l'équation différentielle. Les équations différentielles les plus importantes sont pratiquement celles du premier et du second ordre.

Les équations différentielles aux dérivées partielles sont des équations contenant les inconnues des fonctions de plusieurs variables et de leurs dérivées privées. L'ordre des équations aux dérivées partielles peuvent se définir également pour des équations différentielles ordinaires. Une autre caractéristique importante de la classification des équations aux dérivées partielles est leur division sur l'équation elliptique, parabolique et hyperbolique de type, en particulier pour les équations du second ordre.

### **Polynom als Begriff in der Mathematik** (Полином как понятие в математике)

In der Mathematik ist ein **Polynom** eine (endliche) Summe von Vielfachen von Potenzen mit natürlichzahligen Exponenten einer Variablen, die meist mit  $x$  bezeichnet wird. *Unendliche* Summen von Vielfachen von Potenzen mit natürlichzahligen Exponenten einer Variablen werden Potenzreihen genannt.

In der elementaren Algebra ist eine *Polynomfunktion* eine Funktion  $P$  der Form

$$P(x) = \sum_{i=0}^n a_i x^i = a_0 + a_1 x + a_2 x^2 + \cdots + a_{n-1} x^{n-1} + a_n x^n, \quad n \geq 0$$

- Die  $a_i$  stammen aus einem Ring  $R$ , z. B. einem Körper oder einem Restklassenring, und werden *Koeffizienten* genannt.
- Alle Exponenten sind natürliche Zahlen.
- Als *Grad* des Polynoms wird der höchste Exponent  $n$  bezeichnet, für den der Koeffizient  $a_n$  des Monoms  $a_n x^n$  nicht null ist. Dieser Koeffizient heißt **Leitkoeffizient**.

- Ist der Leitkoeffizient 1, dann heißt das Polynom *normiert* oder auch *monisch*.
- Ist der Inhalt 1, dann heißt das Polynom *primitiv*.

Bezeichnung spezieller Polynome

Polynome des Grades

- 0 werden *konstante Funktionen* genannt.
- 1 werden *lineare Funktionen* oder genauer *affin lineare Funktionen* genannt.
- 2 werden *quadratische Funktionen* genannt.
- 3 werden *kubische Funktionen* genannt.
- 4 werden *quartische Funktionen* oder *biquadratische Funktionen* genannt.

Nullstellen des Polynoms

Als *Nullstellen* einer Polynomfunktion oder Wurzeln oder *Lösungen* einer Polynomgleichung werden jene Werte von  $x$  bezeichnet, für die der Funktionswert  $P(x)$  null ist, d. h., die die Gleichung  $P(x) = 0$  erfüllen. Ein Polynom über einem Körper (oder allgemeiner einem Integritätsring) hat stets höchstens so viele Nullstellen, wie sein Grad angibt.

### **Problème aux limites (Краевые задачи)**

En analyse, un problème aux limites est constitué d'une équation différentielle (ou plus généralement aux dérivées partielles) dont on cherche une solution prenant de plus des valeurs imposées en des limites du domaine de résolution. Contrairement au problème analogue dit de Cauchy, où une ou plusieurs conditions en un même endroit sont imposées (typiquement la valeur de la solution et de ses dérivées successives en un point). Le théorème de Cauchy-Lipschitz de donne une réponse générale. Les problèmes aux limites sont souvent des problèmes difficiles, et dont la résolution peut chaque fois conduire à des considérations différentes.

Dans le cadre des équations différentielles, une famille classique de problème aux limites est étudiée dans le cadre de la théorie de Sturm-Liouville.

En cas des équations aux dérivées partielles, de nombreux problèmes rentrent à la fois dans le cadre des problèmes de Cauchy du point de vue d'une variable, des problèmes aux limites par rapport à une autre variable. Par exemple: l'équation d'une corde vibrante, l'équation de la chaleur.

La corde vibrante est le modèle physique permettant de représenter les mouvements d'oscillation d'un fil tendu. On supposera ici qu'il est tenu par ses deux extrémités, ce qui n'est pas toujours le cas (dans les pendules ou les fils à plomb, par exemple, l'extrémité du bas est libre). En mathématiques et en physique théorique, l'équation de la chaleur est une équation aux dérivées partielles parabolique, pour décrire le phénomène physique de conduction thermique, introduite initialement en 1811 par Jean Baptiste Joseph Fourier<sup>1</sup>, après des expériences sur la propagation de la chaleur, suivies par la modélisation de l'évolution de la température avec des séries trigonométriques, appelées depuis séries de Fourier et transformées de Fourier, permettant une grande amélioration à la modélisation mathématique des phénomènes, en particulier pour les fondements de la thermodynamique, et qui ont entraîné aussi des travaux mathématiques très importants pour les rendre rigoureux, véritable révolution à la fois physique et mathématiques, sur plus d'un siècle.

La similarité des conditions aux limites de ces deux problèmes ne doit pas conduire à les assimiler, les équations aux dérivées partielles qui les gouvernent se rangent dans deux catégories bien distinctes: l'une est une équation hyperbolique, l'autre une équation parabolique.



## **Machine Turing (Машина Тьюринга)**

Machine Turing (MT), ordinateur abstrait, a été proposé par Alan Turing en 1936 pour formaliser la notion de l'algorithme.

Une machine Turing est une extension d'une machine à états finis et, selon la thèse de Church - Turing capable de simuler tous les artistes (en fixant des règles de transition).

La structure de la machine Turing comprend un ruban, des cellules et un dispositif de contrôle. Le nombre d'états possibles du dispositif de contrôle est précisément défini.

L'unité de commande peut aller à gauche et à droite sur la bande et lire et écrire les caractères dans une cellule d'un alphabet fini. Le caractère nul spéciale est prévu et il remplit toutes les cellules sauf celles à laquelle les données d'entrée sont écrites.

Le dispositif de contrôle fonctionne selon les règles de transition qui sont des algorithmes réalisés par cette machine Turing. Chaque règle de transition prescrit à la machine de passer à un nouvel état et de déplacer une cellule à gauche ou à droite. De certains états de la machine Turing peuvent être nommés un terminal. Le passage dans l'un d'eux signifie la fin du travail, la fin de l'algorithme.

Une machine Turing est appelée déterministe si chaque combinaison de l'état et du symbole de ruban dans le tableau correspond à une seule règle. On donne le nom non-déterministe à la machine Turing, s'il y a une paire "symbole de ruban – Etat", pour lesquels il existe deux ou plusieurs commandes.

La machine Turing fonctionne sur les règles qui ont la forme:  $q_i a_j \rightarrow q_l a_k$ . Pour chaque configuration possible  $\langle q_i, a_j \rangle$  il y a une seule règle (pour la machine Turing non-déterministe peuvent être plus grandes quantités de règles). Il n'existe pas de règles pour l'état final quand la machine s'arrête. En outre, il faut donner l'état initial et final de la configuration sur la bande de la machine.

Nous pouvons dire qu'une machine Turing est une machine simple de calcul avec une mémoire linéaire, qui, selon des règles formelles transforme les données d'entrée par une séquence des actions élémentaires.

Dans la machine Turing on change une seule cellule, et le nombre des actions, possibles est fini. Malgré la simplicité la machine Turing peut calculer tout ce qu'on peut calculer à l'aide de toutes les autres machines à calcul.

### **Dernier théorème de Fermat (Последняя теорема Ферма)**

Pierre Fermat est né le 17 août 1601. Il fait ses études à Toulouse qu'il poursuit à Orléans pour devenir bachelier en droit civil. En 1630, il est nommé conseiller du roi à la Chambre des requêtes. Il ne s'intéresse aux mathématiques que pour plaisir, il adore la démonstration et propose des méthodes innovantes. Pourtant Fermat ne publiera rien de son vivant; l'essentiel de ses travaux se disperse à travers de correspondances avec quelques-uns des plus grands scientifiques de son temps tels que Galilée, René Descartes, Blaise Pascal ou Marin Mersenne. Il était un génial mathématicien français du XVIIe s, qui a contribué avec Descartes à la création de la géométrie analytique, à celle du calcul infinitésimal, et à celle du calcul des probabilités. C'était surtout le fondateur de la théorie moderne des nombres. Fermat a été très influencé par la lecture des classiques de l'Antiquité, notamment celle de Diophante, mathématicien grec, l'auteur de l'Arithmetica. Fermat annotait abondamment la marge de son exemplaire. Il était annoncé, plus rarement prouvé, de nombreux théorèmes. En 1840, tous étaient démontrés ou invalidés. Tous sauf un qui a maintenu les mathématiciens en haleine jusqu'en 1994. Le problème consiste à trouver des carrés qui sont des sommes de deux autres carrés. Fermat écrivait: "Un cube n'est jamais somme de deux cubes, une puissance quatrième n'est jamais somme de deux puissances quatrièmes, et plus généralement aucune puissance supérieure à 2 n'est pas la somme de deux puissances analogues. J'ai trouvé une merveilleuse démonstration de cette proposition, mais je ne peux pas l'écrire dans cette marge car elle est trop longue". On ne saura jamais si Fermat avait réellement une preuve de son théorème, c'est peu probable. On démontre d'abord aisément les cas  $n = 3$  et  $n = 4$ , puis d'autres cas particuliers de  $n$ . Au fil des siècles, les chercheurs se rapprochent du cas général, essayant vainement de retrouver cette fameuse démonstration de Fermat, qui devait être vraisemblablement fausse. En 1850, un mathématicien allemand, Ernst Kummer, a réussi à démontrer le théorème pour les entiers inférieurs à 100, sauf 37, 59, 67 et 74. En 1908, un prix de 100 000 marks est offert par l'université de Göttingen en Allemagne, pour récompenser la personne qui trouve une démonstration (et non un contre-exemple) avant 2007. Cette récompense n'a été jamais distribuée. Partiellement démontré par ordinateur, pour des exposants atteignant 125 000, le théorème n'est finalement démontré qu'en 1994 par le mathématicien britannique Andrew Wiles, dont la démonstration fait appel à des concepts mathématiques que Fermat ne pouvait pas connaître. La démonstration de Wiles prend environ 1000 pages.

### **The world's most prestigious prizes for mathematics** **(Наиболее престижные мировые премии в области математики)**

The number of prizes awarded for achievements in mathematics is continually increasing. The winners frequently receive cash prizes in amounts comparable to the Nobel Prize.

The Fields Medal is the most prestigious of all the prizes in mathematics. It is a prize awarded to two, three, or four mathematicians under 40 years of age at the International Congress of the International Mathematical Union, a meeting that takes place every four years. The Fields Medal is sometimes viewed as the highest honour a mathematician can receive. The Fields Medal and the Abel Prize have often been described as the "mathematician's Nobel Prize". The prize comes with a monetary award, which since 2006 has been C\$15,000 (in Canadian dollars). The colloquial name is in honour of Canadian mathematician John Charles Fields. Fields was instrumental in establishing the award, designing the medal itself, and funding the monetary component.

The Fields Medal is made of 14-carat gold (583 samples). The medal was first awarded in 1936 to Finnish mathematician Lars Ahlfors and American mathematician Jesse Douglas, and it has been awarded every four years since 1950. Its purpose is to give recognition and support to younger mathematical researchers who have made major contributions. In 2014 Maryam Mirzakhani became the first woman to be awarded a Fields Medal.

The Abel Prize is an international prize presented by the King of Norway to one or more outstanding mathematicians. Named after Norwegian mathematician Niels Henrik Abel (1802–1829), the award was established in 2001 by the Government of Norway.

The prize was first proposed to be part of the 1902 celebration of 100th anniversary of Abel's birth. Shortly before his death in 1899, mathematician Sophus Lie proposed establishing an Abel Prize when he learned that Alfred Nobel's plans for annual prizes would not include a prize in mathematics. King Oscar II was willing to finance a mathematics prize in 1902, and the mathematicians Ludwig Sylow and Carl Størmer drew up statutes and rules for the proposed prize. However, Lie's influence waned after his death, and the dissolution of the union between Sweden and Norway in 1905 ended the first attempt to create the Abel Prize.

The Abel Prize has often been described as the mathematician's "Nobel Prize" competing in that respect with the much older Fields Medal. It comes with a monetary award of 6 million Norwegian kroner (NOK) (approximately US\$1 million).

## **Turingmaschine** **(Машина Тьюринга)**

Eine Turingmaschine ist ein wichtiges Rechnermodell der Theoretischen Informatik. Eine Turingmaschine modelliert die Arbeitsweise eines Computers auf besonders einfache und mathematisch gut zu analysierende Weise. Sie ist benannt nach dem Mathematiker Alan Turing, der sie 1936 einführte. Eine Turingmaschine repräsentiert einen Algorithmus bzw. ein Programm.

Eine Turingmaschine hat ein Steuerwerk, in dem sich das Programm befindet, und besteht außerdem aus

- einem unendlich langen Speicherband mit unendlich vielen Feldern.
- einem programmgesteuerten Lese- und Schreibkopf, der sich auf dem Speicherband feldweise bewegen und die Zeichen verändern kann.
- endlicher Kontrolle.

Die Kontrolle ist immer in einem von endlich vielen Zuständen, entspricht dem Befehlszähler der RAM.

Das Eingabe- und Rechenband enthält eine Folge von Symbolen (höchstens eins pro Zelle), entspricht den Registern der RAM.

Ausgehend vom aktuellen Zustand verhält sich die TM wie folgt:

- lese das Symbol auf der aktuellen Position des Lese-/ Schreibkopfes
- gehe in einen Folgezustand über
- überschreibe evtl. das Symbol
- bewege den Lese-/ Schreibkopf nach rechts, links oder gar nicht.

### **Formale Definition:**

Formal kann eine deterministische Turingmaschine als 7-Tupel  $M = (Q, \Sigma, \Gamma, \delta, q_0, \square, q_f)$  dargestellt werden.

- $Q$  ist die endliche Zustandsmenge
- $\Sigma$  ist das endliche Eingabealphabet
- $\Gamma$  ist das endliche Bandalphabet und es gilt  $\Sigma \subset \Gamma$
- $\delta: (Q \setminus \{q_f\}) \times \Gamma \rightarrow Q \times \Gamma \times \{L, 0, R\}$  ist die (partielle)

Überföhrungsfunktion

- $q_0 \in Q$  ist der Anfangszustand
- $\square \in \Gamma \setminus \Sigma$  steht für das leere Feld (*Blank*)
- $q_f \in Q$  ist der akzeptierende Zustand

In der Literatur findet man zahlreiche unterschiedliche Definitionen und Varianten der Turingmaschine, die sich jeweils in einigen Details unterscheiden. So variiert etwa das verwendete Bandalphabet, die zusätzlich verwendeten Spezialzeichen, die Definition von Akzeptanz und andere Eigenschaften. Zudem gibt

es Erweiterungen mit mehreren Bändern oder zusätzlichen Stapelspeichern, die ebenfalls hinsichtlich der Berechenbarkeit äquivalent zu Turingmaschinen sind.

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### **Laser-produced cavitation bubble dynamics**

**(Динамика индуцированного лазером кавитационного пузырька)**

Cavitation is the name given to the phenomenon of the rupture of liquids and the effects connected with the motion of the cavities thus generated. Cavitation can be initiated by either setting up a tension in the liquid or by depositing energy into it. Local deposition of energy is brought about by heat transfer in pipes or by dumping hot bodies into liquids. Not only sound, but also light can cause cavitation by dielectrically breaking down the liquid or heating up absorbing impurities fast. This effect is used in eye surgery and for the study of dynamics of cavitation bubbles. Cavitation is found when two rigid interfaces submerged in a liquid which are initially in contact are pulled apart. Here, cavitation occurs in a narrow gap and may lead to damage of the contacting interfaces in ball-bearings and similar devices. Reynolds remarked that ‘the pressure would become negative if the condition did not break down by discontinuity in the oil, which is sure to occur when the pressure falls below that of zero’.

Cavitation is accompanied by a number of effects having their origin in the dynamics of the bubbles generated. Cavitation bubbles tend to collapse exceedingly fast emitting shock waves and even light (sonoluminescence). They erode solid surfaces and induce chemical reactions.

Our experimental work uses the method of optic cavitation, whereby a short pulse of laser light is focused into the liquid. The bubbles are created with a different laser energy inside a narrow gap. Their dynamics is recorded with a high-speed camera. The bubbles are created with a tightly focused laser pulse which explosively vaporizes the liquid due to stress confinement.

The experimental setup consists of an inverted microscope that is used to image the sample and to focus the laser pulse into the liquid gap. The laser is a frequency doubled. The beam is expanded with a telescope consisting of two lenses in order to fill the back aperture of the microscope objective. The narrow gap is illuminated from

the top through the condenser of the microscope and the events are recorded with a high-speed camera with an exposure time. The time interval between the bubble creation and collapse determines the period of the bubble oscillation. The microfluidic gap is created between a couple of cover slides separated with spacers of the known height “h”.

We have measured experimentally the maximum radii of the laser-produced bubbles with different laser energy, power, fluid viscosity. We have analyzed how these factors influence the cavitation process and we have studied bubble dynamics during its oscillation. As a result we can say that value of the bubbles radii has linear dependence on changing parameters.

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### **Dark energy (Темная энергия)**

Dark energy in cosmology is a type of energy introduced in the mathematical model of the universe for the sake of explaining the observed acceleration of its expansion. There are two versions of explaining the nature of dark energy:

- dark energy is a cosmological constant, i.e. constant energy density, uniformly filling the space of the universe (in other words, a non-zero energy and vacuum pressure is postulated);
- dark energy is a kind of quintessence, i.e. a dynamic field where energy density can vary in space and time.

The choice between the two options requires highly precise measurements of the expansion rate of the universe to understand how this rate varies with time. The pace of expansion of the universe is described by the cosmological equation of state. Resolution of the equation of state for dark energy is one of the most topical problems of modern observational cosmology.

The hypothesis of the existence of dark energy (whatever it is) solves the so-called "problem of invisible mass."

The Big Bang theory of nuclear synthesis explains the formation of light elements such as helium, deuterium and lithium in the early universe. The theory of large-scale structure formation of the universe explains the structure of the universe: the formation of stars, quasars, galaxies and clusters of galaxies. Both of these theories suggest that the density of baryonic matter and dark matter accounts for about 30% of critical density required for the formation of a "closed" universe, that is, density required for the universe to be flat. Measurements of cosmic background radiation recently conducted by the WMAP satellite show that the shape of the

universe is indeed very close to being flat. Therefore, some previously unknown form of invisible energy should provide the missing 70% of the density of the universe.

The essence of dark energy is a matter of dispute. It is known to be very uniformly distributed, to have low density, and not to react appreciably with any ordinary matter via known basic types of interactions – except for gravity. Since the density of dark energy is a hypothetical small (of the order of  $10^{-29} \text{ g / cm}^3$ ), it is unlikely to be found in a laboratory experiment. Dark energy can have such a profound impact on the universe (accounting for 70% of total energy) just because it uniformly fills the empty (in other respects) space.

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### **Wechselstrom (Переменный ток)**

Als Wechselstrom bezeichnet man den elektrischen Strom, der seine Richtung in regelmäßiger Wiederholung ändert und bei dem sich positive und negative Augenblickswerte so ergänzen, dass der Strom im zeitlichen Mittel null ist.

Weltweit wird für die elektrische Energieversorgung am häufigsten der sinusförmige Wechselstrom verwendet. Die Gründe dafür sind die einfache Erzeugung und einfache Transformation der Wechselspannung. Im Haushaltsbereich wird gewöhnlich der Einphasenwechselstrom verwendet. Daneben gibt es verkettete Dreiphasenwechselstrom-Systeme zur verlustarmen Fernübertragung mit hochgespanntem Wechselstrom und für einfache Motoren mit hohem Wirkungsgrad. Für die Energieübertragung muss man am Wechselstrom seine Wirkstrom- und Blindstromanteile beachten.

Hochfrequente Wechselströme verwendet man in der Nachrichtentechnik und in der Elektromedizin. Die einfachste Form von Wechselstrom entsteht durch ständig wechselnde Umpolung einer Gleichstromquelle. Obwohl dieser Wechselstrom technisch sinnvoll nutzbar ist, wird er nicht zur großräumigen Energieversorgung verwendet. Der Grund ist sein ausgedehntes Frequenzspektrum. Es umfasst wesentlich höhere Frequenzen als nur die Grundfrequenz. Dieser sehr hohe Oberschwingungsanteil könnte zu starken Energieverlusten bei der Transformation und Fernübertragung der elektrischen Energie führen.

In der Energieversorgung wird fast nur „sinusförmiger Wechselstrom“ eingesetzt, denn er besitzt keine unerwünschten Harmonischen. Er hat seinen Namen daher, dass die Momentanwerte über eine vollständige Periode mit einer positiven und einer negativen Halbschwingung exakt den Werten der Sinus-Winkelfunktion über einen Vollkreis ( $0-360^\circ$ ) entsprechen. Die grafische Darstellung ergibt dabei die typische Sinuskurve.

In der Energieversorgung werden statt Wechselstrom mit nur einer Phasenlage in den rotierenden elektrischen Maschinen verkettete separate Wechselstromphasen erzeugt. Dabei sind die Spulen der Generatoren gleichmäßig um den Kreisumfang verteilt. Diese spezielle Form von Wechselstrom bezeichnet man bei drei Phasen als Dreiphasenwechselstrom und umgangssprachlich auch als „Drehstrom“.

Darüber hinaus existieren auch noch andere mehrphasige Wechselstromsysteme, wie der Zweiphasenwechselstrom oder allgemein Mehrphasenwechselstromsysteme. Sie haben aber in der öffentlichen elektrischen Energieversorgung keine wesentliche Bedeutung. Wechselstromsysteme mit mehr als drei Phasen werden unter anderem bei speziellen elektrischen Antriebssystemen eingesetzt, die auf Synchronmotoren basieren.

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### **X-rays (Рентгеновское излучение)**

X-rays are produced with strong acceleration of charged particles (bremsstrahlung), or by high-energy transitions in the electron shells of atoms or molecules. Both effects are used in X-ray tubes. The main constructive elements of these tubes are metal cathode and anode. In X-ray tubes electrons emitted by the cathode accelerate under the influence of electrical potential difference between anode and cathode (in this case X-rays aren't emitted, since the acceleration is too small), and strike the anode where they are sharp braking. In this case, due to bremsstrahlung radiation X-ray range is generated, at the same time electrons are knocked out of the inner electron shells of the atoms of anode. Empty seats in the shells are occupied by various other atomic electrons. In this case X-ray radiation is emitted. During acceleration-deceleration only about 1% of the kinetic energy of the electron goes to X-rays, 99% of the energy is converted into heat.

Prior to X-ray tube, in which X-rays appear, cathode ray tube was developed by William Crookes. In 1895 Wilhelm Roentgen, working with this cathode-ray tube, made his discovery. He noticed that it was projecting a green light on the wall. Strangely, the light was passing through some materials, including paper, wood and books. As he experimented by placing other materials in the way, he noticed that the outline of the bones in his hand was projected onto the wall. In the following weeks he continued to investigate the new rays, which he temporarily called "X-rays" (signifying an unknown quantity). Two months later, he published his paper "On a new kind of X-rays", and in 1901 he was awarded the first Nobel Prize in Physics.

Everyone knows that X-rays are the images that are used for disease diagnostics. But they are also needed to research in various sciences. For example, in astronomy supernova is studied by X-ray. So the supernova remnant Cassiopeia A (Cas A) was



imaged by three of NASA's great observatories, and data from all three observatories were used to create her the image. In the image infrared data from the Spitzer Space Telescope are colored red, optical data from the Hubble Space Telescope are yellow, and X-ray data from the Chandra X-ray Observatory are green and blue. The X-ray data reveal hot gases at about ten million degrees Celsius that were created when ejected material from the supernova smashed into surrounding gas and dust at speeds of about ten million miles per hour. By comparing infrared and X-ray images, astronomers are learning more about how relatively cool dust grains can coexist within the super-hot, X-ray producing gas.

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### **Thermal radiation (Тепловое излучение)**

This article is about any type of electromagnetic radiation from an object related to its temperature.

*Thermal radiation* is electromagnetic radiation generated by the thermal motion of charged particles in matter.

All matter with a temperature greater than absolute zero emits thermal radiation. When the temperature of the body is greater than absolute zero, interatomic collisions cause the kinetic energy of the atoms or molecules to change. This results in charge-acceleration and/or dipole oscillation which produces electromagnetic radiation, and the wide spectrum of radiation reflects the wide spectrum of energies and accelerations that occur even at a single temperature.

Thermal radiation include *the visible light* and *infrared light* emitted by an incandescent light bulb, the infrared radiation emitted by animals and detectable with an infrared camera, and the cosmic microwave background radiation. Thermal radiation is different from *thermal convection* and *thermal conduction* – a person near a raging bonfire feels radiant heating from the fire, even if the surrounding air is very cold.

Sunlight is part of thermal radiation generated by the hot plasma of the Sun. So, the heating of the Earth by the Sun is an example of transfer of energy by radiation. The heating of a room by an open-hearth fireplace is another example. The flames, coals, and hot bricks radiate heat directly to the objects in the room with little of this heat being absorbed by the intervening air.

The Earth also emits thermal radiation, but at a much lower intensity and different spectral distribution (infrared rather than visible) because it is cooler. The Earth's absorption of solar radiation, followed by its outgoing thermal radiation is the two most important processes that determine the temperature and climate of the Earth.

If a radiation-emitting object meets the physical characteristics of a black body in thermodynamic equilibrium, the radiation is called blackbody radiation. *Planck's law* describes the spectrum of blackbody radiation, which depends only on the object's temperature. Wien's displacement law determines the most likely frequency of the emitted radiation, and the *Stefan – Boltzmann law* gives the radiant intensity.

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### **The forecasting of salt deposition in wells** **(Прогнозирование солеотложения в скважинах)**

While oil is extracted, it will always be accompanied by water, and if it is mineralized water, there is a threat of inorganic salting up. There should be prevention in the oil extraction as a permanent measure, which requires a systematic approach for the main direction of the struggle with salt deposition. Settling out of any substance into the sediment occurs if the concentration of the substance or the ion in solution exceeds the equilibrium concentration. The second condition is an oversaturation of precipitation of waters as a result of thermobaric changes when the magnitude of the equilibrium concentration is reduced in the original solution.

The analysis of changes in the ionic component of 360 stratal water samples from 35 wells for the period of 10 years (2000-2009) showed the tendency to precipitation of gypsum  $\text{CaSO}_4 \times 2\text{H}_2\text{O}$ , which is deposited at high temperatures in the modification of bassanite  $\text{CaSO}_4 \times 0,5\text{H}_2\text{O}$  and anhydrite  $\text{CaSO}_4$ . Let us do the numerical calculations of salt deposition using the method of J. E. Oddo and M.B Thomson according to saturation index for prognostic assessment:

$$\text{SI} = \lg \frac{[\text{Kt}^{2+}] \times [\text{An}^{2-}]}{K} \quad (1)$$

where SI - saturation index;  $[\text{Kt}^{2+}] \times [\text{An}^{2-}]$  - the product of the molar concentrations in the solution of anion and cation constituting the salt; K - constant of solubility product at equilibrium condition depending on the thermobaric conditions and ionic force of solution which is determined by:

$$\text{pK} = a + bT + cT^2 + dP + eI^{0.5} + fI + hTI^{0.5}, \quad K = 10^{-\text{pK}} \quad (2)$$

where T - temperature in degrees Fahrenheit, ° F; P - pressure, Pa; I - Ionic strength, mEq / L, a, b, c, d, e, f, g, h - are empirical coefficients.

When  $SI > 0$  solution is supersaturated by salt, which may drop out into the sediment at  $SI < 0$  - solution is undersaturated with salt and the fallout of sediments is not possible.

The results of calculations showed that there is a risk of drop of gypsum and anhydrite, bassanite because of the positive saturation index in 18 wells  $SI > 0$ , so these wells should be included into the risk fund for salt deposition, and a constant monitoring should be maintained for them

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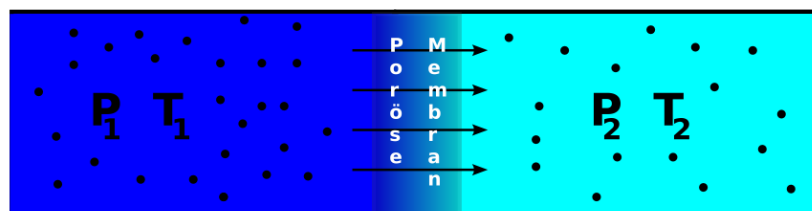
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### **Joule-Thomson-Effekt** (Эффект Джоуля – Томсона)

Der Joule-Thomson-Effekt beschreibt die Temperaturänderung eines Gases beim Herabsetzen des Druckes. Der Effekt tritt auf, wenn ein reales Gas oder Gasgemisch durch Drosselung eine Temperaturänderung erfährt. Diese Erscheinung spielt eine wichtige Rolle in der Thermodynamik von Gasen und ist in erster Linie für die Technik von Bedeutung.

Der Joule-Thompson-Effekt tritt bei allen realen Gasen auf, unabhängig davon, ob sie in atomarer Form oder als Moleküle vorliegen.

## **Joule-Thomson-Effekt**



Beim Joule-Thomson-Versuch wird ein Gas entspannt, indem es durch ein Drosselventil von einem kleinen Volumen  $V_1$  bei hohem Druck  $P_1$  (links) in ein großes Volumen  $V_2$  bei kleinem Druck  $P_2$  (rechts) „von alleine“ strömt. Die Anordnung ist thermisch isoliert, der Vorgang verläuft also adiabatisch. Links wird die Arbeit  $P_1 V_1$  am Gas geleistet, rechts die Arbeit  $-P_2 V_2$  vom Gas wieder abgegeben. Nun wird die Energieerhaltung benutzt: Die innere Energie des Gases ändert sich aufgrund der erbrachten Arbeit;

$$U_2 - U_1 = P_1 V_1 - P_2 V_2, \text{ oder: } U_2 + P_2 V_2 = U_1 + P_1 V_1.$$

Dies ist gerade die Enthalpie-Erhaltung, da die Enthalpie gegeben ist durch  $H = U + PV$ . Statt der inneren Energie  $U$  bleibt hier also  $H$  erhalten, der Vorgang ist isenthalp.

Die Stärke und Richtung der Temperaturänderung wird durch den Joule-Thomson-Koeffizienten  $\mu$  beschrieben:

$$\mu_{JT} = \left( \frac{\partial T}{\partial p} \right)_H$$

Er stellt die partielle Ableitung der Temperatur T nach dem Druck p bei konstanter Enthalpie H dar.

$$\text{Für reale Gase } \mu_{JT} = \frac{\frac{2a}{RT} - b}{C_p}$$

( $C_p$  – Wärmekapazität bei konstantem Druck; a, b – Kohäsionsdruck und Kovolumen)

Abhängig von der Temperatur kann Gas erwärmt (wenn  $T > \frac{2a}{Rb}$ ) oder gekühlt (wenn  $T < \frac{2a}{Rb}$ ) werden. Temperatur  $T = \frac{2a}{Rb}$  bezeichnet man als Inversionstemperatur.

Die Ursache des Joule-Thomson-Effekts liegt in der Wechselwirkung der Gasteilchen. In realen Gasen dagegen gibt es zum einen anziehende (Van-der-Waals) Kräfte zwischen den Molekülen; gegen diese Kräfte muss das reale Gas Arbeit leisten, wenn es expandiert. Diese Arbeit wird der inneren Energie U entnommen und U somit erniedrigt – und damit auch die Temperatur des Gases. Zum anderen haben reale Gasteilchen aber auch eine räumliche Ausdehnung, das heißt, wenn sie sich zu nah kommen, gibt es abstoßende Kräfte. Wenn diese überwiegen, führt eine Expansion dem Gas Arbeit zu und erhöht seine innere Energie und Temperatur. Welche der beiden Kräfte überwiegen, hängt von der Umgebungstemperatur ab – oberhalb der Inversionstemperatur überwiegt die Abstoßung und eine isenthalpe Expansion führt zu einer Temperaturerhöhung, unterhalb der Inversionstemperatur überwiegt die Anziehung und isenthalpe Expansion führt zu einer Temperaturniedrigung.

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### **Gamma ray logging (Гамма каротаж)**

Radioactive ray logging is based on various nuclear radiations mainly neutrons and gamma quanta. Natural radioactivity is the ability of certain radioactive nuclei to disintegrate spontaneously radiating energy. Natural radioactivity consists of the ability of rocks to emit alpha, beta and gamma rays. The depth of penetration of alpha radiation in rocks constitutes the first tens of micrometers, beta radiation – the first

millimeters and gamma radiation – 30-40 centimeters. Due to high penetration ability of gamma quanta they are the main type of radiation recorded in GRL. The magnitude of natural radioactivity of rocks is determined mainly by the presence of three main chemical elements in them, which include: uranium, thorium and isotope of potassium-40.

In the investigation by gamma method a device is lowered in the well which contains a gamma ray detector and an electronic circuit used to power light, enhance its signals and transmit them via the cable to the surface. Measure point of GRL coincides with the center of the detector.

The content of radioactive elements in rocks is different, and therefore the intensity of gamma radiation emitted by them is different. The highest gamma activity is observed in clays and acidic eruptive rocks, such as granite, thus, the maximum curve of GRL is registered in these very rocks. The least activity is characteristic of ultra basic rocks and sedimentary rocks, for example, pure limestones, sandstones, most fossil fuels, they make the minimum curve of GRL. In sedimentary rocks, as a rule, the more clay fraction is present, the higher their radioactivity is. Therefore, when registering them, we can judge about the type of rocks, traversed by the device in the well.

In addition to radioactivity of rocks the instrument reading is also influenced by: the absorption of gamma radiation in the well depending on the diameter of the well, the drilling mud density, the presence and thickness of the casing, cement sheath and environment radioactivity filling the hole. The radius of the sphere from which comes 90-95% of radiation is called the radius of device investigation. It is about 30 centimeters.

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### **Methods of electrochemical analysis (Методы электрохимического анализа)**

Electrochemistry is the branch of physical chemistry concerned with the interaction of electrical and chemical effects. It studies chemical reactions which take place at the interface of an electrode, usually a solid metal or a semiconductor, and an ionic conductor, the electrolyte. These reactions involve electric charges moving between the electrodes and the electrolyte (or ionic species in a solution). Thus, large part of this field deals with the study of chemical changes caused by the passage of an electric current and the production of electrical energy by chemical reactions. In fact, the field of electrochemistry encompasses a huge array of different phenomena (e.g., electrophoresis and corrosion), devices (electrochromic displays, electro analytical

sensors, batteries, and fuel cells), and technologies (the electroplating of metals and the large-scale production of aluminum and chlorine).

Investigation of various solutions led to the emergence and development of different electrochemical methods for their research. Application of methods requires an understanding of the fundamental principles of electrode reactions and the electrical properties of electrode-solution interfaces.

Methods of electrochemical analysis study electrochemical phenomena occurring in the medium or at the interface of the analyte by measuring the potential (volts) and/or current (amperes) in an electrochemical cell containing the analyte. These methods are divided into five main categories. They are: potentiometry (electromotance of reversible electrochemical circuits is measured), coulometry (amount of a substance released at the electrode during the electrochemical reaction is measured), voltammetry (the cell's current is measured while actively altering the cell's potential), conductometry (electrical conductivity of electrolytes is measured) and dielectrometry (permittivity is measured).

One of the methods widely used in electrochemistry and physics over the past years has become the method of electrochemical impedance spectroscopy (EIS). In this method the system under investigation is excited by a small amplitude ac sinusoidal signal of potential or current in a wide range of frequencies and the response of the current or voltage is measured. Frequency sweeping in a wide range from high-to low-frequency enables the reaction steps with different rate constants, such as mass transport, charge transfer and chemical reaction, to be separated. Often, data obtained by EIS is expressed graphically in a Bode plot or a Nyquist plot.

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### **Humidity sensors based on thin films of polyimide**

**(Датчики влажности на основе тонких плёнок полиимида)**

Humidity is an indicator of the water content in physical bodies or environments. Humidity is a measurement of the water vapor content in the atmosphere. Absolute humidity ( $f$ ) is the amount of water vapor actually contained in 1 m<sup>3</sup> of air. To measure moisture the devices called hygrometers are used.

Why are people interested in the humidity sensors more often today? So we all know that humidity has an impact on the overall health of a person so increased or vice versa lowered humidity can cause different kinds of diseases. Therefore, in aired rooms would be appropriate to control the optimum humidity.

That is what pushes people to purchase moisture sensors. This is a special device that is designed to measure and control the amount of moisture in the air. The sensor

measures mainly the relative humidity, that is, the amount of water vapor that contains air at a given temperature. For this reason, for convenience, manufacturers offer to the consumer, mainly humidity sensors with integrated temperature sensor. Humidity sensors are of various kinds.

What is the specific feature of our research? We, under the heading of the scientific advisor Rinat Bayasitovich Salikhov, are trying to create the humidity sensors based on thin films of polyimide. The polyimides (sometimes abbreviated to PI) class of polymers containing in the main chain imide cycles [1], as a rule condensed with an aromatic or other cycles. The greatest use is made of heat-resistant aromatic polyimide - derivatives of tetracarboxylic acids with five-membered imide cycles in the core network. Polyimide is used in many areas of production. Thin (thickness less than one micron) polyimide film is used as optical windows in synchrotron radiation sources. Self-adhesive tape in roll form, for high voltage and high temperature insulation of electric circuits (amber adhesive tape). This type of products is also used for fixing the actuated conductors in laptops, netbooks and other portable electronic devices. Also to produce flexible printed-circuit boards. The main advantage of polyimide in our project is its reversible absorption, that is process of absorption and the subsequent release of water.

How is the sensor created? On a payment with a layer of polyimide we spray a thin layer of silver. Silver has a large porosity, larger in size than the water molecule, which allows the water molecules to freely get on the polyimide film and protects against alien substances with larger nuclear structure. If water got on the polyimide film, its conductivity increases and through the sensor begins to flow an electric current that is displayed on the screen by the increase in humidity. These sensors are have advantages: they are fully automatic and have a longer time of service.

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**Experimental study of dynamics of bubbly liquids exposed to ultrasound  
(Экспериментальное исследование динамики пузырьковых  
жидкостей, подверженных ультразвуку)**

The experimental results of the study of bubbles dynamics in high frequency sound fields are presented. The effect of cleaning of liquid from bubbles by ultrasound is observed. When a sound field is turned on, it pushes bubbles away from the acoustic source and forms a zone free of bubbles. That leads to a propagating boundary between clear and bubbly liquid. The effect observed in experiments is very strong and repeatable. It was also observed in some cases of numerical simulation of bubble self-organization. The study of the dynamics of such bubbly front in glycerol and deionized water at different acoustic frequencies and amplitudes was carried out.

It was revealed that besides overall vertical motion upward, some bubbles move down picking up the neighboring bubbles which leads to cluster formation. After that clusters move up and merge with the bubble front. The wave front looked like a densely packed bubble sheet.

The study of bubbly water exposed to ultrasound showed fast bubble front propagation for the range of frequencies (89 – 209.2 kHz) and pressure fields. Experiments were compared with the results of numerical modelling, and a good agreement was obtained. With the help of a long-distance microscope interesting behavior of bubbles near the front was observed. Besides overall vertical motion upward some bubbles move down picking up the neighboring bubbles which leads to cluster formation. After that, clusters move up and merge with the bubble front.

The cavitation was used for fuel processing. Cavitation devices reduce viscosity of hydrocarbon fuel. This allows to reduce required heating and to increase the dispersion of fuel atomization. These devices are often used to improve the efficiency of combustion or disposal of water-bearing fuels.

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### **The formation of stars near Black Holes (Формирование звезд вблизи черных дыр)**

Black Hole is a region in space-time where the gravitational pull is so powerful that nothing can escape it even objects moving at the speed of light, including the quanta of the light itself.

Despite the harsh conditions around Black Holes that are in the center of the Milky Way, the Stars and Planets can be formed there. The evidence of this fact is the existence of the heavenly bodies at the distance of several light years away from Black Holes.

The question whether Black Holes swallow Supermassive stars whose mass exceeds the mass of the Sun in a few million times, is still open. The majority of scientists insists that Stars couldn't be formed near Black Holes, but new researches suggest the opposite opinion.

Stars are born in clouds of gas and dust. Turbulence within these clouds gives rise to the formation of clusters and nodes which begin to collapse under its own weight. Clusters are heated and harden, turning into a protostars. Protostars got their name due to the fact that they have not yet started nuclear fusion of hydrogen into helium.

Protostars are not visible because they don't generate enough visible light due to internal nuclear fusion and can be hidden by the gas disk and dust accumulations.



For this reason many scientists didn't find anything close to Black Holes except dust accumulations.

There are two theories about the formation of stars near Black Holes now. Both of them can explain the formation and existence of stars around the Black Hole called Sagittarius A-star.

The followers of the first theory believe that gas and dust accumulations can fall apart in a strong gravitational field of a Black Hole and are formed in the disk surrounding it. In this disk young stars will be formed, and the same disks around stars will be the basis for the planet appearance.

The followers of the second theory believe that the gas clouds are stretching into a long narrow “strip”, which is exposed to two opposite gravitational forces from the Black Hole that hold this “strip” beside it. In this strip the formation and the existence of stars and planets is performed.

The disk around the protostars breaks into clumps of gas and dust, which are then compacted in the future planet. Similar gas accumulation was observed in the Orion nebula cluster. There are other places with similar clumps of gas, not bordering on Black Holes.

But in the extreme conditions of the neighborhood with a Black Hole and the effects of stellar winds, the majority of the masses of these disks are lost. Despite the unfavorable environment, near the protostar remains enough material to form planets.

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### **Keyboard (Клавиатура)**

A computer is a device that can be also described in terms of hardware and software. Data and instructions enter a computer with the help of input devices.

An input device is a device that puts data into the computer. An input device allows the user to command the computer. So this means the keyboard takes commands from you and then electronically passes the data to the computer.

A computer keyboard is one of the main devices for user input into the computer. It is a set in a given order of keys (buttons). Despite the development of alternative input devices, such as the mouse, touchscreen, pen devices, character recognition and voice recognition, the keyboard remains the most commonly used device for direct (human) input of alphanumeric data into computers.

While typewriters are the definitive ancestor of all key-based text entry devices, the computer keyboard as a device for electromechanical data entry and communication derives largely from the utility of two devices: teleprinters (or

teletypes) and keypunches. It was through such devices that modern computer keyboards inherited their layouts.

In the IBM-PC compatible computers there are the following standard keyboard:

- IBM PC

- IBM PC / XT - they had 83 keys.

- together with a series of computers IBM PC / AT begin supplying PC / AT or AT-keyboard - has 101 or 102 keys.

Location of keys on the AT-keyboard obeys a single common scheme designed by counting on the English alphabet.

According to the purpose keys on the keyboard are divided into six groups:

- functional;

- alphanumeric;

- cursor control;

- numeric keypad;

- specialized;

- modifiers.

Among the modifier keys there are the Shift, Ctrl, ⌘ Caps Lock, Alt and AltGr (Right Alt) keys. They are designed to change (modify) the actions of other keys. The inclusion of uppercase keys (if outages ⌘ Caps Lock) by pressing and holding down ⌘ Shift. Press and hold the AltGr key is used to move to the second level of the keyboard.

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### **What is nanotechnology? (Что такое нанотехнология?)**

Nanotechnology is an emerging science. It offers ways to create smaller, cheaper, lighter and faster devices that can do smart things, use less raw materials and consume less energy. Nanotechnology originates from the Greek word meaning "dwarf".

In simple terms, nanotechnology can be defined as "engineering at a very small scale", and this term can be applied to many areas of research and development. Nanotechnology, in one sense, is the natural continuation of the miniaturization revolution that we have witnessed over the last decade. It was the computer industry that kept on pushing the limits of miniaturization, and many electronic devices we see today have nano features.

Nanotechnology is already providing the solution to many long-standing medical, social and environmental problems. Nanorequires a team effort, which may include life scientists - biologists and biochemists - physicists, chemists and

information technology experts.

Nano scientists are now enthusiastically examining how the living world 'works' in order to find solutions to problems in the 'non-living' world. There are many examples of the application of nanotechnology from the simple to the complex. For example, there are nanocoating which can repel dirt and reduce the harmful effect of cleaning agents, or prevent the spread of hospital-borne infections. New-generation hip implants can be made more 'body friendly' because they have a nanoscale topography that encourages acceptance by the cells in their vicinity. A good example of the application of nanotechnology is a mobile phone, which has dramatically in a few years - becoming smaller and smaller, while growing cleverer and faster, and cheaper!

One of the great nanotechnology scientists is Drexler. His technology is developing the ability to build simple structures on a molecular scale. The current era is that of passive nanostructures, materials designed to perform one task. The second phase introduces active nanostructures for multitasking, drug delivery devices, and sensors. The third generation is expected to begin emerging around 2010 and will feature nanosystems with thousands of interacting components.

As work progresses through the four generations of nanotechnology, it will become increasingly obvious that engineering of functional systems at the molecular scale is what nanotech is really all about.

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### **Heat exchanger in the ice protection system of gas turbine (Теплообменник в системе антиобледенения газовой турбины)**

A heat exchanger is a piece of equipment built for efficient heat transfer from one medium to another. The media may be separated by a solid wall to prevent mixing or they may be in direct contact.

There are three primary classifications of heat exchangers:

- parallel-flow heat exchanger
- counter-flow heat exchanger
- cross-flow heat exchanger

In parallel-flow heat exchangers, the two fluids enter the exchanger at the same end, and travel in parallel to one another to the other side.

In counter-flow heat exchangers the fluids enter the exchanger from opposite ends.

In a cross-flow heat exchanger, the fluids travel roughly perpendicular to one another through the exchanger

The principle of operation of Heat Electric Power plant:

The water enters the boiler and water heated to the boiling in point. The steam is transmitted to the turbine. From the turbine the exhaust steam goes to capacitor. The water from the capacitor flows to the deaerator. From the deaerator then water enters the boiler.

There is a problem of turbine head icing in winter time. We solved it so that the plate heat exchanger was installed to heat the air entering the compressor of the gas turbine.

There is a special ice protection system. It is used to prevent the turbine head icing in winter time.

The main parts of the system are: thermal shelter, compressor, combustor chamber, GT, the diffuser, fans, air piping, multifunction device, noise reduction unit, air cleaner, valv, and exchanger.

The cold water enters the air cleaner. The air cleaner removes dust and dirt particles. Then clean air goes to the noise reduction unit. From the noise reduction unit it is transmitted to the heat exchanger. There the air is heated by steam from the turbine. This is how we can solve the problem.

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### **Simulation of non-isothermal flow of hydrocarbon liquids in the pipeline (Моделирование неізотермического течения углеводородной жидкости в трубопроводе)**

Solid methane hydrocarbons, waxes are present in actually all crude oils. Their content can range from 20% to 28%. Sometimes their influence on recovery process, petroleum accumulating its and petroleum refining can be decisive. There are cases of intensive wax accumulating even when their share of oil is very small, around 0.4%. Thus, wax accumulation is a serious scientific and technological problem. This presents a number of scientific and engineering problems both in terms of understanding the mechanism of the processes and the development of effective methods of preventing undesirable effects caused by wax accumulation. Wax accumulation in pipelines leads not only to reducing their effective capacity and increase of hydraulic resistance, but also it rises the stability of oil-water emulsion.

One of the most effective ways to prevent wax accumulation is the method of thermal action on hydrocarbon liquid. We assume that there is a part of the cylindrical pipe, which is filled with a hydrocarbon liquid. The mathematical model includes the convective heat transfer equation:

$$c\rho\left[\frac{\partial T}{\partial t}+v_r\frac{\partial T}{\partial r}+v_z\frac{\partial T}{\partial z}\right]=\frac{1}{r}\frac{\partial}{\partial r}\left(rk\frac{\partial T}{\partial r}\right)+\frac{\partial}{\partial z}\left(k\frac{\partial T}{\partial z}\right)$$

where  $c$  - is specific heat;  $\rho$  - density;  $k$  - heat-conduction coefficient;  $v_z$  - velocity of fluid flow along the axis of the pipeline;  $v_r$  - flow speed in the radial direction;  $r$  - the radius of the pipe;  $T$  - temperature of the environment.

We have focused on the process of heat transfer in the fluid by the pipeline with different velocity of its flow, as well as on varying the intensity of heat transfer between the pipe and the environment. The problem is solved numerically by the method of control volume on the implicit scheme.

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### **Nanobiosensoren (Наноразмерные биосенсоры)**

Der Ausdruck "Biosensor" ist die Abkürzung für "biologischen Sensor". Die Vorrichtung besteht aus einem Sensor und einem biologischen Element, das ein Enzym, ein Antikörper oder eine Nukleinsäure sein kann. Das Bioelement tritt in Wechselwirkung mit dem zu analysierenden Stoff und die biologische Reaktion wird vom Transduktor in ein elektrisches Signal umgewandelt. Die Messung eines Analyten mittels eines Biosensors erfolgt in drei Schritten. Zunächst erfolgt die spezifische Erkennung des Analyten durch das biologische System des Biosensors. Dann findet die Umwandlung der physikochemischen Veränderungen, die durch die Wechselwirkungen des Analyten mit dem Rezeptor entstehen (Bioreaktion), in ein elektrisches Signal statt. Dieses Signal wird dann verarbeitet und verstärkt.

Die Biosensoren werden in erster Linie in der klinischen Diagnostik eingesetzt - das ist das Haupteinsatzgebiet von Biosensoren und chemischen Sensoren. Die Kontrolle von biochemischen Präparaten (einschließlich von Konzentrationen der im Blut gelösten Gase, Ionen und verschiedener Metaboliten) ist von höchster Wichtigkeit.

Die Biosensoren werden auch in der Produktion eingesetzt. Derzeit beschränkt sich die on-line-Überwachung in erster Linie auf die Messung von Temperatur, pH und Kohlendioxid- und Sauerstoffkonzentration. Es gibt jedoch auch Sensoren für die Bestimmung einer Vielzahl von Reaktanten und Produkten, insbesondere Zucker, Hefe, Malz, Alkohole, phenolischen Verbindungen, und einer Reihe von Nebenprodukten.

Biosensoren sind notwendig, um die Umwelt zu schützen. Es gibt viele Stoffe, deren Gehalt man in der Luft, im Wasser, im Boden und anderen Medien bestimmen

muss. So muss man zum Beispiel im Wasser Säure, Salzigkeit, Nitrat-, Phosphat-, Calcium- und Fluoridgehalt messen.

Geräte mit nanoskaligen biologischen Sensoren: Biosensoren auf Basis von Feldeffekttransistoren. Der Feldeffekttransistor ist speziell entworfen worden, um Änderungen in der MIS-Struktur zu verfolgen. Um aus einem Feldeffekttransistor einen Sensor zu machen, wird in der Gate anstelle von Metall ein Erkennungselement platziert, zum Beispiel eine Analyt-empfindliche Membran. So erhält man chemisch sensitive Feldeffekttransistoren.

Die Entwicklung von nano-optischen Biosensoren. Der neue Biosensor beruht auf einer Weiterentwicklung der so genannten Oberflächenplasmonenresonanz, einem physikalischen Prinzip, das seit einigen Jahren erfolgreich für die Untersuchung der Wechselwirkungen von Proteinen angewendet wird.

Kleine Ausmaße der Sensoren machen es möglich, mehrere Sätze davon in einem kleinen Volumen zu unterbringen. So können auf einem Halbleiterchip mehrere Fühlelemente angeordnet werden oder in einem kleinen Volumen mehrere unabhängige Sensoren. Somit ist die Möglichkeit für ein "Lab on a Chip" geschaffen, das mit einem Mikroprozessor zur Verarbeitung von Ergebnissen der Analyse ausgestattet ist.

In den letzten Jahren erhielten die Biosensoren beträchtliche Aufmerksamkeit als würdige Nachfolger einer Reihe von analytischen Kontrollmethoden in klinischen Labors, Veterinär- und Lebensmittelindustrie.

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### **Calculation of capillary pressure curve on the basis of centrifuging data**

#### **(Расчет кривых капиллярного давления по данным центрифугирования)**

Capillary pressure is the most important parameter of natural oil and gas reservoirs. Its proper estimation in laboratory conditions is necessary for maximum reliable calculation of stockpile as well as for more accurate modelling of the process of reservoir engineering. Assessment of capillary pressure and, more precisely, dependence of capillary pressure on water saturation of a layer, are typically carried out in two ways: the method of permselective membranes and the method of centrifuging. The membrane method is the most accurate and generally acknowledged among specialists. However, the method of centrifuging is more time-consuming. Meanwhile, this method is determined by a more complicated physical process of fluid expulsion from the sample. In the process of centrifuging changes in capillary pressure and the sample's water saturation are characterized by definite

gradients. Water saturation changes for 100% at the discharge ring of the saturated core. Capillary pressure changes from its maximum at the receiving ring of the saturated core to zero at the discharge ring. Outcoming data of the experiment on centrifuging are frequency points of the centrifuge bowl and the sample's average water saturation, which should be recalculated into the capillary pressure curve (CPC).

The analysis of existing methods of interpretation of centrifuging data allowed separating two approaches to solving the problem:

1) *Methods of average capillary pressure calculation* and correlation of this pressure with average water saturation in the sample. To this group belong: residual water saturation RWS 39-204-86, the formula of Tulbovich B. I., the formula of laboratory "VNIIneft",

2) *Methods of calculation of water saturation at the discharge ring of the core* and correlation of the saturation with capillary pressure at the receiving ring of the core. To this group belong: methods of Hussler-Brunner, Domselaar, Forbes, Rajan, etc.

Owing to its simplicity, the first approach is more commonly used, but it does not have any exact physical connection to the process of centrifugal expulsion. The second approach is more grounded but it entails tedious mathematical calculations. A number of laboratory experiments were conducted with the aim to create a unified method of calculation of capillary pressure curve in the course of the work. At the first stage samples were examined on the capillarimeter and the obtained CPC were taken as "standard". At the second stage the samples were centrifuged, and the data were processed by different methods. As a result of the comparison of the obtained curves with the "standard", the biggest convergency was shown by differential and integrated methods of calculation of water saturation at the receiving ring of the core, which fall under the second group. A step-by-step mathematical calculation algorithm for CPC, based on the undertaken research, was composed, and this algorithm is realized in the form of the program.

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### **The history of research and scientific discoveries of magnetoresistive phenomena in solid materials**

#### **(История исследований и научных открытий магниторезистивных явлений в твердых материалах)**

Technological progress would be impossible without fundamental research of magnetic and quantum-mechanical properties of materials.

150 years ago the British physicist William Thompson began studying the influence of the applied magnetic field on the electrical resistance of iron. If the

electric current flows along the magnetic field, the resistance increases, and if it flows across it the resistance decreases. This phenomenon was called the anisotropic magnetoresistance. Magnetoresistive materials on its base are widely used in practice, particularly permalloy - an alloy of iron and nickel.

The next step was taken by Neville Mott. In the mid-thirties of the XX century, he noticed some anomalies in the electrical transport in ferromagnets, arising due to the electron besides charge has a spin. In 1921, the Stern - Gerlach experiment confirmed the existence of the spin in atoms and the fact of the spatial quantization of the directions of their magnetic moments. However, until recently electronics used in computers and household appliances, "exploited" only the electron charge.

The era of spin electronics started in 1988, when the giant magnetoresistance (GMR) in multilayer materials with alternating thin layers of ferromagnetic and non-magnetic metals was discovered. Individual layer thickness is only a few atoms. The resistance of these samples is large, if the magnetic field in the ferromagnets are oppositely directed, and it is a minimal when the magnetic fields are parallel.

Experimentally the giant magnetoresistance was discovered by two research groups led by Albert Fehr and Peter Grünberg independently from each other in 1988. For the discovery of the giant magnetoresistance effect Fehr and Grünberg were awarded the Nobel Prize in Physics in 2007.

The opinion that the basis of the effect is the so-called spin - dependent scattering of electrons in the superlattice (dependence of the layers resistance on the angle between the magnetization in them and the electron spin direction), was also expressed by the authors of the discovery. The theoretical description of the GMR for different methods of current flow was made over the recent few years.

One of the most close to the commercial potential of a giant magnetoresistance effect is the giant magnetocaloric effect (GMCE). Today, in the world about thirty prototypes of magnetic refrigerators for room temperatures are created. The devices created exhibit very high efficiency of magnetic cooling - up to 60% of the Carnot cycle. Since working body in magnetic refrigerators are solid magnetic materials, such refrigerators will be compact and environmentally friendly.

Thus, the investigations of the magnetoresistive properties of various materials are important and relevant to modern science and technology.

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### **Phasenübergang (Фазовый переход)**

Ein Phasenübergang ist in der Thermodynamik die Umwandlung einer oder mehrerer Phasen eines Stoffes in andere Phasen. Die grafische Darstellung der Stabilitätsbereiche der Phasen in Abhängigkeit von den Zustandsvariablen wie



Druck, Temperatur, chemischer Zusammensetzung und magnetischer Feldstärke liefern Phasendiagramme.

Phasenübergänge können zwischen festen, flüssigen oder gasförmigen Phasen auftreten. Die Phasenübergänge zwischen bestimmten Aggregatzuständen sind:

- Schmelzen (Übergang von fest zu flüssig)
- Verdampfen (Übergang von flüssig zu gasförmig)
- Sublimieren (Übergang von fest zu gasförmig)
- Erstarren, auch Gefrieren oder Kristallisieren (Übergang von flüssig zu fest)
- Kondensieren (Übergang von gasförmig zu flüssig)
- Resublimieren (Übergang von gasförmig zu fest)

Die Theorie kontinuierlicher Phasenübergänge geht von einem Ordnungsparameter aus, zum Beispiel der Magnetisierung bei der Umwandlung eines Ferromagneten in einen Paramagneten. Bei kontinuierlichen Phasenübergängen geht der Ordnungsparameter bei Annäherung an den Umwandlungspunkt kontinuierlich gegen Null (dagegen springt er an einem Phasenübergang erster Ordnung) und die Korrelationslänge divergiert (bei einer Umwandlung erster Ordnung bleibt sie endlich).

Man kann unterschiedliche Arten von kontinuierlichen Phasenübergängen in Universalitätsklassen zusammenfassen. Sie lassen sich durch einige wenige Parameter charakterisieren. In den letzten Jahrzehnten hat man den Zusammenhang zwischen grundlegenden Symmetrien der jeweiligen Phasen und den Werten dieser Parameter im Rahmen der Statistischen Physik ausführlich theoretisch untersucht und auch in einer Vielzahl von Experimenten sowie in Computersimulationen überprüft. Bei theoretischen Beschreibungen von Phasenübergängen wird mitunter die Landau-Theorie benutzt. Dabei werden jedoch kritische thermische Fluktuationen vernachlässigt, die in der Umgebung des Übergangs eine wesentliche Rolle spielen können.

Das Wissen über die physikochemischen Bedingungen, bei denen Phasenübergänge ablaufen, erlaubt Mineralogen Rückschlüsse über die Entstehungsgeschichte von Gesteinen. Wenn ein Gestein unter hohe Drücke und Temperaturen gerät, kommt es in vielen Fällen zu einer Phasenumwandlung. Wenn die anschließende Abkühlung so rasch erfolgt, dass die Umkehrreaktion nicht mehr stattfindet, werden die bei hohen Temperaturen und Drücken stabilen Minerale „eingefroren“ und bleiben so an der Erdoberfläche erhalten. Dieses Wissen hilft uns auch viele technische Prozesse zu verstehen.

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**The improvement of the design of contact device P-201**  
**(Совершенствование конструкции контактного аппарата P-201)**

The purpose of my project is to improve the design of the contact device P-201 of non concentrated nitric acid workshop. The improvement of the design is related to the installation of flange connection between the contact unit and the exhaust heat boiler for easy mounting and demounting.

There is a need for maintenance and diagnostics when operating the contact device P-201. To perform these works, the lower part of the contact device welded to the exhaust heat boiler is periodically demounted and after carrying out works it is mounted into place. The analysis of P-201 technical and maintenance specifications showed that periodic maintenance is carried out at least once in four years. When disassembling and assembling the contact apparatus it is necessary to carry out welding and hot works, non-destructive testing of welded joints and examination of industrial safety. To carry out the abovementioned works it is necessary to involve specialized repair and expert organizations. It leads to additional material costs and as a result the process becomes time-consuming and uneconomical for the owner of the equipment.

To achieve this goal the following tasks were set: to select and calculate the flange connection D<sub>y</sub>1200 for installation between the contact unit and the exhaust heat boiler, to develop a repair process of the contact apparatus, to perform mechanical calculation of flanged joints, to calculate joint weld, select a welding material, to describe methods of non-destructive testing of welded joints and to calculate test pressure for hydraulic tests on the strength and density of the contact unit.

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## **Rund um den Roboter**

### **(Вокруг робота)**

Die Robotertechnik oder Robotik gehört zu den modernen Technologiegebieten. Robotik ist eine prinzipiell neue Gestaltung des Produktionsprozesses unter Ausnutzung von Robotern, Robotersystemen und Komplexen. Das Wort "Roboter" kommt aus dem Tschechischen. Es wurde vom Dramatiker Karel Capek erfunden und eingeführt. In seinem Stück beschreibt K. Capek die fiktive Firma "Rossums Universal Robots" ("RUR") zur Herstellung von Maschinenmenschen, welche er Roboter nennt. Im Tschechischen bedeutet das Wort "robota" "schwerste Arbeit" oder "Zwangarbeit". Die ersten technologischen Hilfsmaschinen und- apparate waren in ihrer Gestalt wirklich einem Menschen ähnlich. Das waren die Roboter der 1. Ceneration; ohne Sensoren und wenig flexibel. Die wichtigste Anforderung an Prozesseinrichtungen ist die Erleichterung der menschlichen Arbeit. Intensive

Verbreitung solcher technologischen Hilfsmittel beginnt mit der Einführung der NC-Technik. Industrieroboter der 2. Generation (etwa 1975-1980) wurden zum wichtigen Rationalisierungs- und Automatisierungsmittel. Diese Rolle spielen sie auch heutzutage. Roboter haben heute viele "Berufe". Man bringt oft Industrieroboter (IR) mit flexibler Fertigung in Verbindung. Traditionsgemäß werden IR am meisten in der Auto- und Metallindustrie eingesetzt. Heute arbeiten in Deutschland schon mehr als 30% aller Roboter in der Fahrzeugindustrie. Industrieroboter unterscheiden sich von einfachen Werkstuckeinlegegeräten. Sie sind in mehreren Bewegungsachsen frei programmierbar, ausgerüstet mit Greifen oder Werkzeugen. Zu den Grundelementen eines IR kann man Plattform (Fuß), Körper, mechanischen Arm und Manipulator als Arbeitsorgan zählen. IR sind automatische Handhabungseinrichtungen mit mehreren Freiheitsgraden, für den industriellen Einsatz konzipiert. Ablauffolge und Richtung der Bewegungsachsen sind ohne mechanischen Eingriff veränderbar. Alle Prozessaufgaben werden vollautomatisch ausgeführt. Bei einfachen Manipulatoren können vorgegebene Bewegungsabläufe nicht verändert werden. Solche Manipulatoren werden nur von Menschen ferngesteuert. Nach ISO, Internationale Organisation für Standardisierung, soll ein. IR aus Mechanik (Manipulator) und Steuerung bestehen. Ein internationaler Vergleich vom Robotereinsatz zeigt, dass. die Bundesrepublik mit 22400 Robotern in Europa an der Spitze steht, gefolgt von Italien, Frankreich, Großbritannien und Schweden. In Europa "arbeiten" 67000 IR. in den USA sind 42000 davon im Einsatz. Weltweit führt Japan mit rund 180000 Robotern. Der größte deutsche IR-Hersteller KUKA Schweißanlagen +Roboter GmbH gehört zur Industriewerke Karlsruhe Augsburg Aktiengesellschaft (IWKA) mit Sitz in Karlsruhe. Mit ihren Tochtergesellschaften in Europa und Übersee bildet KUKA innerhalb dieses Konzerns eine leistungsfähige Gruppe mit über 2000 Mitarbeitern. In Augsburg hat KUKA eine auf Roboter spezialisierte Serienproduktion errichtet. Die Firma produziert 1000 Roboter pro Jahr. Man baut sie für die verschiedensten Anwendungen mit Traglastgrenzen von 8 bis 240 kg. Außerdem stellt das Unternehmen Steuerungen und Zubehör für IR her. Der Industrieroboter ist kein billiges Arbeitsmittel: es kostet zwischen 50000 und 400000 Mark, je nach Größe und Traglast. Dem Aufbau nach unterscheidet man in der 3. IR-Generation Standroboter und. Portalroboter. Jeder IR verfügt über Haupt- oder Grundachsen und Nebenoder Handachsen. Die letzteren sind in der Roboterhand veint. Von ihnen wird das Werkzeug gedreht, geneigt oder geschwenkt. Die IR-Achsen bewegen sich translatorisch (geradlinig) oder drehend (rotatorisch). Beide Bewegungen werden je nach Anwendung kombiniert. Die meisten Roboterkonstruktionen bevorzugen rotatorische Grundachsen. Ihr einiger Nachteil besteht in einer erhöhten Anforderung an die Steuerungstechnik. Für den IR-Antrieb werden pneumatische, hydraulische und elektrische Systeme eingesetzt. Für die richtige Funktion eines Roboters ist seine Steuerung mit vielen Sensoren (Gebern) von großer Bedeutung. Heute übernehmen die IR der 3. Generation verschiedene Arbeiten. Es hat mit dem Punktschweißen begonnen, dann kamen das Bahn- und Schutzgasschweißen dazu. Auch schneiden, kleben, dichten und beschichten können moderne IR. Zahlreiche Bearbeitungsvorgänge laufen nicht flexibel oder rationell

genug ab; andere gefährden den Menschen und gelten als inhuman. Auch in solchen Fällen kommen IR zu Hilfe: sie be- und entladen, palettieren und entpalettieren mit hoher Positioniergenauigkeit. Sie werden in Gießereien und Schmieden beim Gussputzen und Entgräten angewandt. Aber ein besonders großes Rationalisierungspotential haben IR bei der Montage. Als Montageroboter werden sie im Bereich der Elektroindustrie/ Elektronik zum Bestücken von Leiterplatten, zum Zusammenbau von Steckern, Tastern und kleinen Baugruppen eingesetzt. Immer mehr kommen mobile "intelligente" Roboter zur Anwendung. In der Zukunft erwartet man Roboter auch in anderen Bereichen, z.B. kunststoffverarbeitende Industrie, Keramik- und Glasindustrie, holzbe- und verarbeitende Industrie usw. Auch im Dienstleistungssektor möchte man verstärkt IR-Hilfe ausnutzen. In vielen Fällen konkurrieren "intelligente" Maschinen nicht mit dem Menschen, sondern mit einer nicht mehr wirtschaftlichen, unrationellen Technologie. Einige Forscher glauben an den ständigen Robotereinsatz in Kernkraftwerken, beim Aufbau von Raumstationen, in Medizin oder Katastrophenschutz. Manches davon ist vorstellbar, wird schon verwirklicht oder konnte realisiert werden. Anderes wird vielleicht für immer Utopie bleiben. Folgende Grundkriterien sind für die Entwicklung und Konstruktion von IR wichtig: Wartungsfreiheit und eine Lebensdauer von 10 bis 15 Jahren, Präzision, Traglast, Betriebssicherheit, Beweglichkeit und Wiederholgenauigkeit, noch mehr Flexibilität.

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### **What is Nanotechnology? (Что такое Нанотехнология)**

Nanotechnology is the science and technology of small things in particular things that are less than 100nm in size. One nanometer is  $10^{-9}$  meters or about 3 atoms long. For comparison, a human hair is about 60-80,000 nanometers wide.

Scientists have discovered that materials at small dimensions small particles, thin films, etc- can have significantly different properties than the same materials at larger scale. There are thus endless possibilities for improved devices, structures, and materials if we can understand these differences, and learn how to control the assembly of small structures.

There are many different views of precisely what is included in nanotechnology. In general, however, most agree that three things are important:

1. Small size, measured in 100s of nanometers or less
2. Unique properties because of the small size
3. Control the structure and composition on the nm scale in order to control the properties.

Nanostructures – objects with nanometer scale features – are not new nor were they first created by man. There are many examples of nanostructures in nature in the way that plants and animals have evolved. Similarly there are many natural nanoscale materials: catalysts, porous materials, certain minerals, soot particles, etc that have unique properties particularly because of the nanoscale features. What is new about nanotechnology is that we can now, at least partially, understand and control these structures and properties to make new functional materials and devices. We have entered the era of engineered nanomaterials and devices.

One area of nanotechnology has been evolving for the last 40 years and is the source of the great microelectronics revolution- the techniques of micro- and nanolithography and etching. This is sometimes call top-down nanotechnology. Here, small features are made by starting with larger materials and patterning and carving down to make nanoscale structure in precise patterns. Complex structures including microprocessors containing 100s of millions of precisely positioned nanostructures can be fabricated. Of all forms of nanotechnology, this is the most well established. In recent years, the same top down nanoprocessing techniques have enabled many non-electronic applications, including micromechanical, microptical, and microfluidic devices.

The other fundamentally different area of nanotechnology results from starting at the atomic scale and building up materials and structures, atom by atom. It is essentially molecular engineering - often called molecular or chemical nanotechnology. Here we are using the forces of nature to assemble nanostructures the term self assembly is often used. Here, the forces of chemistry are in control and we have, at least to date, somewhat less flexibility in making arbitrary structures. The nanomaterials created this way, however, have resulted in a number of consumer products. Significant advances are expected in the next decade in this area as we understand more completely the area of chemical nanotechnology.

And there are many exciting applications that combine both bottom up and top down processing- to create for example single molecule transistors that have large (macroscopic) leads fabricated by top-down and single molecule assembled from bottom up.

These materials have unique properties because of their small size. At the nanoscale, properties of materials behave differently and are said to behave under atomic and molecular rules. Researchers are using these unique properties of materials at this small scale to create new and exciting tools and products in all areas of science and engineering.

Nanotechnology combines solid state physics, chemistry, electrical engineering, chemical engineering, biochemistry and biophysics, and materials science. It is a highly interdisciplinary area meaning that it involves ideas integrated from many traditional discipline. Some universities have begun to issue degrees in nanotechnology; others view it as a portion of existing academic areas. Either way many trained scientists, engineers, and technicians in these areas will be required in the next 30 years.

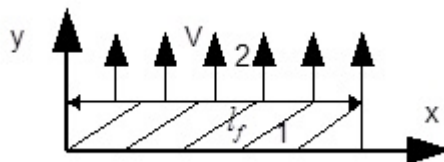
Many are predicting that nanotechnology is the next technical revolution and products resulting from it will affect all areas of our economy and lifestyle. It is estimated that by 2015 this exciting field will need 7 million workers worldwide. The workforce will come from all areas of science and engineering and will include those with two-year technical degrees up to PhD researchers in universities and industry.

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### **The simulation of the temperature field around the hydraulic fracturing crack (Моделирование температурного поля пласта вокруг трещины гидроразрыва)**

With every passing year the interest to methods of enhanced oil recovery increases. The investigations geared towards searching scientifically grounded access to choose more effective reservoir and production engineering are being developed. The thermal method is the one used to enhance oil recovery. The productivity of the oil formation increases with the temperature rise. Thermal oil recovery methods are applied generally in recovery of the highly viscous oils and bitumen. If warmed, oil gets thin, that leads to the decrease of oil viscosity and increase of mobility.

The given problem concerns porous reservoir with the hydraulic fracture crack of  $l_f$  meters long,  $k_f > k$  permeability where  $k$  is the permeability of the porous reservoir. The heat-transfer medium (for example, hot water) has a greater temperature than the temperature of the reservoir in the fracture. The fluid from fracture strains to the porous structure due to the pressure difference. It is necessary to find the distribution of the temperature in the porous reservoir (Picture 1).



Picture 1. 1 – Fracture, 2 - The porous reservoir

The distribution of the temperature in the porous reservoir (2) is expressed by the equation:

$$\rho \cdot c \frac{\partial T}{\partial t} = \lambda \frac{\partial^2 T}{\partial y^2} - (\rho \cdot c)_f v \frac{\partial T}{\partial y}, y > 0,$$

$$T(y = 0, t) = T_c.$$

where  $\rho c, (\rho c)_f$  are respectively volume heat capacities of the porous reservoir and fluid,  $\lambda$  is the thermal conductivity of the reservoir. The filtration rate of the fluid  $v$  in the reservoir is defined from the solution of the relevant hydrodynamic problem and in the initial approximation it can be taken as constant:  $v = v_0 = \text{const}$ .

The resultant expression for temperature is:

$$T(y,t) = T_0 + \frac{T_c - T_0}{2} \left( e^{\frac{\beta y}{a}} \operatorname{erfc}\left(\frac{y + \beta \sqrt{at}}{2\sqrt{at}}\right) + \operatorname{erfc}\left(\frac{y - \beta \sqrt{at}}{2\sqrt{at}}\right) \right), \quad a = \frac{\lambda}{\rho \cdot c}; \beta = v \frac{(\rho \cdot c)_f}{\rho \cdot c}$$

This expression allows to find the temperature of the reservoir depending on time and to define sizes of the heat zone up to the required temperature.

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### **Numerical simulation of viscous incompressible fluid in a channel with deposition**

The oil industry is one of the most advanced areas of industry that uses the latest developments and achievements. But despite this, in the complex processes of production, transportation and storage of oil we can observe the processes, the results of which can have both positive and negative effects. In particular, one of these processes is the formation of deposits, which not only changes the fluid flow, but makes detrimental effect on the structure in which the process of fluid flow occurs. One effective way to study it is numerical modeling.

The purpose of this work is to numerically calculate and plot the velocity and pressure fields in two dimensional channel in laminar flow of a viscous incompressible fluid for different flow regimes, fluid properties and geometric dimensions of obstacles, as well as to determine the influence of geometry constraints on the flow characteristics. To achieve this goal the Navier-Stokes, continuity and energy equations in the two-dimensional case were solved numerically using the volume method.

$$\left\{ \begin{array}{l} \frac{\partial \vec{V}}{\partial t} + (\vec{V} \cdot \nabla) \vec{V} = -\nabla P + \frac{\nu}{Re} \Delta \vec{V} \\ \nabla \vec{V} = 0 \\ \frac{\partial T}{\partial t} + \nabla(\vec{V} \cdot T) = \frac{1}{Pr \cdot Re} \Delta T \end{array} \right. \quad \text{Boundary condition: } \left\{ \begin{array}{l} P(0, y, t) = 1 \\ P(1, y, t) = 0 \\ \vec{V}(x, 0, t) = \vec{V}(x, 1, t) = 0 \\ T(0, y, t) = 0 \\ T(x, 0, t) = T(x, 1, t) = 1 \end{array} \right.$$

where Re - Reynolds number,  $\nu$ - dimensionless viscosity , Pr - Prandtl number.

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### **Problems of analog information transmission through optical fiber communication lines (OFCL) (Проблемы передачи аналоговой информации по волоконно-оптическим линиям связи (ВОЛС))**

Many of the problems associated with the design of optical fiber communication systems occur as a result of the unique properties of the glass fiber as a transmission medium.

There are limitations, however, inherent to analog optical fiber transmission. For instance, the unique requirements of analog transmission over digital are for high signal to noise ratios at the receiver output which requires high optical input power, and high end to end linearity to avoid distortion and prevent crosstalk between different channels of a multiplexed signal.

Analog fiber optic transmission systems are sold in both AM (amplitude modulation) and FM (frequency modulation) versions. In both types of systems, the optical transmitter takes in an analog, baseband video, audio or data signal and converts it to an optical signal.

In an AM system, the optical signal is generated as a beam of light that varies in intensity with respect to variations in the original, incoming, electrical analog signal. Either a light emitting diode (LED) or a laser diode serves as the source of the optical signal. Unfortunately, both LEDs and laser diodes are nonlinear devices. This means



that it is difficult to control the brightness of their light in a controlled linear continuum, from completely off to completely on with all variations in between.

In an effort to improve upon the performance of AM-based fiber optic transmission systems, FM design techniques were introduced. In these systems, the signal is conveyed by pulsing the LED or laser diode completely on and off, with the speed and duration of pulsing varying with respect to the original incoming signal.

While FM transmission systems eliminate many of the problems found in AM systems, which result from difficulties in controlling the varying brightness level of light emanating from the diode, FM systems offer their own unique set of problems. One distortion common in FM systems is called crosstalk. This occurs when multiple FM carriers are transmitted over a single optical fiber, such as when using a multiplexer. Another type of distortion is called intermodulation. Like crosstalk, this problem occurs in systems designed to transmit multiple signals over a single fiber.

In certain areas of the telecommunication network or for particular applications, information transfer in analog form is still likely to remain for some time to come, or be advantageous. Therefore, analog optical fiber transmission will undoubtedly have a part to play in future communication networks, especially in situations where the optical fiber link is part of a larger analog network (e.g. microwave relay network). Use of analog transmission in these areas avoids the cost and complexity of digital terminal equipment, as well as degradation due to quantization noise.

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### **The problem of the application of hydraulic fracturing in Russia (Проблема использования ГРП в России)**

The essence of the method of hydraulic fracturing is introduced into the bottom zone of the liquid under high pressure, resulting in the rupture of the rock and the formation of new or expansion of the existing cracks. To maintain the open state of cracks in the fixative agent - proppant - is pumped. The Soviet Union began to use hydraulic fracturing method since 1952. The peak of application of this method was achieved in 1959, after which the number of operations decreased and then stopped. From the early 1970s until the late 1980s fracturing in domestic oil production on an industrial scale had not been carried out. The revival of the hydraulic fracturing practice in Russia began only in the late 1980s. In Russia, the hydraulic fracturing technology is mainly applied in the oil fields of Western Siberia [1]. Private oil companies "Yukos" and "Sibneft" used the hydraulic fracturing method in their fields. A number of journalists and experts then claimed that this method of oil production was barbaric and led to the plundering of fields. Similar critical statements were made by the president of "Rosneft" Sergey Bogdanchikov [2]. At the same time, "Rosneft" has commonly used the method of hydraulic fracturing, and according to

the data of the 2009-2010, "Rosneft" remains among biggest customers of the Schlumberger oilfield services company specializing on carrying out hydraulic fracturings. At the beginning of November, 2006 on the Ob oilfield operated by LLC "RN-Yuganskneftegaz" (a subsidiary of the state company "Rosneft", gained control of the main asset of "Yukos" - "Yuganskneftegaz"), with the participation of experts of the company Newco Well Service, the hydraulic fracturing of oil layer, largest in Russia, was made. 864 tons of proppant (proppant) were pumped in the reservoir. The operation had been carried out for seven hours and was broadcast on the air at office of "Yuganskneftegaz" [3]. Currently, Rosneft makes more than 2 thousand fracturing operations per year, the vast majority of new wells put into operation with hydraulic fracturing [4].

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### **Black holes (Черные дыры)**

Black holes are some of the most mysterious and delightful objects in the whole universe. They are objects of great density, with such strong gravitational attraction that objects at the speed of light and even light cannot escape from their grasp if they come near enough.

The Theory of Relativity is the first key to understand the black hole phenomena. It claims that gravity affects time. The more massive object in space, the more it slows down time. But the gravity of black hole is so huge that it stops the time. If you, by accident, become a witness of the situation when a spaceship falls in it, you will see that the spaceship becomes bigger and bigger and slower and then, finally, disappears.

Black holes are actually formed from super massive stars, the weight of which is at least ten times more than our Sun. In the process of evolution of a star there is a gradual burning of hydrogen, respectively, the quantity decreases which leads to the fact that the force of light pressure begins to exceed the force of gravitational compression. The star becomes bigger and bigger, turns into red giant which, subsequently, explodes. After the explosion starts compression and then a star cools down and it's not visible. But in rare situations, when the weight of the residue of red giant excels the solar mass in 2-2.5 times, compression couldn't stop, because of the

fact that gravity force completely suppresses resist compression, as a result this residue is compressed into a tight tiny body. And at this moment of gravitation collapse, black holes form.

Obviously, many people are concerned with the questions like “How dangerous are the black holes?” and “Do they threaten our planet?” And the answer is: no, they don’t. The nearest black hole, which can theoretically destroy us, is about 1600 light years away. Fortunately, we are far enough from this monster.

As a matter of fact, there are 3 types of black holes. The first type is the smallest black holes, their sizes range from a single atom to a mountain. Stellar black holes, the most common type, are bigger than our sun in 20 times. And, finally, supermassive black holes – they are located in the centers of galaxies. They are bigger than our sun in million times. But, unfortunately, we still don’t know their certain origin.

It is believed that nothing can escape from a black hole. The only exception to this rule is radiation. According to some scientists, as the black holes emit radiation, they lose mass. As a result of this process the black hole can disappear.

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### **Lab-on-a-chip: pros and cons** **(Лаборатория на чипе: преимущества и недостатки)**

The ability to perform multiple laboratory operations on a small scale using miniaturized devices is very appealing. Lab-on-a-chip devices, more formally known as "Micro Total Analysis Systems" ( $\mu$ TAS) are micro fluidics-based systems which integrate multiple laboratory-type capabilities on a single chip only a few centimetres in size. LOCs deal with the handling of extremely small fluid volumes down to less than Pico liters. Lab-on-a-chip devices are subsets of Microelectromechanical systems devices and often indicated by “Micro Total Analysis Systems” ( $\mu$ TAS). ‘Microfluids’ is a term that describes also mechanical flow control devices like pumps and valves or sensors like flowmeters and viscometers. However, strictly regarded “Lab-on-a-chip” indicated generally the scaling of single or multiple lab processes down to chip-format, whereas “ $\mu$ TAS” is dedicated to the integration of the total sequence of lab processes to perform chemical analysis. The term “Lab-on-a-chip” was introduced later on when it turned out that  $\mu$ TAS technologies were more widely applicable than only for analysis purposes.

LOCs may provide advantages, very specifically for their applications. The typical advantages are: low fluid volumes consumption, because of the low internal chip volumes; higher analysis and control speed of the chip and better efficiency due to short mixing times (short diffusion distances), fast heating (short distances, high wall surface to fluid volume ratios, small heat capacities); better process control

because of a faster response of the system (e.g. thermal control for exothermic chemical reactions); compactness of the systems due to large integration of functionality and small volumes; massive parallelization due to compactness, which allows high-throughput analysis; lower fabrication costs allowing cost-effective disposable chips, fabricated in mass production; safer platform for chemical, radioactive or biological studies because of large integration of functionality and low stored fluid volumes and energies.

The disadvantages of LOCs are the following: LOC are not fully developed yet; physical effects like capillary forces and chemical effects of channel surfaces become more dominant and make LOC systems behave differently and sometimes more complex than conventional lab equipment; detection principles may not always scale down in a positive way, leading to low signal to noise ratios

LOCS provide the following opportunities: real-time PCR (detect bacteria, viruses and cancers); immunoassay (detect bacteria, viruses and cancers based on antigen-antibody reactions); blood sample preparation ; can crack cells to extract DNA; cellular lab-on-a-chip for single-cell analysis; ion channel screening.

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### **Erdgasspeicher – Energiespeicher der Zukunft**

#### **(Коллекторы природного газа – коллекторы энергии будущего)**

Unter den fossilen Brennstoffen ist Erdgas der mit Abstand sauberste. Erdgas ist einer der umweltfreundlichsten und zukunftsträchtigsten Energieträger, bestens speicherbar und in Kombination mit Gaskraftwerken der ideale Ausgleich für die stark schwankenden Leistungen von Wind- und Solarstromanlagen. Die weltweiten Erdgasreserven sind enorm, die größten liegen in Russland. Erdgas ist nach Erdöl und Kohle der drittgrößte Energielieferant. Die Bedeutung von Erdgas wird weiter zunehmen.

Erdgas wird kontinuierlich in etwa gleich großen Mengen gefördert und über sehr große Entfernungen angeliefert. Der Verbrauch ist aber je nach Jahres- und Tageszeit unterschiedlich. Um sowohl die saisonalen Verbrauchsschwankungen als auch Tagesspitzen auszugleichen, muss Erdgas zwischengespeichert werden. Eine der größten Herausforderungen für die Zukunft ist die Speicherbarkeit von Energie.

Die Untertagespeicherungsindustrie hat schon eine fast hundertjährige Geschichte. Die UGS (Untertage-Gasspeicher) tragen zur sicheren Gasversorgung der Abnehmer bei. Die UGS sind in Russland bei seinen Klimaverhältnissen und der Entfernung der Ressourcenquellen von den Endabnehmern besonders wichtig.

Gas nimmt ein viel größeres Volumen als feste Stoffe und Flüssigkeiten ein. Es wäre schwierig, hermetische Behälter für Gas zu finden, wenn sie nicht bereits die Natur gebaut hätte. Bei der Kavernenspeicherung werden riesige Hohlräume in

geeigneten Salzformationen durch Aussolung hergestellt. Die Salzhöhlen weisen als Behälter die optimale Dichtigkeit auf. Es ist nicht schwierig, einen Salzhöhlen-UGS zu bauen, obwohl dies ein langer Prozess ist. Die Salzkuppel ist nicht nur gasundurchlässig – Salz ist in der Lage, Risse und Brüche selbständig zu „heilen“. Derzeit werden in Russland zwei Speicher an Salzsteinablagerungen gebaut –in der Nähe von Kaliningrad und Wolgograd.

Bei der Porenspeicherung werden die nur wenige Mikrometer großen Porenräume von Sedimentgesteinen genutzt. Meist werden ehemalige Erdgaslagerstätten zur Zwischenspeicherung genutzt. Porige Sandsteinbänke in der Erdkruste, die von oben mit einer Kuppel aus Tonschicht hermetisch abgeschlossen sind, bilden natürliche UGS. Die weltweit größte Speicheranlage ist der Severo-Stavropolskoye UGS mit einem Volumen von 43 Mrd. Kubikmeter aktiven Gases.

Gas kann auch in flüssiger Form gespeichert werden. Das ist die teuerste Speicherungsart, wird aber angewandt, wenn es unmöglich ist, Speicher anderer Art in der Nähe von Großabnehmern zu errichten. Derzeit überprüfen die Fachleute von Gazprom die Möglichkeit, einen solchen Speicher im Gebiet von S.-Petersburg zu errichten.

Es gibt auch Beispiele für eine erfolgreiche internationale Zusammenarbeit auf dem Gebiet der Erdgasspeicherung. Haidach (der größte Erdgasspeicher Österreichs und der zweitgrößte Mitteleuropas) ist ein Gemeinschaftsprojekt dreier Erdgasspezialisten mit langjähriger Erfahrung: RAG (Rohöl-Aufsuchungs AG), Wingas (Wingas GmbH) und Gazprom. Die drei investierten insgesamt 300 Millionen Euro und leisten damit einen wesentlichen Beitrag, um die Versorgung mit umweltfreundlichem Erdgas für Österreich und Europa sicherzustellen.

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## **ФИЛОЛОГИЧЕСКИЕ НАУКИ**

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### **Neologismen im gegenwärtigen Deutsch (Неологизмы в современном немецком языке)**

Sprachliche Neubildungen im allgemeinen Sprachgebrauch sind Ergebnisse der rasanten wirtschaftlichen, politischen und sozialen Veränderungen der Gesellschaft. Neue Bedeutungen vorhandener Wörter sind auch Neologismen: **Outfit**, **Spam**.

Neologismen entstehen auch als Abkürzungen: **Hiwi** (Hilfswilliger); **funzen** - Wenn etwas *funktioniert*, dann *funzt* es; **dissen** - Neudeutsches Jugendverb, das als Abkürzung für *diskreditieren* dient: „Ich diss dich“.

Das im Wortschatz etablierte Verb **klicken** zeigt eine starke Wortbildungsproduktivität: **einklicken**, **hineinklicken**, **reinklicken**, **ver klicken**, **doppelklicken** (eine Lehnübersetzung aus Englisch *to double-click*). [3]

Es entstehen auch Phraseologismen: **und tschüs** – Etwas ist zu einem Abschluss gekommen (am Ende der Äußerung, emotionell); **den Ball flach halten** - sich zurückhalten; **im grünen Bereich** – alles ist in Ordnung/unter Kontrolle. [2]

Die jüngsten Neologismen sind Metapher: **Computerwitwe** - in den 1980er Jahren vom „Spiegel“ eingeführter Begriff für Frauen, die sich vom Ehemann aufgrund der ausgeprägten Computersucht verlassen fühlen; **Münzmallorca** - Neben dem „**Assi-Toaster**“ ein Begriff fürs Solarium; **Popcorn-Kino** - Seelenlose Filme für die breite Masse; **App-Zocke** - Betrug durch mobile Anwendungen; **Auszeit** - „Ich brauche eine Auszeit!“ – Ich brauche Pause; **Fabbing** - das Herstellen von dreidimensionalen Objekten mithilfe eines 3D-Druckers; **Phubbing** – Urbanismus, kunstvolles Kofferwort aus „Phone“ und „Snubbing“, das Verhalten, wenn sich eine Gruppe von Jugendlichen in einem Cafe versammelt, knacken alle den Wlan-Key, holen ihre Handys raus und beginnen statt miteinander mit anderen auf Facebook, Whatsapp oder Kik zu chatten; **Cybermobbing** - Spott und Hohn via Internet; **Dumbphone** - Einfache Handys, die nicht „smart“ sind; **Konsolero** - Jemand, der viel Zeit mit Videospielkonsolen verbringt; **Nikotinarium** - Lounge für Raucher. [1]

Die politischen ‚Produktionen‘ sind: **das Treffen der vier Länder im "Normandie-Format"**; **die Gipfelerklärung**; **Scheitern der Waffenruhe**. [4]

Wenn ein Begriff sich in der allgemeinen Sprachgemeinschaft etabliert, wird er im Wörterbuch aufgenommen, seither er existiert als Neologismus.

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### **Expressivity and Expressiveness in Language and Texts** **(Экспрессия и экспрессивность в языке и тексте)**

At the end of the XX century various data about expressivity were accumulated on the basis of different languages. It resulted in contradictory understanding of this phenomenon.

Traditionally, the problem of expressivity was studied by rhetorics, linguistics, stylistics. It should be noted that the basic knowledge of expressivity was found out while discussing other problems of the language theory. At the heart of all expressivity conceptions lies the so-called “affective” theory of stylistics, elaborated by Charles Bally in his book “French stylistics” in 1909. He described the possibility of twofold study of expressivity: 1) within linguistic approach to its realization in a text; 2) within text approach to emphasizing expressive means in contextual relations.

Charles Bally divided all language phenomena into facts with logical dominant and the ones with emotional dominant. He assumed the notion of emotional color of expressive factors as a basis of stylistics, which gives birth to the expressive system of language.

Emotional coloring is based on qualitative and quantitative differences. The notion of subjective evaluation is very important for qualitative variety, it is connected with such categories as size, value, force. And quantitative diversity is based on the notion of intension.

Charles Bally’s theory gave rise to many conflicting conceptions and views on expressivity. We should take into consideration the following. One of the main differences to the approach of expressivity is that some scientists connect expressivity only with expressiveness itself, while the others treat it as the means of intensifying expressiveness and picture.

Nevertheless, there is no sense in speaking about intensifying expressiveness and picturing, since expressivity can be only realized in a definite situation.

In fact, expressivity is intensification, emphasizing the content of a text with the aid of various linguistic means. At the same time expressivity is a dynamic characteristic of a text, as the text itself is dynamic. The situations presented in the text are expressed by linguistic means, but they are given through the prism of the author’s consciousness, his personality, which immediately interacts with the consciousness and personality of the recipient.

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### **Probabilistic Modeling in Linguistics** **(Вероятностное моделирование в лингвистике)**

Probabilistic modeling is one of the oldest and newest areas in linguistics and psycholinguistics at the same time. Much research in linguistics and psycholinguistics in the 1950s was statistical and probabilistic. Then the situation changed.

This omission is astonishing when we consider that the input to language comprehension is noisy, ambiguous. In order to deal with these problems, computational models of speech processing, by contrast, have had to rely on probabilistic models for over 30 years. Computational techniques for processing of text, an input medium which is much less noisy than speech, rely just as heavily on probability theory. More than 70% of the papers in the year 2000 annual conference of the Association for Computational Linguistics relied on probabilistic models of language processing or learning.

Recently, there is an emerging consensus that human cognition is in fact rational, and relies on probabilistic processing. Thus, such aspects of human language processing as language comprehension, production and learning are probabilistic by nature.

The aim of this paper is to investigate applicability of probability modeling to the study of literary text comprehension. Texts are characterized by two-side structure of the inner and outer form. Thus, the correct interpretation of language signs is not enough for adequate understanding of a text. Comprehension and interpretation of a text is a process of cognition and we must consider the probability of correct interpretation of not words, phrases and sentences, but of propositions as the elements of its semantic structure. So we consider the probabilistic approach to be promising for the text comprehension study.

The probability model applied to the study of literary text comprehension is the so-called competition model. The main task is to analyze titles of literary texts as compressed surface cues within the framework of the model and to compute their probability ratio and to estimate their role in understanding a literary text. We also carry on an experiment in order to estimate availability and reliability of titles as surface cues.

Literary texts are specific by their nature, so it is necessary give an overview of their structure and peculiar features as well as to review different approaches to the problems of literary text comprehension in linguistics, psycholinguistics and computational linguistics.



## **The main stages of history of translation and translation studies** **(Основные этапы истории перевода и науки о переводе)**

The first ones who tried to distinguish the stages of development of the translation were Huet ("On the best way of translating", 1661) and S. Johnson ("The Idler", 1759). They considered different approaches to the translation and achievements of the translators, starting from antiquity and up to the 18<sup>th</sup> century. But the classification acquired the scientific basis only in the second half of the 20<sup>th</sup> century.

While working out the classifications, the 2 main approaches are used: historical/ historical-literary and conceptual.

### **I. Historical/ historical-literary approach**

#### **1. *The stages of social-historical chronology of the world (Kopanev, 1972)***

1 - The Ancient period – the period of slavery and feudalism; 2 - The Middle – from the primitive accumulation of the capital up to scientific-technical revolution (17-18 centuries); 3 – The New – the conquest of the political domination by bourgeoisie; 4 - The Newest – after the October Revolution (the beginning of 20<sup>th</sup> century).

#### **2. *The periods of cultural-historical development of the civilization (Ballard, 1992)***

1 – Antiquity; 2 – Middle Ages; 3 – Renaissance; 4 – 18<sup>th</sup> century; 5 – 19<sup>th</sup> century; 6 – 20<sup>th</sup> century.

#### **3. *The history of the belles-lettres development, taking into account the chronological principle (Bassnett, 2002)***

1 – Rome; 2 – The translation of the Bible; 3 – The first theorists; 4 – The Renaissance; 5 – 17<sup>th</sup> century; 6 – 18<sup>th</sup> century; 7 – Romanticism; 8 – Post-romanticism; 9 – Victorian Era; 10 – Archaization; 11 – 20<sup>th</sup> century.

These classifications include pre-scientific period of translation studies in general, and not only the translation theory.

### **II. Conceptual Approach**

#### **1. *This approach comes from the change of the theoretical concepts, suggesting qualitatively new understanding of the translation process, redefining the history of the relations between the source and target texts (George Steiner, 1975)***

1 – From 40-s BC (the statements of Horace and Cicero on translation) up to 18<sup>th</sup> century (the publication of Alexander Fr. Taytler's "Essay on the principles of translation) - empirical approach; 2 – From 18<sup>th</sup> century up to 1946 (The publication of the French scholar Larbaud's "Sous l'invocation de Saint Jerome") – hermeneutic

approach; 3 – 50-s – 60-s of the 20<sup>th</sup> century (The publication of the first papers on machine translation) – structural approach; 4 – Early 1960 – beginning of the 21 century – reversion to hermeneutics.

We should take into account that every classification is based on the subjective ideas of different scholars, so each classification has its pros and cons.

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### **Formale Kennzeichen von Eigennamen** **(Формальная характеристика имен собственных)**

Eigennamen sind formal eine Besonderheit im Sprachsystem: das betrifft ihre grammatischen, phonetischen und graphischen Charakteristika. In grammatischer, d.h. morphosyntaktischer, Hinsicht unterliegen Eigennamen wesentlich strengeren Beschränkungen als Elemente des allgemeinen Wortschatzes. Was den Numerus betrifft, so treten Eigennamen im Allgemeinen im Singular auf: sie dienen ja dazu, ein Referenzobjekt zu identifizieren; kommt dennoch eine Pluralform vor (gebildet dann mit dem Pluralmorphem –s), so herrschen immer besondere Kontextbedingungen: meist wird dann eine Mehrzahl individualisierter Referenzobjekte, die den gleichen Namen tragen, gemeinsam bezeichnet (z.B. eine Familie bei den Personennamen: die Mann's oder beide Deutschlands usw.); daneben existieren Namen, die von vornherein eine Bündelung mehrerer Einheiten bezeichnen wie die Alpen, die Niederlande oder die Vereinigten Staaten, diese Namen sind dann nur im Plural, nicht jedoch im Singular zu verwenden.

Eigennamen unterliegen ebenso strengeren Regeln, was ihren Artikelgebrauch betrifft: im Allgemeinen werden sie – vor allem Orts- und Personennamen – ohne Artikel verwendet (z.B.: Sie liebt *Frankreich* / *Berlin* / *Hans Maier*.); unter bestimmten Bedingungen kann systematisch ein Artikel, dann aber der bestimmte Artikel, nötig sein, etwa bei Ländernamen (*die Schweiz*, *der Iran*), bei Fluss- und Bergnamen (*der Rhein*, *der Arber*), bei Straßen- und Plätzenamen (*die Mozartstraße*), bei Firmen / Institutionen / Organisationen, wenn der Name ein Appellativum enthält (*die Sozialdemokratische Partei Deutschlands* / *die SPD*). Spezifische Kontextbedingungen führen darüber hinaus zur Verwendung des bestimmten Artikels bei attribuierten Länder- und Ortsnamen (*das alte Berlin*) und bei Personennamen (*die Callas*, *der Tom*): hier lassen sich regionale Unterschiede feststellen (im süddeutschen Sprachgebrauch besteht eine Tendenz des (konnotationsfreien) Gebrauchs von Personennamen mit Artikeln; in anderen Regionen kann damit auf besonders bekannte Personen oder auch auf vertraute Personen verwiesen werden). Die Verwendung des unbestimmten Artikels bei Eigennamen ist selten und signalisiert ganz besondere Interpretationsbedingungen: so wird oft angenommen, dass es sich um einen Gebrauch als (abgeleitetes) Appellativ handelt, um

metaphorischen Gebrauch (z.B. *Sie ist eine Mata Hari*) und einige andere spezifische Verwendungen. Eigennamen können weiterhin die Form eines (vorangestellten) possessiven Genitivs einnehmen, was andere Substantive nicht können (z.B. *Evas Auto, Brandenburgs Seen*). Eigennamen weisen graphische Besonderheiten auf: einmal die durchgehende Großschreibung am Wortanfang (*Schwarzes Meer, Kap der Guten Hoffnung*); zum anderen die Tatsache, dass sich oft alte Schreibweisen gehalten haben (*Thalhammer, Soest, Goethe*) und zum dritten, dass es – gerade auch zur weiteren Differenzierung bei den funktional stark belasteten Personennamen – Mehrfachschreibungen gibt (*Schmidt/ Schmitt/Schmid* oder *Meier/Maier/Mayer/Meyer/Mair* ).

Eigennamen können phonetische Besonderheiten aufweisen, insofern sie Laute oder Lautkombinationen enthalten können, die im Kernwortschatz nicht vorkommen (z.B. *Wrba, Jacqueline*); dies gilt natürlich insbesondere bei der Übernahme von Namen aus anderen Sprachsystemen. In Eigennamen können schließlich auch alte Formen oder dialektale Formen erhalten bleiben (z.B. *Bruck* statt *Brücke*).

## ХИМИЧЕСКИЕ НАУКИ

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### Biomedical Uses of Chitosan

#### (Биомедицинское использование хитозана)

Chitosan is a linear polysaccharide composed of randomly distributed  $\beta$ -(1-4)-linked D-glucosamine (deacetylated unit) and N-acetyl-D-glucosamine (acetylated unit). It is made by treating shrimp and other crustacean shells with the alkali sodium hydroxide.

Chitosan has a number of commercial and possible biomedical uses. It can be used in agriculture as a seed treatment and biopesticide, helping plants to fight off fungal infections. In winemaking it can be used as a fining agent, also helping to prevent spoilage. In medicine, it may be useful in bandages to reduce bleeding and as an antibacterial agent; it can also be used to help deliver drugs through the skin.

The amino group in chitosan has a pKa value of  $\sim 6.5$ , which leads to a protonation in acidic to neutral solution with a charge density dependent on pH and the %DA-value. This makes chitosan water soluble and a bioadhesive which readily binds to negatively charged surfaces such as mucosal membranes. Chitosan enhances the transport of polar drugs across epithelial surfaces, and is biocompatible and biodegradable. It is not approved by FDA for drug delivery though. Purified quantities of chitosans are available for biomedical applications.

Chitosan's properties allow it to rapidly clot blood, and have recently gained

approval in the United States and Europe for use in bandages and other hemostatic agents. Chitosan hemostatic products have been shown in testing by the U.S. Marine Corps to quickly stop bleeding and to reduce blood loss, and result in 100% survival of otherwise lethal arterial wounds in swine. Chitosan hemostatic products reduce blood loss in comparison to gauze dressings and increase patient survival. Chitosan hemostatic products have been sold to the U.S. Army and are currently used by the UK military. Both the US and UK have already used the bandages on the battlefields of Iraq and Afghanistan. Chitosan is hypoallergenic and has natural antibacterial properties, which further support its use in field bandages.

Chitosan hemostatic agents are often chitosan salts made from mixing chitosan with an organic acid (such as succinic or lactic acid). The chitosan salts are biocompatible and biodegradable making them useful as absorbable haemostats. The protonated chitosan is broken down by lysozyme in the body to glucosamine and the conjugate base of the acid (such as lactate or succinate) are substances naturally found in the body. The chitosan salt may be placed on an absorbable backing. The absorbable backing may be synthetic (for instance made from existing absorbable suture materials e.g. Tephaflex polymer) or natural (e.g. cellulose or gelled/solidified honey).

Chitosan's properties also allow it to be used in transdermal drug delivery; it is mucoadhesive in nature, reactive (so it can be produced in many different forms), and most importantly, has a positive charge under acidic conditions. This positive charge comes from protonation of its free amino groups. Lack of a positive charge means chitosan is insoluble in neutral and basic environments. However, in acidic environments, protonation of the amino groups leads to an increase in solubility. The implications of this are very important to biomedical applications. This molecule will maintain its structure in a neutral environment, but will solubilize and degrade in an acidic environment. This means chitosan can be used to transport a drug to an acidic environment, where the chitosan packaging will then degrade, releasing the drug to the desired environment. One example of this drug delivery has been the transport of insulin.

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**Polymer gels for biomedical applications on the basis of water-ethanol solutions of chitosan succinimide (Полимерные гели биомедицинского назначения на основе водно-этанольных растворов сукцинамида хитозана)**

The problem of creating biocompatible polymer hydrogels with a predetermined set of properties on the basis of polymers of natural origin (e.g., chitin, chitosan

(CTZ) and its derivatives) characterized by biodegradability and lack of toxicity is currently very relevant. Such materials can be used as wound-healing coatings, polymeric forms of drugs with sustained yield of pharmacologically active substances etc.

The most common way to obtain gels on the basis of CTZ and its derivatives is cross-linking of the macromolecules with glutaraldehyde. However, the products of the reaction, of glutaraldehyde with the amino groups are CTZ Schiff bases which are sufficiently toxic. We have chosen the approach to create viscoelastic systems based on water-soluble derivative of CTZ - sodium salt of chitosan succinamide (SCTZ) - in the absence of crosslinking agents, with further forming the network of physical connections due to the change in the thermodynamic quality of the solvent, namely water (thermodynamically good solvent for SCTZ) is substituted by a mixture of water and ethanol, which is not solvent for SCTZ. The formation of the gel in the polymer solution may be judged from the geologic data, for example, by the appearance of yield point or elastic characteristics in the presence of the polymer solution. In this regard, the purpose of the work is to study the rheological properties of SCTZ solutions in water-ethanol mixtures.

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### **Cinétique chimique (Химическая кинетика)**

La cinétique chimique est une étude de la transformation d'espèces en d'autres espèces, ou la réaction chimique. Son but est de décrire l'évolution d'un système en prenant en compte la réactivité des espèces chimiques présentées.

On associe en général l'enseignement de la thermodynamique et de la cinétique, qui sont deux aspects différents mais complémentaires de la réaction chimique. Ce sont deux types de descriptions macroscopiques: on s'intéresse à l'évolution d'un grand nombre de molécules (l'unité de référence est la mole), à leur comportement collectif.

Le système cinétique est décrit par des équations différentielles représentant la variation du nombre de moles ou de la concentration au cours du temps. La thermodynamique permet de prévoir si une réaction chimique est possible ou non, la cinétique s'intéresse à la vitesse à laquelle cette réaction va avoir lieu.

Dans le cadre des hypothèses les concentrations de l'ensemble des espèces présentées définissent entièrement l'état du système réactionnel à l'instant  $t$ . Cet état est seul responsable de son évolution future. Cette simple application du principe de causalité, confirmée par l'expérience, se traduit par une particularité tout à fait générale des équations différentielles cinétiques. La réaction chimique détermine sa propre échelle de temps.

Il s'agit d'une caractéristique générale de ce que l'on appelle les systèmes dynamiques. Le système d'équations différentielles décrivant un tel système est appelé un flot autonome continu. Cette fonction sera précisée à partir des lois de vitesse des réactions élémentaires constitutives du mécanisme.

Nous nous sommes intéressés aux fondements des équations cinétiques, qui constituent un modèle permettant de simuler quantitativement le comportement au cours du temps d'un mécanisme réactionnel donné. Ce modèle comprend deux parties: la structure même des équations, traduisant directement le mécanisme, et l'ensemble des paramètres cinétiques qui interviennent dans la vitesse de chacune des réactions constitutives. Aux paramètres cinétiques, on doit le plus souvent adjoindre d'autres paramètres, qui interviennent dans les relations entre des grandeurs mesurées et des concentrations, par exemple les coefficients d'extinction molaire lorsque la réaction est suivie par spectroscopie d'absorption UV-Visible. L'intégration numérique de ces équations, avec certains jeux de paramètres nous a permis de dégager et de comprendre quelques comportements typiques de mécanismes courants et de constituer une sorte de boîte à outils 'conceptuelle.

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**Acid corrosion inhibitors based on nitrogen- and sulfur-containing heterocycles  
(Ингибиторы кислотной коррозии на основе азот- и серосодержащих  
гетероциклов)**

One of the most efficient and technologically simple ways to reduce losses of metal from corrosion is inhibitor protection. For corrosion protection of metal structure of oilfield equipment, inhibitors based on quaternary amine salt are one of the most appropriate methods of corrosion control. Moreover, very high barrier properties are characterized by nitrogen heterocycles and their complex compounds due to their effective adsorption capacity.

The aim of this study is to find effective inhibitors for inhibiting corrosion metal in acidic media on the basis of heterocyclic compounds containing N and S and able to form a protective film on metal surfaces as a result of adsorption and chemisorptions.

We suppose that thiazyl binuclear saturated heterocycles and their N-coordinated adducts with S atoms having a single electron pair and N-quaternary cations are very promising as inhibitors of acid corrosion of anionic and cationic types.

In synthesis we used a multicomponent thiomethylation reaction of amines with formaldehyde and hydrogen sulfide, which leads to the formation known as 1,3,5 -

ditiazinans. To build binuclear heterocycles into thiomethylation reaction 2-aminopyridine was involved.

Anticorrosive properties are studied according to the standard procedure by exposing the plate in a solution of 0.5 M HCl for 5 hours.

It is observed that, the degree of inhibition efficiency of binuclear heterocycles is 85,0- 98.0%.

Using atomic force microscopy it was found that the average surface roughness of fresh alloy and alloy in corrosive environments (0.5 MHCl) without an inhibitor were 26 and 256 nm respectively, and with inhibitors - binuclear heterocycles with concentration of 0.005 - M roughness average value according to the structure binuclear heterocycles does not exceed 30 nm.

Thus, we conclude that saturated N- and S- heterocycles of physical and chemical sorption of the protective layer are formed by reducing the roughness on the steel surface.

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### **Synthesis of ketosulfone on the basis of sulfide-alkaline solutions for purification of hydrocarbons (Синтез кетосульфидов на основе сульфидно-щелочных растворов очистки углеводородного сырья)**

By desulfurization of crude hydrocarbons (oil, natural gas liquids) are formed non-recyclable sulphide-alkaline solutions (SAS). Due to the toxicity to microorganisms SAS are not bioprocessed and pumped into deep layers (up to 2000 m<sup>3</sup>/day).

We have examined the regeneration capacity of spent caustic from gas-fractionation plant and both synthesis of valuable s-containing polyfunctional compounds to reduce the negative impact of waste on the environment and for rational use of the sulfur-containing components in natural hydrocarbons. To solve the set of tasks was used the reaction of alkylthiomethylation of ketones (ATK) [1]. The method is based on the involvement of sulfur-containing components SAS in alkylthiomethylation of ketones (ATK) and their extraction in the form of ketosulphides [2].

It is established that ATK of methyl ethyl ketone by formaldehyde, mercaptans and sodium sulfide SAS proceeds at 20°C for 1-5 hours. The optimal molar ratio of ketone: formaldehyde per 1 g-at mercaptans sulfur and sulfide is 0.5-1: 1 and 2: 2 respectively. At the specified flow rate conversion of sodium mercaptans reaches 94-97%, sodium sulfide - 100%.

The dependence of the conversion of sodium mercaptans from the conditions of alkylthiomethylation of butanone

| No. experiment | the Molar ratio of CH <sub>2</sub> O : ketone, 1 g-at, S <sub>mer</sub> | Temperature, °C | Conversion of sodium mercaptans, Rel.% |      |      |      |
|----------------|-------------------------------------------------------------------------|-----------------|----------------------------------------|------|------|------|
|                |                                                                         |                 | The reaction duration, h               |      |      |      |
|                |                                                                         |                 | 0.5                                    | 1    | 2    | 3    |
| 1*             | 1:0.5                                                                   | 20              | 48.0                                   | 61.5 | 73.5 | 84.6 |
| 2              | 1:0.5                                                                   | 50              | 68.0                                   | 72.5 | 80.2 | 93.6 |
| 3              | 1:1                                                                     | 20              | 57.0                                   | 73.0 | 85.5 | 96.5 |
| 4              | 1.7:1.7                                                                 | 20              | 95.6                                   | 97.6 | -    | -    |

\*- conversion of the sodium mercaptans after 5 is 94.2%.

Reduction of ketone from 1 to 0.5 mol leads to a decrease of the reaction rate. So, the conversion of sodium mercaptans after 0.5 h decreases to 1.2 times (exp. 1, 3). The maximum conversion of sodium mercaptans (94.2-96.2%) is maintained. To increase the speed of reaction is possible after increasing the flow rate of ketone and formaldehyde to 1.7 moles per 1 g-at mercaptans sulfur (exp. 3 and 4) or temperature from 20 to 50°C (exp. 1 and 2). Thus, by increasing temperature, the conversion of sodium mercaptans for 0.5 h increases in 1.4 times.

According to GLC the major ATK products of methyl ethyl ketone with equivalent content of formaldehyde, methyl and ethylmercaptan sodium SAS are 3-methyl-5-tuexen-2-one (1) and 3-methyl-5-tahatan-2-one (2) (yield 63% and 11%). By the interaction of methyl ethyl ketone with formaldehyde and sodium sulfide is formed 3,7-dimethyl-5-tiannan-2,8-dione (3) with 6% yield. Reduction of ketone leads to the preferred formation of butanones - 2-methyl-1,5-bis(methylthio)-4-[(methylthio)methyl]pentane-3-one (4) and 2-methyl-1,5-bis(ethylthio)-4-[(ethylthio)methyl]pentane-3-one (5) with 60 and 8%. The yield of 3,7-dimethyl-5-tiannan-2,8-dione (3) is increased to 12%.

Thus, sulfide and mercaptans of sodium presented in SAS with AGFA can be used as sulfur-containing reagents in the reaction of alkylthiomethylation of ketones. As a result a useful mixture of ketosulphides can be obtained, and researchers can separate individual compounds - synthons by organic synthesis of polyfunctional substances.

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**Sorption properties of films on the basis of chitosan**  
**(Сорбционные свойства пленок на основе хитозана)**

The number of studies concerned with the diffusion of electrolytes in polymers, including diffusion of water, is fairly large. The reason is that diffusion plays a primary role in such processes as dialysis, permeability of biomembranes and tissues, prognostication of the protective properties of polymeric coatings, etc. The studies of the diffusion of water into a polymer matrix are also necessary in the development of medicinal polymeric films with controllable release of a medicinal preparation. This is so because the necessary condition providing diffusion transport of a medicinal preparation from the polymer matrix is its swelling in water.

The purpose of this work is studying the regularities of the process of sorption of water by chitosan films with antibiotics of the amino glycoside series.

The main mechanisms by which the transport of water occurs in polymeric films are diffusion and relaxation processes in a swelling polymer. In this case, the film swelling kinetics is described by the equation:

$$m_t/m_\infty = kt^n,$$

where  $m_t$  и  $m_\infty$  is the relative amount of water at time  $t$  and in an equilibrium-swollen film sample,  $k$  is a constant related to the polymer–diffusant interaction parameters,  $n$  is the index characterizing the substance transfer mechanism.

The parameter  $n$  for a pure CTS film is 0.63 (i.e.,  $n > 0.5$ ), which is characteristic of polymers below the glass-transition temperature. If a chitosan film sample is subjected to a short isothermal annealing accompanied by relaxation of nonequilibrium chain conformations and reduction of the free volume,  $n$  decreases and becomes close to  $n = 0.5$ . This indicates that the transfer of water is limited by diffusion, which is described under the given conditions by the Fick's mechanism. If, however, the heating duration is raised to 60–120 min, the values of the parameter  $n$  become substantially smaller than 0.5, which is characteristic of the so-called “pseudo-Fick” diffusion. The “pseudo-Fick” nature of diffusion is also confirmed by the fact that the diffusion coefficients calculated from the initial and final portions of the curves do not coincide.

Thus, the study of the process of water sorption by medicated chitosan films revealed a correlation between the amount  $m_\infty$  of equilibrium sorption of water vapor, parameter  $n$  characterizing the mechanism of water transport into the polymeric film, and fraction  $\beta$  of the medicinal substance bound to a polymer chain.

It was found that the amount  $m_\infty$  of equilibrium sorption and the the parameter  $n$  regularly decrease with increasing the content of a medicinal substance in the film. An increase in the isothermal annealing duration is also accompanied by a regular decrease in the parameter  $n$ .

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**Technical note to regularity of oxidation  
of waste fibrous materials of polyethylene  
(Техническое примечание закономерности окисления  
отходов волокнистых материалов из полиэтилена)**

The purpose of chemical modification of polymers is to change chemical structure by introducing the functional groups with different chemical nature into the macromolecules. In some cases, it is necessary to improve the characteristics of a polymer surface by chemical modification while retaining the properties of materials in the volume and shape of the polymer material (fiber, film, bulk product). It is necessary, for example, when changing the wettability or sorption.

An effective method of modifying of the surface of polymeric material is oxidation. It is known that at temperatures below 90 °C the reaction takes place mainly on the surface and is not accompanied by oxidative degradation of the polymer in the bulk. Obvious, that it is impractical to create complex chemical surface modification technology simultaneously saving money on technical costs of creating the necessary forms of materials. Oxidation is also a convenient method of pre-activation of the polymer surface, which leads to the appearance of oxygen-containing functional groups capable of being active centers during the further chemical modification. For example, it is known that the polyolefins oxidation is accompanied by the formation of hydroperoxide (HP) groups. Further thermal decomposition of the HP - groups leads to the appearance of free radicals on the surface and initiate growth of the grafted chains.

Therefore, it seems reasonable to study the simple and technologically advanced methods of surface oxidation of the waste fibrous materials of polypropylene (PP) as a method of creating of the secondary polymeric materials.

Thus, comparing the results of oxidative surface modification of waste fibrous materials of PP, we can see that the obtained modified samples have a better adhesion and absorption properties than unmodified ones. We can suggest that there is possibility of their usage as multifunctional additives in various composite materials.

**The structure of amino acid complexes Ni (II)**  
**(Структура аминокислотных комплексов Ni (II))**

Nickel is a trace mineral that is essential for normal development of living organisms. The phenomena of nickel deficit were not observed, so it belongs to the conditionally essential trace elements.

The human body contains approximately 10 mg of this element. The highest concentrations of nickel are found in liver, lung, pancreas, pituitary and kidneys. The role of nickel in the human body is not completely investigated, but it is known that nickel in combination with cobalt, iron and copper affects hematopoiesis, enhances hypoglycemic activity (efficiency of insulin), participates in the organization of the structure and the operation of the major components of the RNA and DNA cells, protein, etc.

The literature contains information about the study of amino acid chelate complexes of Ni(II) in solutions [1,2], but the study of their stereoisomeric structure in the crystalline state is the object of active research. In our work we used amino acids as they have donor carboxyl and amino groups are the most effective chelating ligands for metals. In order to determine the stereo isomer of amino acid complexes of Ni(II), formed on the basis of methods described in the literature [3], complexes with glycine (gly), *DL*-valine (*DL*-val), *L*-alanine (*L*-ala) were synthesized.

As a result, the crystalline complexes Ni(gly)<sub>2</sub> (**1**), Ni(*DL*-val)<sub>2</sub> (**2**), Ni(*L*-ala)<sub>2</sub> (**3**) were obtained with a yield of 45-65%. Complexes **1-3** were identified by infrared spectroscopy (FT-IR spectrometer FTIR-8400S, Shimadzu). It was established that for identification of the most informative bands of absorption of the functional groups of amino acid complexes of Ni(II), IR spectra for **1-3** lie in the range 3300 cm<sup>-1</sup> (stretching vibrations  $\nu_{as}$  (NH<sub>2</sub>-) and  $\nu_s$  (NH<sub>2</sub>-)), and in 1580 cm<sup>-1</sup>  $\nu_{as}$  (COO-) and 1420 cm<sup>-1</sup> for  $\nu_s$  (COO-).

It was found that the complexes **1-3** are mixtures of stereoisomers in different ratios. Thus, in one complex mixture of geometric isomers was found in the ratio of 1: 1, and in the complexes **2,3** mainly *trans*-isomers were observed.

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### **Basics of Chromatography (Основы хроматографии)**

In chromatography, one phase is held immobile or stationary, and the other one is passed over it (the mobile phase). The designations GC and LC refer to the physical state of the mobile phase. Further classification can be made by naming the mobile and stationary phases; thus we have gas-solid (GS), gas-liquid (GL), liquid-liquid (LL), and liquid-solid (LS) chromatography. More recently, supercritical fluids have been used as mobile phases, and these techniques have been named supercritical fluids chromatography (SFC) irrespective of the state of the stationary phase.

An operational definition of chromatography is: chromatography is a separation method composed of two phases, one stationary and one mobile. A mixture of analytes is introduced into the mobile phase and is carried through the system by it.

However, as the mobile phase passes over and through the stationary phase, the components of the mixture equilibrate or partition between the two phases, resulting in differential migration rates through the system. Alternatively, we could say that the various components of the mixture are retarded in their passage through the system in proportion to their interaction with (sorption on) the sorbent bed. At any given time, a particular analyte molecule is either in the mobile phase, moving along at its velocity, or in the stationary phase and not moving at all. The sorption-desorption process occurs many times as the molecule moves through the bed, and the time required to do so depends mainly on the proportion of time it is sorbed and held immobile. A separation is effected as the various components emerge from the bed at different times, which are called retention times. Since all the molecules of a particular analyte will have a finite width in the chromatogram.

The type of chromatography just described is called elution chromatography, since the sample is continually washed or eluted through the system by mobile phase. A less popular form of chromatography is controlled by displacement. The sample is pushed through the system by displacing it from the stationary bed with other sample components or with a strong mobile phase. Displacement chromatography is sometimes used in LSC, but it will not be discussed further.

The chromatographic process we have defined is also known as zonal or batch chromatography because the sample is applied to the system all at once in one narrow zone. By contrast, the sample can be applied continuously during a run; this process is called frontal analysis, and it will not be discussed further because of its limited use.

The mode of interaction between the sample components and the two phases can be classified into two types, although many separation processes are combinations of both. If the sample is attracted to the surfaces of the phases, commonly to the surface

of a solid stationary phase, the process is called adsorption. Alternatively, if the sample diffuses into the interior of the stationary phase-for example, into the bulk of a stationary liquid-chromatographers call the process partition. Actually, absorption seems to be a better name for this process because we can then speak of sorption as the general process and add the prefixes ab or ad when we want to be more specific. For this reason, the terms absorption and adsorption will be used in this monograph even though partition is usually used by chromatographers to denote the former interaction.

## **ЭКОНОМИЧЕСКИЕ НАУКИ**

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### **Quality control of products and marketing (Управление качеством товаров и маркетинг)**

Quality of the goods is of great socio-economic importance. The growing demands to improve it at the moment - one of the characteristic features of the world market. Therefore, the quality of goods should be subject to evaluation and adjustment at all stages of the reproduction process, from planning production to establish the level of prices, promotions, marketing, after-sales service, product quality must be managed.

Quality management is a process that involves the identification of the nature and scope of product requirements, evaluation of the actual level of its quality, the design, selection and implementation of measures to ensure the planned level of production quality.

The quality of products is one of the most important factors in the success of any organization. At present, the world has significantly increased requirements to the quality of consumer products. Stricter requirements accompanied by conscious all the necessary continuous quality improvement, without which it is impossible to achieve and maintain effective economic activity and marketing approach to quality management.

Trade policy involves a systematic study of the properties of consumer goods in the stages of production, processing, transportation, storage, sale. When this product is studied to meet the requirements, requests of specific markets, consumers. We study the response of consumers to various marketing activities at each stage of moving goods from producer to consumer.

Quality management provides the necessary socio-economic effect only when the production is characterized by a certain rhythm, flexibility, willingness to

unexpected situations, timely performance of the duties of all employees. Also, the system of quality management product involves determining the responsibility of all parts of business management, including senior management, with specific tasks to ensure the quality of manufactured goods.

Consumers appreciate the most high quality goods from supplier companies. If the company is committed to "stay at a distance," to maintain a high level of profit, it must adopt a quality management system. Lack of a comprehensive marketing strategy leads, of course, not to the results that are needed producers. Pay particular importance to these problems. One of the most effective ways to solve such problems is the implementation and use of methods and tools for quality assurance and management as prescribed by international and domestic standards.

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### **Banking system of Russia (Банковская система России)**

Banking system in Russia is the two-tier system: the upper level is presented by the Central Bank, and the bottom level - credit institutions.

Banking business is licensed activities.

The modern Russia inherited the banking system of the Soviet Union, with a few big state banks (like Sberbank, Vneshekonombank, and Vneshtorgbank). After more than 15 years of reforms in Russia, there are now 1183 financial institutions with 3286 regional branches.

Banking in Russia is subject to significant regulations as banks in the Russian Federation have to meet mandatory Russian legislation requirements, and comply with numerous Bank of Russia instructions and regulations.

The Bank of Russia was founded on July 13th, 1990. According to the constitution, it is an independent entity, with the primary responsibility of protecting the stability of the national currency, the ruble. It is the main regulator of the Russian banking industry, responsible for banking licenses, rules of banking operations and accounting standards, serving as a lender of last resort for credit organizations. It holds the exclusive right to issue ruble banknotes and coins. Bank rate is 15%. Chairman is Elvira Nabiullina.

A commercial bank is a type of bank that provides services such as accepting deposits, making business loans, and offering basic investment products.

Commercial banks perform many functions. They satisfy the financial needs of the sectors such as agriculture, industry, trade, communication, so they play very significant role in a process of economic social needs. Commercial banks accept various types of deposits from public especially from its clients, including saving

account deposits, recurring account deposits, and fixed deposits. Commercial banks provide loans and advances of various forms, including an overdraft facility, cash credit, bill discounting, money at call etc.

Largest banks in Russia in terms of net assets (trillions of rubles) as of Dec. 1, 2013:

1. Sberbank - 15,8;
2. VTB – 5,2;
3. Gazprombank – 3,5;
4. VTB-24 – 2;
5. Rosselkhozbank – 1,8.

Thus, banking system of Russia is the most important for national economy.

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### **State System of the Russian Federation (Государственная система Российской Федерации)**

In December 1993, Russia adopted a new constitution that established a permanent government.

Russia is a democratic federative state with a republican form of government.

The population of Russia is about 150 million people and the territory is 6.6 million square km. The Russian Federation consists of 85 subjects of the federation.

The federal government consists of three branches: legislative, executive and judicial. Each of them is checked and balanced by the President.

- The legislative power belongs to the Federal Assembly. It consists of two chambers. The Upper Chamber is the Council of the Federation; the Lower Chamber is the State Duma
- The executive power belongs to the Government which is headed by the Prime Minister. The first task of the Prime Minister on accepting the office is to form the Cabinet.
- The judicial branch is represented by the Constitutional Court, the Supreme Court and the regional courts.

The President is on the top of the state system. The President of Russia is the government's chief executive, head of the state, and the most powerful official.

The President is the commander-in-chief of the armed forces, he makes treaties, enforces laws, appoints ministers to be approved by the Federal Assembly.

The President works with two consultative bodies — the Security Council and the State Council.

The President is a chairman of these two councils. The President forms his Executive Office and oversees the work of the Office.

The president is elected by the people for 6 years. The President appoints the Prime Minister to serve as the government head but only with the approval of the lower house of parliament.

The prime minister is the top-ranking official of the Cabinet Ministers.

Institution of state power is responsible for enforcing the Constitution

Vladimir Putin was born (7 October, 1952, Leningrad) - Russian politician, has been the President of Russia since 7 May 2012

Putin previously served as President from 2000 to 2008, and as Prime Ministers of Russia from 1999 to 2000 and again from 2008 to 2012

Recognition:

On 5 October 2008 the central street of Grozny, the capital of Russia's Republic of Chechnya, was renamed from the Victory Avenue to the V. Putin Avenue, as ordered by the Chechen President Ramazam Kadyrov

In February 2011 the parliament of Kyrgyzstan named a peak in Tian Shan mountains Putin Peak

In 2014, the Organized Crime and Corruption Reporting Project awarded Putin their Person of the Year Award for his innovations in furthering corruption and organized crime.

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### **Financial illiteracy (Финансовая безграмотность)**

Business practices of the XXI century is a new stage in the development of the economy, when important emphasis is made on legal and financial education of the Russian population. Illiterate legally and financially population cannot be free. Obviously, if the population of the country for the most part does not have economic knowledge, no economic growth can be considered. Public opinion polls indicate that more than 68% of the population older than 18 years have not bank deposits, only 7% of people use plastic cards, 16% make foreign exchange transactions. And only 4% use consumer loans and mortgage - 0.1% of the population [1, 124]. Behind these dry figures there is a serious social problem which not only affects the economy, but also the general situation.

If the population does not use the opportunities that are given to them by the state, such state cannot be successful. It is impossible to calculate damage which financial ignorance brings. But clearly it is huge. And the sooner we will solve this problem, the faster we will move forward.



In many countries, including the United States, this problem is also very acute. In the United States there is a program on educating financially illiterate people. It started more than 12 years ago.

Russia cannot enter a post-industrial society with low levels of financial education. Ministry of Finance has prepared a program to improve financial literacy. This program includes the media information about financial services, the allocated funds and publishing training manuals [2]. Gradually, the business community comes to understanding that it must also contribute to the elimination of financial literacy of the population, because it directly affects the success of the company. We believe that these measures will help our citizens to efficiently handle their income and to be more pragmatic in terms of their expenses.

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### **Three branches of government in the UK (Три ветви власти в Великобритании)**

The United Kingdom of Great Britain and Northern Ireland is a constitutional monarchy. Britain does not have a written constitution, but a set of laws. Parliament is the most important authority in Britain. Technically Parliament is made up of three parts: the Monarch, the House of Lords; and the House of Commons. The monarch serves formally as head of the state. But the monarch does not make political decisions.

The present sovereign is Queen Elizabeth II. She was crowned in Westminster Abbey in 1953.

The House of Commons consists of Members of Parliament. There are 650 of them in the House of Commons. They are elected by a secret ballot. General elections are held every five years. Voting is not compulsory in Britain.

There are few political parties in Britain. The main parties are: the Conservative Party, the Labour Party and the Liberal Party. Each political party puts up one candidate for each constituency. The one who wins the most votes is elected MP for that area. The party which wins the most seats in Parliament forms the Government. Its leader becomes the Prime Minister.

The functions of the House of Commons are legislation and scrutiny of government activities. The House of Commons is presided over by the Speaker. The Speaker is appointed by the Government.

The House of Lords comprises about 1,200 peers. It is presided by the Lord Chancellor. The House of Lords has no real power. It acts rather as an advisory council.

The government possesses functions of the executive power. The monarch elects the head of the government (prime minister). The candidate for this post has to be a member of the House of Commons. The prime minister elects other ministers. All of them together make the Government and are political heads of Department. 20 most important ministers make the Cabinet. The prime minister has the right to dismiss the Cabinet or to invite new members. The Prime Minister presides over Cabinet, leads the majority in the House of Commons and also represents Britain abroad.

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**Business honor of state officials as the main component of their professional activity (Профессиональная этика государственных служащих как основная составляющая их профессиональной деятельности)**

Business honor is a tool coordinating employers' behavior according to their professional activities.

Business honor is aimed to classify and to prove principles, requirements and other professional ethics components of a specific social group involved in a special activity.

Civil service supposes every worker to have any regulatory powers, so civil service ethics includes all the main components of management culture and ethics.

State officials are supposed to be state representatives, and the efficiency of the state functioning depends on their professional competence and moralities.

Thus there can be 3 main business honor principles :

- humanity principle which means respect for any person taking into consideration its individuality;
- professional optimism principle. In carrying out duties a state official should believe that his or her efforts, decisions he or she makes contribute state development, consolidation of state democratic principals', law and order;
- patriotism principle as any activity especially those which is aimed to people should have a concept.

Sum up, it can be said that state officials should meet all the moral requirements as their job is connected with people, and their activity is mainly directed to satisfy people's needs and to solve the problems of the population.

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### **Treasury bonds (Облигации Казначейства США)**

Security is a document certifying compliance with the established form and obligatory requisites, property rights; the exercise or transfer shall be possible only upon its presentation.

There are several types of securities: shares, bonds, futures, options, etc. Buying a share, the investor becomes one of the owners of the issuing company. By purchasing a bond of an issuing company, the investor becomes its lender.

There are four types of bonds:

- government bonds
- municipal bonds
- corporate bonds
- foreign bonds.

United States Treasury Securities are government debt instruments issued by the United States Department of the Treasury to finance the national debt of the United States. Treasury securities are often referred to simply as Treasuries.

There are four types of marketable treasury securities:

- Treasury bills
- Treasury notes
- Treasury bonds,
- Treasury Inflation Protected Securities (TIPS).

There are also several types of non-marketable treasury securities including State and Local Government Series (SLGS), Government Account Series debt issued to government-managed trust funds, and savings bonds. All of the marketable Treasury securities are liquid and are heavily traded on the secondary market. The non-marketable securities (such as savings bonds) are issued to subscribers and cannot be transferred through market sales.

Treasury bills (or T-bills) mature in one year or less. They do not pay interest prior to maturity. Treasury bills are the least risky investment.

Treasury notes (or T-notes) mature in two to ten years, have a coupon payment every six months, and have denominations of \$1,000.

Treasury bonds (T-Bonds, or the long bond) have the longest maturity, from twenty years to thirty years. They have a coupon payment every six months.

Treasury Inflation-Protected Securities (or TIPS) are the inflation-indexed bonds issued by the U.S. Treasury. The principal is adjusted to the Consumer Price Index (CPI), the commonly used measure of inflation.

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### **Two-tier banking system of the Russian Federation (Двухуровневая банковская система РФ)**

The Russian banking system has two levels. The Central Bank of the Russian Federation together with some special loan offices is on the first level of the system.

Legislature sets a clear distinction between the functions of the Central Bank and those of other banks.

The central bank acts as the regulator of the economy, of the money supply stock and of the currency mix. A very important function of the Central Bank is the banks refunding. As a lender of last resort it provides banks with short-term loans and sets secured lending credit conditions.

The main functions of the Central Bank are to issue cash, to regulate money circulation, to maintain the national currency stability at domestic and foreign markets.

Trade banks represent the second level of the bank system. They concentrate the main part of the country credit resources and are the basis of the credit system. Banks are organized on a joint-stock basis.

The functions of the banks are as follows:

- to raise deposits and give loans;
- to make calculations for the clients and provide them with cash services;
- to open and operate accounts;
- to finance investments on behalf of the clients and etc.

The savings banks of Russia specialize in public services.

Investment banks deal with emission promotional operations. They issue and place securities (stocks of companies), organize their secondary circulation. They also deal with the operations similar to the trade banks operations.

Mortgage banks specialize in giving long-term mortgages for housing and industrial construction.

**The Eurasian Economic Union as a new stage of the Eurasian integration  
(Евразийский экономический союз как новый этап Евразийской  
интеграции)**

The integration is the process of the development which is associated with the union in the whole previously separated parts and components. Integration processes may occur in an already existing system - in this case, they lead to the organization improvement and its integrity, and after that a new system of the previously unconnected elements.

Eurasian Economic Integration (EAEI) is a conscious and purposeful process of agglomeration, mutual adaptation and merging of the former Soviet Union on the basis of the agreed interstate economic policy for the creation of a separate unified economic complex [3].

Nowadays, the Eurasian economic integration process is being considered on the context of the functioning of the Customs Union and Common Economic Space within the Eurasian Economic Union (EAEC).

Eurasian Economic Union is an international organization of regional economic integration, which has an international legal personality and established by the Treaty on the Eurasian Economic Union [1].

Member States of the Eurasian Economic Union are the Republic of Armenia, Belarus, Kazakhstan and the Russian Federation.

The Eurasian Economic Union is a subject of an international law and its career began with the formation of a single market for services since the beginning of 2015, and then moved to the creation of a single market for financial services, transportation, telecommunications, construction, that will confirm the seriousness of the economic integration. The Eurasian Economic Union is already considered as a common labor market, of financial, raw materials, which should not be limited by the scope of the import and the export of goods [2].

Thus the Eurasian Economic Union is a very profitable project for all participating countries. It acquired its improved appearance on the basis of the previous experience of the Eurasian integration, namely the Eurasian Economic Community, which eventually showed some flaws. The Eurasian Economic Union is important for the foreign trade and the financial stability, the feasibility of the economic restructuring and the modernization, and, ultimately, for improving the welfare of the citizens integrating countries in material and spiritual ways.

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### **Quality management (Управление качеством)**

One of the main problems facing Russian enterprises is their successful adaptation to the conditions of market economy. Modern market economy imposes essentially other requirements to the quality of products. Now the survival of any firm, its steady situation on a commodity market are defined by its competitiveness level. Competitiveness is connected with two indicators – the level of the price and the level of the goods' quality. The concept of Russian national policy in the field of the quality of products and services underlines that the main task of domestic economy in the XXI century is the growth of competitiveness due to the growth of quality.

#### **Quality pyramid**

Above the pyramid there is TQM –total quality management which assumes high quality of all work for achievement of the demanded quality of products. First of all, it is the work connected with providing a high organizational technological level of production, appropriate working conditions. The quality of work includes validity of administrative decisions, the system of planning. The quality of products is a component and a consequence of the quality of work.

Problems of the course "Quality management" include:

definition of the basic concepts characterizing consumer properties of production; analysis of types and features of quality control; analysis of processes of standardization and certification. The course "Quality management" covers a wide range of problems and therefore is connected with disciplines which are taught in higher education institutions since its purpose is not only to improve consumer characteristics of production and services, but also to improve the quality of social and economic and psychological aspects of people's life.

The improvement of quality surely leads to decrease in expenses (losses) at all stages of life cycle of production (marketing – development — production — consumption – utilization) and consequently to decrease in primary cost.

### Секция 3

## **НАУЧНО-ТЕОРЕТИЧЕСКИЕ И ПРИКЛАДНЫЕ ПРОБЛЕМЫ (на материале кандидатских и магистерских диссертаций, выпускных квалификационных и научных работ студентов старших курсов)**

### **АГРАРНЫЕ НАУКИ**

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### **Using Natural Aroma Components in Brewing (Использование натуральных ароматических добавок в пивоварении)**

Brewing is the production of beer through steeping a starch source in water and then fermenting with yeast. Brewing industry is an important part of economies of different countries.

Nowadays, there are four ingredients used in brewing: water, starch source, such as malted barley, yeast and flavoring, such as hops.

The brewing process includes the following stages: malting, milling, mashing, lautering, boiling, fermenting, conditioning, filtering, carbonization and packaging.

There are two major types of beer: top-fermenting beer and bottom-fermenting beer.

Majority countries and factories are not obliged to comply with the Purity Law adopted in 1516 in Germany so some brewers add more aromatic components from natural fruits and parts of plants. To satisfy consumer's demands the following natural components are added: peel of oranges and their flowers, elderberry's flowers, salvia, coriander, ginger, cinnamon, clove, pumpkin, nuts, field's flowers, buckwheat etc.

Bashkortostan is favorable and environmentally friendly for bees, that's why I want to make a project of brewery with honey beer production line in our republic. Honey can add floral notes to the aroma, sweetness to the taste, and roundness in the mouthful. Honey is added at the very end of the boiling process, which means that the heat source is removed. After boiling process the addition of honey preserves its aroma qualities. Besides, the dose of honey must be carefully controlled because beer may be too sweet. Combination of residual sweetness, light honey flavor and light hops bitterness make beer very unusual and more fascinating.

We should bear in mind that these unusual types of beer take small part in market and they can't supersede famous types of beer.

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**Improving the efficiency of the linear induction drive of riddle case grain cleaning machines (Повышение эффективности линейного асинхронного привода решетного корпуса машин для очистки зерна)**

In the agricultural enterprises grain cleaning machines with mechanical transducers rotational motion of the shaft of the driving motor into an oscillatory motion of the riddle case are used. They have the following disadvantages:

- large weight and dimensions parameters of the drive riddle case grain cleaning machines;
- presence mechanical converter of rotary motion of the drive shaft of the motor into a reciprocating motion of the riddle case;
- mechanical vibrations of the frame arising due to significant dynamic loads [1, 2].

Proceeding from the aforesaid, to date, one of the most important scientific and technological solutions to this problem is the creation of immediate electric riddle case grain cleaning machines based on the linear induction motor (LIM), that will allow simplify the kinematic a driving circuit grain cleaning machines.

In this case renunciation of the use of mechanical converters rotational motion of the shaft of the drive motor to vibrate the riddle case will enhance the technical and economic and energy indicators of grain cleaning machine.

There are different types of electric drive designs grain cleaning machines using cylindrical LIM [3, 4], in which the working body is coupled with the secondary element of thrust, which allows to directly receive fluctuations reciprocating working body. It is known to use flat LIM as a direct electric drive riddle case, which is a positive thing is the ability to create complex motion and thereby increase the efficiency of cleaning grain material [5]. However, the resulting complex oscillatory motion the riddle case with the change in the specific load feed grain material reduce the efficiency of separation (cleaning) of the grain of the material and make it impossible to control of linear electric drive grain cleaning machine self-oscillation mode, which leads to the need for the self-adjusting control system (SCS), capable of supporting a sufficient within specified parameters (frequency and amplitude) vibrational motion of the riddle case [6].

Thus, the establishment of the proposed SCS of linear electric drive of the riddle case grain cleaning machines will increase the efficiency of separation (purification) by maintaining grain material with sufficient accuracy the set values.

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### **Sport complex territory projecting**

#### **(Проектирование территории спортивного комплекса)**

The planned sport complex is located in the village of Kirgiz-Miyaki on the Shosseynaya Street. The projected building of sport complex refers to objects, whose technological process is not a source of industrial hazards and has no adverse impact on the environment and human health.

Laying the projected water supply and sewerage networks are provided by undeveloped territory and there is no any mineral deposits and trees. In carrying out earthworks topsoil previously is removed, stockpiled in designated areas and reused.

During the construction of a sport complex territory, special attention should be given to design the main and side facades. To make the original appearance of the building a combination of the lining of various materials: composite panels "Alucobond" and reinforced plastic with a filling of glass and glazing are used. Alucobond is made on the basis of a sandwich. It consists of two aluminum sheets, between which is a layer of mineral wool and plastic. From a technical point of view, Alucobond is a material, which is used for buildings facades decorating and for various purposes and consists of 7-9 layers. Alucobond has several advantages: the strength of the material, flexibility and rigidity of the panels, resistance to aggressive

environment, the panels do not crack, do not crawl at the junction and have a long service life. At last, Alucobond is an environmentally friendly material.

Bearing walls are built of ceramic bricks. The advantage of this construction material is considered to be environmentally friendly. Thanks to the using of natural materials in brick buildings and structures substances harmful to the human body are not allocated.

The roof consists of the outer skin made of the roof steel with double seam, mineral wool, waterproofing membrane and vapor barrier.

The project includes an access road to the complex and a sidewalk. The roads in the territory are projected of two-layer asphalt concrete, and sidewalks are monolayer. Roadway is separated from the sidewalk with curbs.

Exploited land along the perimeter is fenced by metal fence. There are many small architectural forms - benches, bins, garbage bins. Areas available from building and pavement become green by planting trees, bushes, and seeding lawns.

Municipal solid waste from the sport complex territory will be transferred to the village dump. The project provides for the installation of standard metal containers for the collection of solid waste. Access roads for movement of garbage trucks will be built to a site for garbage bins.

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### **Sewage sludge disposal** **(Утилизация осадков сточных вод)**

Sewage sludge is a by-product of the wastewater treatment process. Sewage sludge is slurry emitted from waste and wastewater in the process of mechanical, biological and chemical-physical treatment. Sewage sludge is generated in biological treatment facilities of settlements and industrial enterprises. This waste can be used as fertilizers for non-traditional agricultural products growing. Sewage sludge using involves the development of safe technologies applications, such as - dehydration, disinfection, crop selection, etc. Serious negative processes can accompany using of such wastes. For example, the disposal of sewage sludge can lead to soil, plant products and natural waters contamination with heavy metals and other toxicants.

It is necessary to improve the quality of sewage sludge to use it as a fertilizer. In our country, they it is in special landfills. It represents foci of environmental pollution by toxic elements. The current state of science and technology makes it possible to solve these problems.

Storage conditions of sewage sludge lead to surface and subterranean waters, soils, and vegetation pollution. This problem escalates year by year and requires a solution. In Russia sewage sludge is kept on sludge banks of water and wastewater treatment facilities areas. It creates a threat of bacteriological and toxicological hazard. Utilization level of sewage sludge in agriculture sector is low. The soil receives no more than 4 to 6 % of sewage sludge from water and wastewater treatment facilities in large cities. The most part of sewage sludge is taken out to range. These ranges are a source of environmental pollution. Useful components contained in sewage sludge are lost.

Sewage sludge stored on silt cards and dumps belongs to the second and third class of hazardous waste. Noxious, odorous gases are released to the atmosphere upon storage. Their concentration may exceed the allowable limits several time

It is necessary to reduce storage and disposal of sewage sludge volume on storage ranges and begin to use them rationally.

Using of sewage sludge as fuel permits to save the main fuel for cement kiln. The mineral part of sewage sludge combustion products remains in the cement composition and does not affect its properties. Transportation of dewatered sewage sludge to cement production is the only disadvantage of this technology.

A passport of waste accompanies sewage sludge, if it is placed in ranges. A quality certificate accompanies sewage sludge, if it is used at ranges. Indicators of the quality of sewage sludge are determined by GOST.

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### **Processing of sugar beet (Переработка сахарной свеклы)**

Sugar beet is a hardy biennial plant a member of the "Chenopodiaceae" family, a plant whose root contains a high concentration of sucrose. It is grown commercially for sugar.

After harvestig sugar beet is transported to the sugar factories for processing. The beet sample is checked for

- soil tare - the amount of non beet delivered
- crown tare - the amount of low sugar beet delivered

- sugar content ("pol") - amount of sucrose in the crop
- nitrogen content - for recommending future fertilizer use to a farmer.

The actual sugar content of the load is calculated and the grower's payment determined proceeded from these elements.

The beet is moved from the heaps into a central channel or gulley, where it is washed towards the processing plant.

After reception at the processing plant, the beet roots are washed, mechanically sliced into thin strips called cossettes, and passed to a machine called a diffuser to extract the sugar content into a water solution.

The final byproduct, vinasse, is used as fertilizer or growth substrate for yeast cultures.

Carbonatation is a procedure which removes impurities from raw juice before it undergoes crystallization. First, the juice is mixed with hot milk of lime (a suspension of calcium hydroxide in water).

Next, carbon dioxide is bubbled through the alkaline sugar solution, precipitating the lime as calcium carbonate (chalk). The chalk particles entrap some impurities and absorb others. A recycling process builds up the size of chalk particles and a natural flocculation occurs where the heavy particles settle out in tanks (clarifiers). A final addition of more carbon dioxide precipitates more calcium from solution; then it is filtered off, leaving a cleaner, golden light-brown sugar solution called thin juice.

Before entering the next stage, the thin juice may receive soda ash to modify the pH and sulphitation with a sulfur-based compound to reduce colour formation due to decomposition of monosaccharides under heat.

The thin juice is concentrated via multiple-effect evaporation to make a thick juice, roughly 60% sucrose by weight and similar to pancake syrup. Thick juice can be stored in tanks for later processing, reducing load on the crystallization plant.

Thick juice is fed to the crystallizers. Recycled sugar is dissolved into it, and the resulting syrup is called mother liquor. The liquor is concentrated further by boiling under vacuum in large vessels (the so-called vacuum pans), seeded with fine sugar crystals.

The remaining syrup is fed to another crystallizer from which a second batch of sugar is produced. The syrup from the raw is also sent to a crystalliser. From this a very low-quality sugar crystal is produced (known in some systems as "AP sugar") that is also redissolved. The syrup separated is molasses, which still contains sugar but contains too much impurity to undergo further processing economically.

Actual procedure may vary from the above description, with different recycling and crystallisation processes.

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**Agroecological efficiency of application of different fertilization systems for  
spring rapeseed grown in a southern forest-steppe zone of the Republic of  
Bashkortostan (Агроэкологическая эффективность применения различных  
систем удобрения для ярового рапса, выращенного в Южной лесостепной  
зоне Республики Башкортостан)**

Spring rapeseed is one of the most promising oil crops in world agriculture. The main condition for obtaining high yields of rapeseed is the rational use of fertilizers. The goal of this study is to develop a science-based system of fertilization of spring rapeseed varieties "Yubileyny" on leached chernozem soils to provide long-term average seed yields of 2.0 to 2.5 t/ha with a crude protein content not less than 19% and also mitigating environmental nutrient pollution.

Investigations were carried out in 2011-2014 in the experimental field of the Bashkir State Agrarian University.

The soil of experimental plot was heavy leached chernozem. Topsoil had an average content of available phosphorus, high content of exchangeable potassium, humus content of 6.8 - 7.2% and slightly acid soil reaction (5.2%). Experience was repeated three times.

The experimental setup comprises a variant without fertilizers and 4 different fertilizer systems designed for the planned seed yield of 2.5 t / ha.

The use of fertilizers on the systems of leached chernozem in average for 2011 - 2014 has allowed us to get 1.58 - 1.68 t / ha of spring rape seeds, which accounted for 67% of the planned level, with the return on each kg of fertilizer 1.49 - 1.96 kg of seeds and equity of their participation in the formation of the harvest 22 - 26%.

Positive balance of nitrogen and phosphorus and negative balance of potassium were held in the application of calculated systems of fertilizers in the soil. At the same time, the balance sheet ratios of nitrogen, phosphorus and potassium were lower than expected, and in average during 2 years it was amounted to 56 - 57, 38 - 75 and 106 - 109%, respectively.

Thus, in conditions of southern forest-steppe zone of the Republic of Bashkortostan to produce a crop of spring rape seeds 2 t / ha in the calculation of doses of fertilizers it is recommended to use the removal of nitrogen, phosphorus and potassium with 1 ton of seeds with an appropriate amount of straw is 52, 26 and 36kg, and balance sheet ratios of use 100, 100 - 150, and 150 - 200%, respectively.

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**Biologically available nitrogen in agroecological systems**  
**(Биологически доступный азот в агроэкологических системах)**

Nitrogen is one of the most essential crop nutrients. The given article discusses possibility in principal to alter nitrogen fertilizers with biologically available nitrogen fixed in the soil with manure, crop residues and straw being cost effective and environmentally friendly.

One of the ways to make agricultural production more environmentally safe is use of biologically available nitrogen. Large stocks of biologically available nitrogen can be got from cultivation of permanent grasses. According to the All-the Russian Fodder Research Institute by the fourth – sixth year of grass cultivation there accumulates 116-130 centners per hectare of root and stubble dry matter containing 230-270 kg per hectare of nitrogen in the plowing soddy podzolic layer that is equal to application of 40-50 tons per hectare of manure. In the leached black soil of the southern forest and steppe zone of the Bashkortostan republic two-part mixtures of alfalfa and timothy left about 104 centners per hectare of stubbles in the soil equal to application of 156 kg per hectare of nitrogen. The experiments conducted by the chair of Soil Management and Science of the Bashkir State Agrarian University in 1991-1998 showed that mixtures of clover and alfalfa accumulated 70-100 centners per hectare of root residues that fix 140-210 kg per hectare of biologically available nitrogen.

Currently the All-Russian Research Institute of Agricultural Microbiology has detected several thousands of nitrogen-fixing organisms in samples of different soils and rhizoplanes of rice, wheat, barley, corn and other crops. Then the most promising nitrogen-fixing organisms were selected.

Positive effect of associative nitrogen-fixing bacteria can be distinguished into four major factors. These are increased amount of biologically available nitrogen that makes up to 30 kg per hectare of nitrogen a year, release of stimulating hormone substances by bacteria (including root release), growth of root system that results in enlarged use of other nutrients and protection from a pathogenic soil microflora.

Much work on studies of biologically available nitrogen fixation in agroecosystems has been carried by B. F. Sadykov in the Soil Science laboratory at the Ufa Science Center's Biology Institute of the Russian Academy of Sciences. The scientist claims that the mankind wastes enormous resources of the planet for technical nitrogen fixation from the atmosphere being literally "bathing" in nitrogen. Meanwhile only one third of manufactured fertilizers goes for developing higher yields, the rest either pollutes the environment or returns into the atmosphere.

Thus, taking into account all the bioresources there is an opportunity to minimize use of technically fixed nitrogen in crop farming of the Bashkortostan republic. It is necessary to consider the fact that alteration for biological sources of nitrogen create favorable conditions not only for nitrogen-fixing microorganisms but for other groups microorganisms, alga, fungi and actinomycetes, the pedofauna. As the result the biological activity of the soil increases as well as acidification of the soil environment is prevented since the soil is enriched with calcium, potassium, magnesium and other microcells due to their movement from underlying layers. And finally biologically available nitrogen improves the soil humus condition and rises its fertility.

Table 1. Effect of different organic fertilizers on nitrogen and humus supply and yields of barley and winter rye on gray forest soils compared to effect of mineral fertilizers (at the example of peasant farm association “Signal” in Baltachevo district of the Bashkortostan republic).

| Variant                                   | Nitrogen,<br>mg/kg | Yield, centner per hectare |                        | Humus,<br>% |
|-------------------------------------------|--------------------|----------------------------|------------------------|-------------|
|                                           |                    | barley,<br>1991 r.         | winter rye,<br>1988 r. |             |
| Control                                   | 2406               | 21,9                       | 20,7                   | 4,30        |
| Pea straw, 4,5 t/ha annually              | 2448               | 28,4                       | 24,5                   | 4,40        |
| Rape herbage, 20 t/ha once per rotation   | 2472               | 26,5                       | 22,5                   | 4,31        |
| Wheat straw, 4,5 t/ha+N45 annually        | 2568               | 29,4                       | 25,5                   | 4,42        |
| Clover herbage, 20 t/ha once per rotation | 2562               | 27,4                       | 27,7                   | 4,33        |
| Manure, 60 t/ha once per rotation         | 2694               | 29,9                       | 28,6                   | 4,38        |
| Manure, 15 t/ha annually                  | 2778               | 31,1                       | 29,1                   | 4,45        |
| (NPK)60, annually                         | 2370               | 29,0                       | 25,4                   | 4,30        |

These assessments of biologically available nitrogen have been proved experimentally. As Table 1 shows straw, herbage and manure enable to increase nitrogen supply in the soil by the end of five-crop rotation. Annual application of complete mineral fertilizer rises yields but decreases nitrogen supply.

Meanwhile biological sources of nitrogen at the same level of yields conserve soil stocks of nitrogen, that become even higher for some variants. Besides organic fertilizers particularly straw and green manure fix mineral nitrogen of microbial plasma into organic one that prevents nitrogen loss from the agroecosystem. In addition it greatly improves water and physical properties (density, porosity, water capacity, water stability and physical state) of the soil.

Therefore, optimizing soil conditions for plant and microorganism life as well as cropland structure when using biological preparations and organic fertilizers it is possible to shorten application of technically fixed nitrogen thus making the ecological situation in agroecosystems sounder.

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### **Der Einfluss von Blei und Zink auf die Aktivität der Boden-Enzyme (Влияние свинца и цинка на активность ферментов почвы)**

Die Enzymaktivität unter der Einwirkung von Schwermetallen auf die Boden ist wenig untersucht und die Forschung in diesem Bereich hat große Bedeutung für die Wissenschaft und Landwirtschaft. Enzyme sind eine biologisch wichtige Gruppe der Proteine. Sie katalysieren biochemische Reaktionen innerhalb aber auch außerhalb lebender Zellen. Unter Bodenenzymen sind hauptsächlich extrazelluläre Enzyme zu verstehen, die sowohl mikrobiellen als auch pflanzlichen oder tierischen Ursprungs sein können. Der gesättigte Boden der überschwemmten Wiesen ist der Gegenstand unserer Forschung.

Unsere Gruppe untersucht die Auswirkungen von Blei und Zink in verschiedenen Konzentrationen im Bodenzusammensetzen auf die Aktivität von Redoxenzymen überschwemmten Wiese gesättigten Böden. Die vorliegenden Ergebnisse zeigen, dass für alle untersuchten Enzyme deutliche Unterschiede in den Aktivitäten in Abhängigkeit von der allgemeinen Belastungssituation des jeweiligen Standortes auftreten. Andererseits reagierten die einzelnen Bodenenzyme jedoch auch individuell auf die Spurenelementbelastung. Des Weiteren sind Beziehungen der Bodenenzymaktivitäten zu den physikalischen und chemischen Bodenparametern zu beobachten. Zur genaueren Charakterisierung des allgemeinen Aktivitätszustandes der Bodenmikroflora werden derzeit Versuche zur Bodenatmung durchgeführt.

Laborversuche werden mit der oberen Bodenschicht (A10-30cm) durchgeführt. Bei der Bestimmung der physikalisch-chemischen Eigenschaften des Bodens stellten wir fest: der Boden enthält Carbonate, Sulfate und Nitrate, Huminsäure, Partikelgrößenverteilung des Bodens - mittels Lehmerde Wasserbeständigkeit, Feuchtigkeit - einem leichten, pH nahe neutral. In Böden mit verschiedener Konzentration von Zink nahm die Aktivität der Katalase ab, die Aktivität der Polyphenol-Oxidase und der Peroxidase zeigte aber wesentliche Unterschiede nicht.

Visuelle Beobachtungen des Wachstums und der Entwicklung von Hafer (*Avena sativa*) zeigten, dass die ersten Triebe bis 4 Tage nach der Aussaat zu keimen begann. Die beobachteten Unterschiede im Wachstum der Pflanzen, die im Boden mit verschiedenen Konzentrationen an Blei im Vergleich zur Kontrolle auf kontaminierten Böden durchgeführt wurden, zeigen, nach 30 Tagen werden die Pflanzen immer schwächer als auf den unverreinigten Böden. Bei den Versuchen mit Zink wuchsen die Pflanzen gleichmäßig nach der Keimung nach 30 Tagen, unabhängig von der Konzentration des Metalls.



Analyse Biotrockenmasse von Hafer zeigte, dass der kontaminierte Boden mit verschiedener Konzentration von Blei Wurzellänge verringert und dabei der vegetative Teil nicht wesentliche Veränderungen hat.

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**The peculiarities of thyroid hormones, thyroid stimulating and somatotropic hormones content in the diabetics II blood (Изучение особенностей содержания гормонов щитовидной железы и гормонов аденогипофиза (тиреотропного и соматотропного гормонов) в крови больных сахарным диабетом второго типа)**

According to the International Diabetes Federation there are at least 285 million people suffering from diabetes mellitus (DM) in the world, and by 2030 this figure is likely to be more than 438 million people. The main part of them is suffering from diabetes mellitus type II. According to the State register of diabetic patients on January 1, 2010 in Russia there are over 3.1 million patients with diabetes, among them 2,822,634 with T2DM. The growing scale of the disease suggests the need for a comprehensive examination of its causes, in particular, identification of hormonal disorders, associated with the formation of the state of decreased sensitivity to insulin. Previously it has been shown, that in diabetic's blood the molecular mechanisms of hormone transport are disordered. The purpose of this research is to study the peculiarities of thyroid hormones, thyroid stimulating and somatotropic hormones content in the diabetics II blood. Four groups of donors (30 persons each) older than 40 were studied: a group of healthy women, healthy male patients, women with non-insulin-dependent diabetes and men with diabetes. Concentrations of thyroid stimulating hormone (TSH), somatotropic hormone (STH), of free and total thyroxine, triiodothyronine were determined with the help of enzyme-linked immunoassay. It was found that women with Type II diabetes have significantly higher levels of thyroid stimulating hormone: in healthy donors the value of this index was  $0,78 \pm 0,19$  mU / l, and in women with diabetes -  $6,40 \pm 2,32$  IU / ml. Similarly, the male patients with Type II diabetes showed a significant increase in the hormone as compared with the control group. Blood concentration of thyroid stimulating hormone in healthy men was  $1,6 \pm 0,12$  mU / l, in men with type II diabetes -  $4,84 \pm 0,81$  IU / ml. Significant difference in the concentration of thyroid hormones in the peripheral blood of the women surveyed was found. Triiodothyronine concentration in the control group of women was  $6,16 \pm 0,55$  pmol / l, in women with non-insulin-dependent diabetes -  $6,26 \pm 0,83$  pmol / l. The total concentration of thyroxine in the diabetic group was significantly reduced and was

equal to  $84,89 \pm 0,5$  nmol / l in control group and  $100,2 \pm 1,3$  nmol / l ( $T = 3.87$ ,  $p = 0.03$ ); the concentration of free thyroxine in the blood of women was slightly reduced: in diabetic group, it was  $16,34 \pm 0,94$  pmol / l, in control one -  $19,32 \pm 0,91$  pmol / l ( $T = 3.45$ ,  $p = 0.045$ ) It has been shown, that regardless of gender, thyrotrophic hormone increase in type II diabetic's blood, is observed somatotrophic hormone and thyroid hormones blood concentrations have gender differences.

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**Some results of physico-chemical and palynological analysis of honeys of Bashkortostan (Некоторые результаты физико-химического и палинологического анализа мёдов Башкортостана)**

The Republic of Bashkortostan has a unique natural potential, which contributes to the development of beekeeping. In the Republic in recent years honey contests, where the honey is evaluated for sensory properties, are held. In 2014 there was a contest of honey called "the Most delicious honey." physicochemical and palynological analysis was carried out for 29 samples of honey.

The samples were collected in 13 regions of the Republic of Bashkortostan.

Pollen analysis was carried out using the agreed methodology [Von der Ohe W., 2004]. 20 of 29 samples of honey were identified as monofloral (lime). According to melissopalynological analysis, the content of pollen of Tiliacordata extract in Linden honey samples varies in the range of 33.5-89.2%.

In a single sample of honey sunflower the *Helianthus annuus* pollen content was 80.0%.

According to the current standard of the Russian Federation, which applies to monofloral varieties of honey, the mass fraction of water of white honey should not be more than 20.0%, of sunflower honey not more than 18.0 %, and buckwheat honey not more than 19.0%. [GOST R 52451-2005]. According to *GOST R 54644-2011 natural honey TC.*, mass fraction of reducing sugars for honey should be not less than 65.0%, sucrose not more than 5.0% and the mass fraction of water should be not more than 20.0 % [GOST R 54644-2011].

In lime tree honeys mass fraction of water ranged from 14.2 to 19.2% and in polyfloral honeys from 14.6 to 18.0%. In the sample of sunflower honey value of the mass fraction of water was 16.2 %.

The content of reducing sugars and sucrose is one of the indicators of honey maturity and purity. In the studied samples of Linden honey, the mass fraction of reducing sugars averaged 84.0%, 5.7% of sucrose), and sunflower honey –90.0% of

reducing sugars and 2.1% of sucrose. In polyfloral honey of mass fraction of reducing sugars ranged 67.1-70.6, an average of 68.5%, sucrose 4.0-4.3%, on average, 4.1%.

Thus, the samples of the tests results meet the requirements of *GOST R 54644-2011 natural honey. Technical specifications*; *GOST R 52451-2005 monofloral honeys. Technical conditions*.

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### **Mechanical engineering impact on the environment (ecological audit of the "Uraltehnostroy-Tuimazykhimmash" joint-stock company)**

**(Воздействие машиностроения на окружающую среду  
(экологический аудит ОАО «Уралтехнострой-Туймазыхиммаш»))**

Mechanical engineering is one of the leading industries of Russia. Its contribution to the environmental pollution is significant. Therefore there is a need to assess the impact of mechanical engineering on the environment and to study its impact on the health of workers.

During the preparation of my thesis, I studied the environmental impact of "Uraltehnostroy-Tuimazykhimmash", located in the city Tuimazy. JSC "Uraltehnostroy-Tuimazykhimmash" is a manufacturer of capacitive, heat exchanging, column and other equipment for oil and gas, refining, petrochemicals, metallurgy and other industries. There are 131 sources of pollutant emissions at JSC "Uraltehnostroy-Tuimazykhimmash": 117 organized and 14 unorganized.

In the period of 2011-2014 1 substance of III hazard class exceeded the maximum permissible emission (MPE). It is xylene. Xylene emissions exceed the MPE in 2014 because a large amount of vapor is released into the atmosphere during the use of paint.

In the period of 2011-2014 1 substance of hazard class IV exceeded MPE. It is kerosene. Kerosene exceeded MPE in 2013. It is used in all the shops for flushing mechanisms and removing rust in containers for metal cutting and as a solvent, which explains its presence in large quantities in the air.

49 types of waste are formed. It was revealed that the proportion of waste hazard class V accounts for about 94% of the total amount of waste production and consumption. Analysis of waste management at the enterprise "Uraltehnostroy-

Tuimazykhimmash" showed that the largest share of waste - 76.95% of the total waste - is sent for recycling. This high rate was achieved by passing scrap to organizations involved in its collection and remelting. 10.59% of waste is sent to refuse grounds for landfilling, owned by the State Unitary Enterprise "Tabigat".

The audit of environmental management system allows to evaluate the implementation of the tasks. Energy consumption and paints emission are significant environmental aspects. In 2013 electricity consumption was reduced by 25% by replacing incandescent light bulbs for energy saving lamps, the introduction of energy efficient equipment.

Airless painting and the purchase and commission of painting machines Merkur G30C76 and Contracor ASP-681 allow to minimize emissions in the air. Less harmful analogues of paints were found. The audit of environmental management system showed that the system is functioning effectively.

In order to localize emissions accompanying the painting process, it was recommended to create a paint station. The painting booth and filter air Speriglass G2 purchase was suggested for this purpose.

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**Quantitative parameters of spike-wave discharges on primary somatosensory cortex EEG in WAG/Rij ratline by intraperitoneal injection of cortexin (Количественные параметры пик-волновых разрядов на электроэнцефалограмме первичной соматосенсорной коры у крыс линии WAG/Rij при внутрибрюшинном введении кортексина)**

One of the serious diseases, that often require lifelong therapy, is childhood absence epilepsy (CAE). The proper selection of antiabsence drugs plays an important role in the prognosis of CAE. Expanding the range of pharmacological activity of known drugs to increase the efficiency of their use and the creation of new antiepileptic drugs involve their preclinical testing. WAG/Rij rat line is an adequate model to study mechanisms of human absences epilepsy (van Luijtelaar and Coenen, 1987). It is shown that in the EEG of WAG/Rij rat line spike-wave discharges, typical for absences epilepsy, are logged.

The aim of the experimental work was to examine the quantitative characteristics of the spike-wave discharges (the duration and amount of spike-wave discharges per unit time) on the electroencephalogram of primary somatosensory cortex in WAG/Rij rat line.

The study was conducted on adult six-month old WAG/Rij rat line (n=6). For conducting electrophysiological studies a stereotactic method of chronic implantation of electrodes was used. Surgery on rats was carried out in sterile conditions. Chloral

hydrate at a dose of 400 mg/kg was used as anesthesia. The implantation of the electrode in the primary somatosensory cortex with the coordinates (AP +3; L-3) was performed (Paxinos, Watson (1998)). The reference electrode was placed above the cerebellum. Registration of EEG was performed with the electroencephalograph Neuron-Spectrum-1/In (Neurosoft, Russia). Background EEG was recorded 7 days after surgery. Cortexin was administered intraperitoneally at a dose of 1 mg/kg once a day for 9 days, then, EEG was recorded. The analysis of the duration and amount of spike-wave discharges was performed on EEG.

The duration of the spike-wave discharges on background EEG of primary somatosensory cortex amounted  $9,41 \pm 1,03$  h, their number was equal to  $7.1 \pm 0,9$  pcs. When assessing the same parameters on the background of intraperitoneal administration of Cortexin, it was found that discharge duration is  $8,9 \pm 0,9$  sek, but the number of bits is equal to  $1,25 \pm 0,23$  pcs, which was significantly lower compared with the background recording. Thus, we noted a positive antiabsence effect of Cortexin at intraperitoneal administration in WAG/Rij rat line, which manifested a significant decrease in the number of spike-wave discharges on primary somatosensory cortex EEG, which is the main focus when generating spike-wave discharges.

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**The study of polymorphic loci PvuII (b) and XmnI of phenylalaninehydroxylase gene in patients with phenylketonuria from the Republic of Bashkortostan (Изучение полиморфных локусов PvuII (b) и XmnI гена фенилаланингидроксилазы у больных фенилкетонурией из Республики Башкортостан)**

Phenylketonuria (PKU, MIM 261600) - one of the most common severe autosomal recessive diseases caused by metabolic disorders of phenylalanine and it leads to mental retardation, reaching in a high proportion of patients the degree of imbecility and idiocy, and leading to severe mental disability if not treated early by without phenylalanine diet.

The frequency of PKU varies considerably in different regions and ethnic groups from 1:2600 to 1:125,000 newborns, averaging 1:10,000. According to the Russian mass screening for PKU in the average the rate among newborns is 1:7697, and in the Republic of Bashkortostan (RB) - 1:9585, which is comparable to the average value in European populations.

The disease is caused by mutations in the phenylalanine hydroxylase (PAH), localized in the region q23.2 of chromosome 12, which consists of 13 exons and has a length of about 90 kb. To date more than 620 mutations in PAH are described. Different populations of the world have expressed genetic heterogeneity in frequency and nature of PAH mutations, which is reflected in the clinical features, diagnosis and treatment of PKU.

Sufficiently high incidence of PKU in the Republic of Bashkortostan and the severity of its clinical implications dictate the need to identify the genetic nature of the disease in these regions with the definition of major mutations and DNA haplotypes of polymorphic loci gene PAH, which will identify heterozygous carriers and implement effective prenatal diagnosis of PKU in the affected families.

XmnI (rs869916,c.912+1452C>A) polymorphic locus is localized at a distance of 1452 bp from the 3'-end of intron 8 PAH gene that arises owing to substitution of to adenine to cytosine, which leads to the creation of a restriction site for the endonuclease XmnI.

PvuII (b) (rs464987,c.352+1446T>C) polymorphic locus is localized at a distance of 1446 bp from the 3'-end of intron 3 PAH arising owing to substitution of thymine to cytosine, which leads to the creation of a restriction site for the endonuclease PvuII.

A total of 148 patients with a clinical diagnosis of "phenylketonuria" (PKU) from the Republic of Bashkortostan and 260 members of their families were studied.

To study the biallelic polymorphic loci PvuII (b) and XmnI PAH gene RFLP analysis method was used. Allele frequencies and haplotypes of studied polymorphic loci were determined as well as the degree of their engagement with the mutant chromosomes, the statistical analysis of the frequency of distribution of alleles and haplotypes in the normal and mutant chromosomes using the criterion  $\chi^2$  was conducted.

An analysis of biallelic polymorphic loci PvuII (b) and XmnI PAH gene in 148 patients with PKU and 260 members of their families revealed significant differences in the distribution of allele frequencies between normal and mutant chromosomes ( $p < 0.05$ ).

Thus, the analysis of polymorphic loci PvuII (b) showed that the mutant and normal chromosomes and predominant T allele (0.96 and 0.85, respectively), and the frequency of allele C in normal chromosomes was 4 times higher than the mutant (0.15 and 0.04, respectively), which resulted in a statistically significant difference in the distribution of frequencies of alleles of this locus between the mutant and normal chromosomes ( $\chi^2 = 20,78$ ,  $p = 0,005$ ).

Locus XmnI showed the same pattern: A allele was more frequent in all the studied chromosomes with a predominance in the mutant (0.77 and 0.62, respectively), and the frequency of C allele was significantly higher in normal chromosomes (0.38 and 0.23, respectively), which is also reflected in the fairly significant differences in the distribution of frequencies XmnI-alleles between the mutant and normal chromosomes ( $\chi^2 = 13,57$ ,  $p = 0.0009$ ).

Taking into account the literature data on the presence of significant differences in the distribution of haplotypes that are based on combinations of polymorphic alleles of studied PAH gene loci haplotype frequencies of the studied loci (PvuII (b) - XmnI) on normal and mutant chromosomes in families with PKU from Bashkortostan were investigated. For the members of each family with PKU in two polymorphic loci the haplotypes were made. It 6 different haplotypes were determined. The most common haplotype is TA, which met is 1.4 times more in mutant chromosomes compared with normal one (0.75 and 0.53, respectively). The frequency of haplotypes TC, CA and CC was higher compared to normal chromosomes mutant. The differences in the distribution of haplotype frequencies in the normal chromosomes from their distribution on the mutant chromosomes were statistically significant ( $p < 0,05$ ).

Thus, the analysis of polymorphic loci PvuII (b) and XmnI PAH gene in patients with PKU and their families from the Republic of Bashkortostan has shown, that indirect prenatal diagnosis is not informative and to increase its efficiency and accuracy of the results of such a diagnosis it is necessary to use them in conjunction with other polymorphic PAH gene loci, including micro- and minisatellite intragenic repeats (STR and VNTR).

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### **Risk factors for ovarian cancer (Факторы риска рака яичников)**

Ovarian cancer is the third most common gynecological malignancy following uterine corpus cancer and cervix cancer and it is the fifth leading cause of cancer death among women (Urmancheeva et al., 2012; Vorobieva et al., 2013). Annually more than 238 000 new cases of ovarian cancer and 151 000 deaths (GLOBOCAN 2012 (IARC) Section of Cancer Surveillance (6/1/2015)) are registered all over the world.

Ovarian cancer is a multi factorial disease the development of which depends on a variety of environmental, genetic and hormonal factors. Genetic factor is a major in the development of this pathology. Most of hereditary ovarian cancer and breast cancer is caused by mutations in suppressor genes tumor growth - BRCA1 and BRCA2. Mutations in these genes detected in 5-10% of all cases of ovarian cancer. They also account for 80-90% of all cases of hereditary ovarian cancer (Lynch, 2009). Mutations in these genes lead to a significant increase in risk of ovarian cancer and breast cancer in their lifetime. In carriers of mutations in the genes BRCA1 and

BRCA2 breast cancer risk is 65-80% and 45-80%, respectively. Ovarian cancer risk is increased to 37-62% and 11-23%, respectively.

As ovarian cancer refers to hormone-dependent tumors, metabolic disorder of estrogen is one of the factors in the development of this pathology (Mikhaleenko et al., 2013). Numerous epidemiological studies have reported that pregnancy reduces the risk of ovarian cancer, while the "unrealized" reproductive function significantly increases its opposite (Chizhov et al., 2008).

Risk factors for ovarian cancer are also an early age at menarche (under 11 years) and late (after 55 years) entering into menopause, as there is an increase in the number of ovulation cycles (Runnenbaum, Stickeler, 2001; Pertmuth-Wey J. et al, 2009). Reducing the number of ovulations during life, under the influence of pregnancy, lactation, oral contraceptives with a low dose of hormones, reduces the risk of ovarian cancer (Purdie et al., 2003).

Another protective factor in the development of ovarian cancer is the use of oral contraceptives (OC), which suppress ovulation, thereby reducing the risk of ovarian cancer by about 30-40% (Vessey M. et al, 2006). Thus, the degree of reducing the risk of ovarian cancer disease depends on the time of oral contraceptives. Using OK for over 5 years by half reduces the incidence of ovarian cancer (Risch, 1994; Runnenbaum, Stickeler, 2001; Vessey, Painter, 2006).

Obesity and increasing body mass index (BMI) may lead to an increased risk of ovarian cancer in 2 times in women younger than 18 years (Fairfield et al, 2002).

Food, edible, is an important risk factor for ovarian cancer (Kiani F. et al, 2006). Conflicting results have been obtained with respect to the role of dairy products, coffee, vitamin A and beta-carotene, fiber and whole vegetables and fruits in the development of ovarian cancer (Wood et al., 2006; Edefonti et al., 2008).

Physical activity acts as a protective factor in ovarian cancer (Zhang et al., 2003).

Generally, ovarian cancer is a heterogeneous complex disease, in the development of which a large number of factors is involved. The first focuses on genetic predisposition, as a certain proportion of diseases accounted for hereditary forms. Detection of cases in the family contributes to the early diagnosis and prevention of ovarian cancer. It should be noted that in the development of ovarian cancer some role is played by such factors as hormonal status of women and lifestyle.

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### **Phytoremediation der verschmutzten Böden (Фиторемедиация загрязненных почв)**

Der Bereich meiner Interessen ist der Entstehung von Schwermetallhyperakkumulatoren gewidmet. Dieses Thema erforscht man aktiv in



der Molekularbiologie und Physiologie der Pflanzen. Es ist sowohl vom praktischen, als auch vom theoretischen Interesse in der Naturwissenschaft.

Schwere Metalle gehören zu den am meisten verbreiteten gefährlichen chemischen Verschmutzern. Die Zahl der schweren Metalle, die sich im Boden befinden, wächst von Zeit zu Zeit, sie kommen in der Bergbauindustrie, in der Landwirtschaft und bei der anderen Tätigkeit des Menschen vor. Das führt zu sehr gefährlichen Folgen für die Natur und auch für die Gesundheit der Menschen. Heute nutzt man verschiedene teure Technologien aus, die diese chemischen Verschmutzungen beseitigen können.

Eine der neusten Technologien dieser Art ist Phytoremediation. Dazu gehören Verfahren, bei denen schwermetalakkumulierenden Pflanzen zur Dekontamination belasteter Böden eingesetzt werden. Diese sanfte Strategie der Schwermetallentfernung basiert auf der Aufnahme von Schwermetallionen durch die Wurzeln. Ein Teil der aufgenommenen Schwermetalle wird in den Sproß transportiert, der abgeerntet und schadstoffarm verbrannt werden kann. Dieses Anwendungspotential ist der Hauptgrund dafür, dass die Entgiftungsleistungen dieser sog. Schwermetallhyperakkumulatoren vom mehr als nur akademischen Interesse sind. Neben der Bodensanierung werden bestimmte Pflanzen sehr erfolgreich zur Abwasserreinigung und -behandlung eingesetzt. Die Entwicklung der Abwasserreinigung durch Pflanzenkläranlagen führte insbesondere in den letzten Jahren zu verbesserten Verfahren und Anlagekonzeptionen.

In der Natur gibt es naturgemässe Hyperakkumulatoren, sie sammeln schwere Metalle in großer Konzentration an. Es haben sich hier spezielle Metall-Toleranz-Mechanismen entwickelt, die dafür sorgen, dass die Metalle den normalen Stoffwechsel der Pflanze nicht stören. Beispielsweise werden die Metalle in der Zellwand oder Zellvakuole abgelagert. Aber diese Pflanzen vergrößern sich allmählich und haben eine niedrige Biomasse. Dabei spielt die Gentechnik eine sehr wichtige Rolle. Ihre Aufgabe besteht darin, die Transgenpflanzen zu züchten, die hoch resistent zu Metallen sind, um Ionen der Metalle anzusammeln.

Im Laufe der Arbeit haben wir verschiedene Versuche durchgeführt. Für Experimente wurden die Modelle der Transgenpflanzen und Pflanzen des Tabaks genommen, die mit verschiedenen Konzentrationen des Kadmiums bearbeitet worden sind. Die Transgenpflanzen hatten schärfer ausgeprägte Kadmiumspeichereigenschaften als bei Pflanzen.

Die Entstehung und die Ausnutzung dieser Methoden der Gentechnik sind vom großen praktischen Interesse. Sie haben viele Vorteile, weil diese Methoden nicht teuer und ziemlich einfach sind. Außerdem können die gezüchteten Pflanzen weiter bei der Phytoextraktion verwendet werden.

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**Molecular genetics of primary congenital glaucoma**  
**(Молекулярная генетика первичной врожденной глаукомы)**

Congenital or infantile glaucoma is an important cause of childhood blindness which is usually recognized during the first year of life. Inheritance is primarily autosomal recessive, although pedigrees with dominant inheritance have been described. The severe congenital form of glaucoma is due to obstruction of the drainage of the aqueous humour caused by a primary developmental anomaly at the angle of the anterior chamber. The disease has an onset in the neonatal or infantile period, manifested by symptoms of increased intraocular pressure (IOP) and corneal oedema such as excessive tearing, photophobia and an enlargement of the globe (buphthalmos). The incidence of congenital glaucoma varies among ethnic groups, with the highest incidence in Slovakian Gypsies (1 in 1,250) and the lowest in Western nations (1 in 10,000).

Molecular genetic studies conducted during the last several years have thrown some light on the basic molecular defects in primary congenital glaucoma (PCG) and the rationale behind the clinical and genetic presentation of this paediatric eye condition. Currently, mutations in 6 genes (*MYOC*, *PITX2*, *FOXC1*, *PAX6*, *CYP1B1*, and *LTBP2*) can cause early-onset (either congenital or juvenile) glaucoma.

The existence of a hereditary form of PCG segregating as an autosomal recessive trait with high penetrance is confirmed. The primary molecular defect underlying the majority of PCG cases has been identified as mutations in the cytochrome P4501B1 (*CYP1B1*) gene. The human *CYP1B1* gene is located on chromosome 2p22-21. This gene is expressed in tissues of the anterior chamber angle of the eye. Many different disease-causing *CYP1B1* mutations have been found in populations throughout the world, including missense, frameshift, premature stop codons, small insertion/deletions, and large deletions. The gene product, cytochrome P-450 1B1, metabolizes complex molecules such as polycyclic aromatic hydrocarbons and 17- $\beta$ -estradiol. The role of the protein in congenital glaucoma is not clear; however, it has been hypothesized that the P-450 1B1 activity is responsible for metabolism of a compound involved in ocular development.

*LTBP2* is located on chromosome 14q24. In nonocular tissues, *LTBP2* is involved in tissue repair and cell adhesion. Ocular expression studies have determined its presence in both the trabecular meshwork and ciliary processes. Several studies have shown that *LTBP2* mutations are associated with secondary glaucoma. The role of *LTBP2* in primary congenital glaucoma remains unclear, because some studies did not discover any mutations within the gene, but null mutations have been found in consanguineous Slovakian Roma, Pakistani, and Iranian families. *MYOC* also is associated with juvenile and primary open-angle

glaucoma and is located on chromosome 1q24.3–q25.2. Pathogenic *MYOC* variant proteins can alter the trabecular meshwork and ciliary body architecture, obstructing the outflow and increasing IOP.

The identification of a gene mutation in patients and/or family members can have a significant impact on clinical care. Disease surveillance can be targeted to mutation carriers, making timely initiation of treatment possible and eliminating unnecessary surveillance for family members who do not carry mutant alleles. Mutation detection can also define the mode of inheritance, as *CYP1B1* and *LTBP2* cause autosomal recessive disease while *MYOC*, *PITX2*, *FOXC1*, and *PAX6* all cause dominantly inherited glaucoma. Without genetic testing the pattern of disease inheritance may not be readily apparent because of the variable expressivity and phenotypic overlap among the early-onset disorders caused by mutations in this collection of genes.

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**The ecology of the species *Ranaridibundus* in the mountainous forest area  
of the Republic of Bashkortostan  
(Экология вида *Ranaridibundus* в горно-лесной зоне  
Республики Башкортостан)**

Marsh frog is the most common type of semi-aquatic amphibians of the Southern Urals. However, in the mountain forest zone *Pelophylax (Rana) ridibundus* are found quite rarely.

The material for the study was 20 individuals of *P. ridibundus*, captured in June and July 2013 on the territory of the village Assy, Beloretsk region of the Republic of Bashkortostan (RB). Full helminthological autopsy was carried out according to standard procedures followed by specific diagnosis of parasitic worms. The material for the analysis of food lumps was obtained by the standard technique. In the studied population of *P. ridibundus* 7 female, 13 male individuals were revealed, i.e. the ratio of female and male individuals is 1: 2. By five morphometric parameters (body length - 96 mm, hips - 42, leg – 49, eye - 10; body weight - 82) females have larger average values than males (90, 39, 45, 9 mm and 67), only two parameters are observed to be equal (the length of the first finger and the internal tuberosity). Among individuals of *P. ridibundus* there dominates (80%) the spotted coloration of the back (*maculata*), this makes frogs less noticeable in the aquatic environment and on the ground (on the banks of ponds). The proportion of speckled individuals (*punctata*) is 10%, the lowest number of frogs in this population is

represented by the morph *striata* (*striped*) and *burnsi* (5% each). The study of the colour of ventral side revealed the prevalence of light-abdomen individuals with pigmented throat (75%).

We have found 5 species of parasitic worms belonging to the class Trematoda: bladder parasites - *Gorgoderacygnoides* (Zeder, 1800), *Gorgoderaloossi* (Sinitzin, 1905), *Gorgoderinavitelliloba* (Olsson, 1876); intestinal parasite - *Opisthioglypheranae* (Froelich, 1791), lung parasite - *Pneumonoecesvariegatus* (Rudolphi, 1819). The predominance of trematodes indicates the long stay of *P. ridibundus* individuals in the aquatic environment, where the infecting by flukes takes place. The study of the diet also revealed the dominance of water food - in 75% of cases aquatic insects are found in the digestive tract, in 25% - terrestrial invertebrates. The study showed that the distribution of populations of *P. ridibundus* in mountainous areas is local. In the studied population of marsh frogs the ratio of females to males is 1: 2; females have larger size. The study of polymorphism revealed that light-abdomen frogs with pigmented throat (75%), with the spotted dorsal side (80%) dominate. Among helminths 5 species of trematodes were found in whose circulation aquatic invertebrates are involved (their share in the diet of is 75%).

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**The connection of the functionalities of the organism of newborns by the scale of Apgar with the concentration of amino acids and fatty acids in plasma  
(Связь между функциональными возможностями организма новорожденных детей по шкале Апгар и содержанием в плазме крови аминокислот и жирных кислот)**

The results of the comparative analysis revealed that the intensity of energy metabolism makes significant contribution to the processes of growth of children characterized by low values of health assessment at birth. The organism of newborns needs free amino acids, this demand decreasing with age. Amino acids are not only the substrate for protein synthesis, but also they are the precursors of a number of hormones, neurotransmitters, cofactors and other biologically active regulators of metabolism, which allows them to influence the regulation of almost the entire body.

The functional state of 81 newborns has been tested in accordance with the value of health assessment by the scale of Apgar. Three groups were studied: 28 newborns with 5-6 points, 34 newborns - with 7 points and 19 newborns with 9-8 points.

The concentration of amino acids (Ala, Arg, Cit, Gly, Leu, Met, Orn, Phe, Pro, Tyr, Val) and fatty acids (C12, C14, C16, C18, C12: 1, C14: 1, C16: 1, C18 1) in the blood samples was determined using a tandem mass spectrometer Quattro micro MS / MS of the firm Waters (PerkinElmer, Turku, Finland).

The following picture was revealed in the assessment of the state of the newborns by the scale of Apgar. It was found that the proportion of newborns with low levels of health (5-6 points by the scale of Apgar) is 35%, with an average level of health (7 points) - 42% of the patients, and with a high level of health (8-9 points) - 23% of newborns.

As the result of the comparative analysis revealed, the newborns with higher rates of health are in general characterized by high concentrations of amino acids. In the second group the concentration of arginine, methionine and proline was significantly higher than in the first one, the concentration of alanine, glycine, methionine, proline, and tyrosine was higher in the third group than in the first one. The total concentration of the studied amino acids was also found to be higher in the second and third groups than in the group of newborns with poor health status.

The analysis of the lipid spectrum showed higher levels of fatty acids in newborns with higher points by the scale of Apgar. Myristic and palmitic fatty acids differ significantly between the first and the third groups of newborns, and the most common fatty acid - stearic – is different for all three groups. Moreover, the differences between the second and the third groups are clearly visible unlike the amino acid concentration. Like the concentration of amino acids, the maximum value of fatty acids is observed in the newborns with the best indicators of health.

## **МАТЕМАТИЧЕСКИЕ НАУКИ**

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### **Information technology system of analysis of vapor-liquid equilibrium in multicomponent hydrocarbon systems (Информационно-вычислительная система анализа парожидкостного равновесия в многокомпонентных углеводородных системах)**

Knowledge of phase transformations laws, the ability to predict and analyze them is necessary for qualified calculation of recoverable reserves, engineering of deposits development, field processing, transportation of extracted raw materials, development of methods for increasing condensate and reservoir recovery. To study these transformations modern methods of information technology are applied.

Review of literature and creative contacts with Ufa specialists in oil and gas industry have shown that there are few unified integrated information systems, which

would include a database of deposits, mathematical models, computer programs and technologies of parallel computing.

In this article the development of a unified information technology system of analysis of different phases equilibrium has been started.

At the initial stage mathematical description of phase state of the systems of natural hydrocarbons is developed; it includes determination of composition and quantitative ratio of equilibrium vapor and liquid phases at a given pressure, temperature, and the overall composition of the mixture:

$$\left\{ \begin{array}{l} f_{i,L} - f_{i,V} = 0, \quad i = \overline{1, N} \\ x_i L + y_i V - z_i = 0, \quad i = \overline{1, N} \\ \sum_{i=1}^N y_i - 1 = 0 \\ L + V = 1 \end{array} \right.$$

where  $z_i$  - component molar composition of the mixture,  $V$  and  $L$  – molar fractions of vapor  $y_i$  and liquid  $x_i$  phases,  $f_{i,V}$  and  $f_{i,L}$  - volatilities of the components in vapor and liquid phases, respectively.

The database includes many interrelated factors of establishing thermodynamic equilibrium, serial and parallel algorithms for calculating vapor-liquid equilibria in multicomponent hydrocarbon systems containing water.

Computational experiment for the data from the reviewed literature was conducted and it is shown that the calculated results correspond to the data in the literature.

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### **Verallgemeinerter Fock-Raum (Обобщенное пространство Фока)**

Ein Fock-Raum sieht so aus:  $F = \left\{ f(z) \in H(\square) : \|f\|^2 = \frac{1}{\pi} \int_{\square} |f(z)|^2 e^{-|z|^2} d\mu < \infty \right\},$

wobei  $d\mu$  — Lebesgue-Maß auf der Ebene ist. Verallgemeinerter Fock-Raum wird auf folgende Weise definiert:  $\beta > 0$

$$, F_{\beta} = \left\{ f(z) \in H(\square) : \|f\|^2 = \frac{1}{\pi \frac{2}{\beta} \Gamma\left(\frac{2}{\beta}\right)} \int_{\square} |f(z)|^2 e^{-|z|^{\beta}} d\mu < \infty \right\}. \quad \text{Der Raum } F_{\beta} \text{ ist ein}$$

Hilbertraum. Der konjugierte Raum  $F_{\beta}^*$  ist dem Raum  $F_{\beta}$  isomorph, das heißt  $F_{\beta}^* \sim F_{\beta}$ .

Die Funktionen  $e_n(z) = \sqrt{\frac{\Gamma\left(\frac{2}{\beta}\right)}{\Gamma\left(\frac{2}{\beta}(n+1)\right)}} z^n, n = \overline{(0; +\infty)}$ , bilden eine orthonormale Basis im

Raum. Sind  $f(z) \in F_{\beta}$  und  $f(z) = \sum_{n=0}^{\infty} \alpha_n z^n$  die Taylorreihe für die Funktion  $f(z)$ , so

werden deren Koeffizienten nach der Formel  $\alpha_n = \sqrt{\frac{\Gamma\left(\frac{2}{\beta}\right)}{\Gamma\left(\frac{2}{\beta}(n+1)\right)}} (f, e_n), n = \overline{(0; +\infty)}$

ausgerechnet.

Der Operator der Multiplikation auf der Variablen  $z$  sieht folgenderweise aus:  $S = z \cdot$ . Man muss den adjungierten Operator zu diesem Operator im verallgemeinerten Fock-Raum beschreiben. Er wird aus der Beziehung  $(Sf, g) = (f, S^*g)$  für die Funktionen  $f(z)$  und  $g(z)$  abgeleitet. Der klassische Differentialoperator wird als Term

$S^* = c_1 \frac{d}{dz} + c_2 z \frac{d^2}{dz^2} + \dots + c_{n-1} z^{n-2} \frac{d^{n-1}}{dz^{n-1}} + c_n z^{n-1} \frac{d^n}{dz^n} + \dots$  definiert, wobei  $n < \infty$  oder  $n = \infty$ . Der Operator der verallgemeinerten Differenzierung sieht wie folgt aus:  $Df(z) = D \sum_{n=0}^{\infty} a_n z^n = \frac{1}{z} \sum_{n=0}^{\infty} a_n m_n z^n$ , wo  $f(z) = \sum_{n=0}^{\infty} a_n z^n$ ,

$$m_n = \frac{\Gamma\left(\frac{2}{\beta}(n+1)\right)}{\Gamma\left(\frac{2n}{\beta}\right)}, n \geq 1, m_0 = 0.$$

**Theorem 1.** Der klassische Differentialoperator  $S^*$  stimmt mit dem Operator der verallgemeinerten Differenzierung  $D$  überein. Sie sind mit dem Operator der Multiplikation um die Variable  $z$   $S = z \cdot$  konjugiert.

**Theorem 2.** Es sei  $k = \frac{2}{\beta}$ , dann gilt: falls  $k$  eine ganze Zahl ist, so ist der Differentialoperator  $S^*$  endlich mit Ordnung  $k$ , ist  $k$  eine unganze Zahl, so ist der Differentialoperator  $S^*$  unendlich. Die Koeffizienten dieses Operators  $S^* = c_1 \frac{d}{dz} + c_2 z \frac{d^2}{dz^2} + \dots + c_{n-1} z^{n-2} \frac{d^{n-1}}{dz^{n-1}} + c_n z^{n-1} \frac{d^n}{dz^n} + \dots$  werden nach der Formel  $c_n = \frac{\Gamma(k(n+1))}{n! \Gamma(kn)} - \frac{c_1 n + c_2 n(n-1) + \dots + c_{n-1} n(n-1) \dots 2}{n!}, n = \overline{(1; n_0)}$ , ausgerechnet, wobei  $n_0$  — die Ordnung des Differentialoperators ist.

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**Automatic digitization of well survey's data**  
**(Автоматическая оцифровка данных геофизических исследований**  
**скважин)**

Automatic digitization of well survey's data is a very relevant and important problem, because there are many paper well-logging diagrams in oil companies obtained before the computer age and though having no digital analogs. Such data need to be presented in the digital form for their computer analysis and further interpretation. Existing software for well logs processing digitizes well logs in semi-automatic mode, and this is not effective because of influence of the human factor and a large amount of information which needs to be processed that leads to increasing of time costs on digitizing or to reduction of its accuracy. Therefore, the problem of development a software implementing correct digitization of well logs in automatic mode has been posed. In this work solving this problem has been proposed.

Well logs digitizing refers to work complex by scanning, recognition and translation into tabular form well-logging data with further quality control. Usually this deals with the following problems: slope and defects of image arising while scanning, presence of letterings by hand. Moreover, it requires that each point in depth corresponded to the only value of each parameter. It is also necessary to digitize diagrams' headers and depth intervals correctly.

The software designed by the author implements automatic digitization of well logs with preliminary writing in well passport containing information on the well and logs. Designed program reads an image pixel by pixel using raster image processing functions, recognizes colored pixels by means of RGB-model and digitizes the image by means of mathematical methods of averaging, interpolation and normalization. The result of the program is a LAS-file, which can be used by the majority of software for visualization, well-logging data interpretation and modeling.

Results of computer experiment for developed software revealed achieving the required accuracy with significant speedup of calculation comparing with used software for semi-automatic digitization.

At present, debugging of software module for automatic digitization of diagrams' headers and depth intervals, without filling well's passport, is being held. The software implementing proposed algorithms will allow getting more reliable results for wells having been logged in analog way and taking them into account while constructing geological models of oilfields and calculating of hydrocarbon reserves. And this will lead to increasing precision of these operations and in general to improving the technical and economic indicators of oilfields development.



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**Parametric identification algorithm of wells connectivity system  
(Алгоритм параметрической идентификации  
в задаче анализа связности скважин)**

Reservoir pressure maintenance by water injection is necessary for effective oil production. Water flooding is realized through systems of injection wells. So water in reservoir is distributed irregularly. This can reduce water injection efficiency. Thus the purpose of this work is researching of injection and production wells interaction.

Wells connectivity system may be represented as a multidimensional dynamic system. Model inputs – injection well flow measurements, model outputs – production well flow measurements. It is necessary to assess injection wells influence on production wells. This is the problem of identification – building mathematical models of dynamical systems from measured data. It is proposed to use the method of generalized adjusted object of measurement (GAOM) for solution of multidimensional dynamic system identification problem. This method is based on constructing a generalized model of object by passing input and output signals from filters. The advantage of this method is a linear dependence of adjustable parameters for error.

In the presence of noise assessment of system parameters sometimes shifts. This problem can be solved by using the bootstrap analysis which allows obtaining a set of models and shows whether models are resistant to changes in the sample. The bootstrap analysis has been applied to the proposed method.

In this work existing identification methods (GAOM, prediction error method (Pem), subspace method of identification (N4sid)) have been implemented in Matlab and have been tested for parametric identification of multidimensional dynamic system. According to the results obtained GAOM allows constructing more qualitative models in less time than methods Pem and N4sid in the presence of noise. And GAOM with bootstrap analysis surpass GAOM in the presence of noise with non-zero initial conditions. It is planned further to develop the algorithm which allows identifying the non-stationary dynamical systems.

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**Numerical investigation of viscous fluid flow in divergent channels**  
**(Численное исследование течения вязкой жидкости**  
**в расширяющихся каналах)**

Scientists were always interested in blood circulation in a human body. At the first glance, it seems that everything is well known, that a wealth of knowledge about the structure, functions, the basic ideas and principles of work has accumulated for centuries, but now, due to the development of science and technology, it became clear that not all the questions already have answers. Moreover, the problem of high lethality in diseases of the cardio - vascular system is extremely sharp, as it ranks first, both in Russia and around the world. After all, heart disease takes away most of the young and even children's lives. It is important to understand the physical processes that occur in normal conditions as well as to analyze the painful or abnormal conditions, thereby improving the treatment and diagnosis.

Blood vessels narrowing (stenosis) impedes normal blood flow and it causes many diseases. The mathematical model of blood flow in vessels with stenosis (considering blood as a Newtonian fluid) comes to the classical Jeffery-Hamel flow problem. This problem is about steady laminar flow of viscous incompressible fluid in a divergent flat channel – in a diffuser.

The attempt of numerical solution of steady laminar flow of Newtonian incompressible fluid in a diffuser is made in the present work. Two dimensional mathematical model is written in polar coordinates. This problem is remarkable as in its framework the system of Navier-Stokes equations can be reduced to ordinary differential equations. As a result, the solution of the problem is reduced to solving a standard nonlinear boundary value problem containing two dimensionless parameters - opening angle and Reynolds number.

The results obtained using this model describe full enough the dependence of flow rate and flow velocity of fluid on the angle between the channel walls and the Reynolds number. These findings are extremely useful in the study and treatment of stenoses.

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### **The study of two-dimensional superionic conductors**

#### **CuCrS<sub>2</sub>, AgCrS<sub>2</sub> and CuCrSe<sub>2</sub>**

#### **(Изучение двумерных суперионных проводников**

#### **CuCrS<sub>2</sub>, AgCrS<sub>2</sub> и CuCrSe<sub>2</sub>)**

Superionic conductors have some unique properties, the main one is their high ionic conductivity. In recent years, superionic conductors have found significant prospective use as elements of information processing systems and energy sources. It has stimulated the study of their physical properties and characteristics, proved to be extremely diverse.

Increasing interest in the study of superionic conductors is explained by both the importance of fundamental problems of condensed matter physics, and the search for promising new compounds having abnormally high ionic conductivity.

We can distinguish between the following classes of materials for conductivity: conductors of purely ionic conductivity, mixed ionic-electronic conductors, electronic conductors, dielectrics.

The objectives of the investigation are the following:

1. To synthesize two-dimensional superionic conductors;
2. To carry out x-ray investigation;
3. To measure the parameters of electroconductivity and thermopower according to the temperature.

The compounds were synthesized by direct agglutination of the respective amount of electrolytic copper, silver 99.99% pure, electrolytic chromium 99.99% pure, sulphur evacuated to residual pressure of 10<sup>-3</sup> Pa in quartz vessels. The vessels placed into an oven were slowly heated up to 1100°C. At this temperature the vessels were held incubated for 100 hours. The total time of heating was 500 hours. Then the resulting load was milled in an agate mortar and compressed in the form of parallelepipeds required for experimental research, which were homogenized in quartz vessels at 900 K for a week.

X-ray studies were performed on the standard automated diffractometer DRON-4-07 using Cu-K $\alpha$  radiation and on the spectrometer STOE on MoK $\alpha$  radiation. Kinetic properties for the given compounds were measured by the standard four-probe method.

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### **The Mathematical Model of the Temperature Distribution under the Active Thermometry (Математическая модель распределения температуры при активной термометрии)**

One of the major challenges in control of oil and gas development is the definition of a range and azimuth directions of behind the casing flow. One of the main methods is thermometry. According to the thermometry, the complexity of this task is explained by heat exchange processes in the system "well-rocks -channel behind the casing flow».To enhance the information content of thermometry synthetic thermal field could be used, which is generated by heating metal columns. To study this question in detail it is necessary to conduct a research of thermal fields in under heating of the column.

We are going to construct a mathematical model of temperature distribution in the behind the casing flow in terms of local short-term heating of the casing. Let us consider the section of the wellbore with the height of 2 m, the outer diameter of 159 mm and the inner diameter of 150 mm. The well is surrounded by rock. For the well there is a channel behind the casing flow of a thickness of 3 mm.

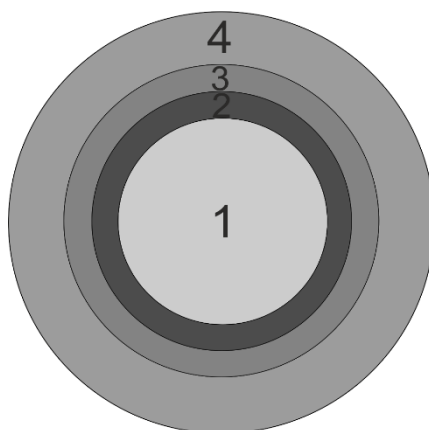


*Fig.1. The geometry of the problem-the topview (code: 1-borehole fluid, 2-metal column, 3-behind-the-casing flow, 4-layer)*

In the calculation of the temperature distribution the law of conservation of energy with heat source is used:

$$\rho C \frac{\partial T}{\partial t} + \rho C (\vec{u} \cdot \nabla T) = \text{div}(\lambda \nabla T) + Q, \quad (1)$$

$\rho$ -density,  $C$ - capacity for heat,  $\lambda$ -thermal conductance of the corresponding area;  $\vec{u}$ - the velocity of the fluid;  $Q$ - the heat source.

To calculate the velocity and to account the natural convection in the borehole we use the Boussinesq model. Fig.2 shows the results of the calculation for the heater

power  $P=500\text{W/m}^3$  below. From Fig.2 it can be seen that after heating of the casing uneven temperature distribution along the perimeter of the well is formed. In the interval of behind the casing flow decrease and displacement of the thermal anomaly in the wellbore occur.

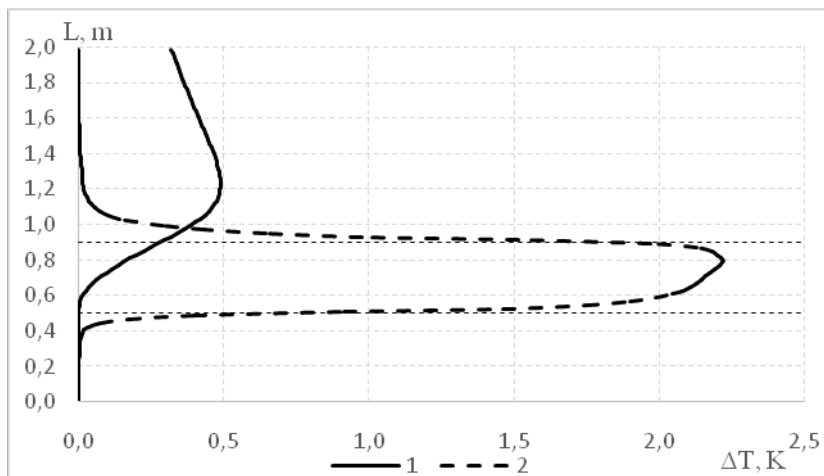


Fig.2. The distribution of the excess temperature in the reservoir at a distance of 8.6 mm from the well of a borehole (curves code: 1-side flow channel, 2 - by the lack of channel flow). The dotted line marks the heating zone.

Thus, the heating of the casing leads to a non monotonic change in the temperature around the perimeter of the well due to heat exchange processes with the channel behind the casing flow, which can be used to enhance the information content of thermometry in determining behind the casing flow.

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### **Study of the surface modes dynamics of a bubble under the influence of the ultrasonic field (Исследование динамики поверхностных мод пузырька под действием ультразвукового поля)**

Bubbles occupy an important place in contemporary science and technology. For example: in the production and transport of oil, where bubbles are purposely injected to help lift heavy oil to the surface; in chemical industry, when gas-liquid reactors rely on bubbles to increase the contact area between the phases, etc. The most important application of cavitating bubbles is ultrasonic cleaning. Cavitation is the formation of pulsating bubble filled with steam, gas or a mixture thereof. One type of cavitation is acoustic cavitation occurring when the sound wave of high intensity passes through the liquid. In the area of cavitation there appear powerful hydrodynamic perturbations in the form of strong pulse compression and microflows

generated by pulsating bubbles. Under the influence of a powerful ultrasonic field on the water, the bubbles pulsate at the surface, thereby cleaning the surface from dirt. The method of purification of computer chips using oscillating bubbles, as well as the method of cleaning surfaces, using microparticle gas bubbles are well known. Numerous studies in the field of cavitation and bubble dynamics in ultrasound were conducted at different times. However, this question is very topical at the present time as well.

To solve this problem an experimental setting was constructed. A plexiglas cube was made, piezoceramic element was glued to the upper wall. Ultrasonic field in the experimental cube was produced by the applied voltage to the piezoelectric element from the signal generator with the frequency corresponding to the resonant frequency, the pressure amplitude was amplified by the signal amplifier. The experimental cell was completely filled with water. A small air bubble was blown into the vessel. Coming up to the surface the bubble rise to the side of the vessel on which there was a piezoelectric element. Processes were recorded using a high speed camera with a frame rate of up to 350 000 frames per second, which was synchronized with the signal generator, so while switching on the ultrasound field the recording started. To measure the amplitude of the pressure generated by the ceramic element we used the hydrophone connected to the oscilloscope.

In conclusion, it may be noted that the nature of the dynamics of bubble oscillations, was defined and that was managed through the use of modern equipment: the bubble oscillates initially and then perturbations on its surface become stronger. We further plan to investigate the effect of oscillations under the influence of ultrasound on the contact angle of the bubble near the wall which may find application in studies of cleaning surfaces using the oscillating gas bubbles.

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### **Experimental investigation of electromagnetic field impact on the oil systems (Экспериментальное исследование воздействия СВЧ электромагнитного поля на нефтяные системы)**

In recent years, the impact of electromagnetic fields on the petroleum system in the process of oil extraction and transportation attracted great interest.

The correct choice of parameters electromagnetic fields impact on the oil system should reduce their viscosity, their dehydration and desalting.

We investigated the behavior of emulsion drops of radio frequency and microwave electromagnetic fields. Study of the real-water emulsions is difficult, since they represent a multicomponent complex system. Therefore the model used in the emulsion, which is a drop of water, covered with asphaltene shell in heptane.

### **Influence of high frequency electromagnetic field**

Under the influence of high-frequency electromagnetic fields which are generated in the form of chains of aggregates drops elongated mainly along the direction of the electric field lines [1]. The attraction of water drops in an electromagnetic field and the formation of coagulation chains mainly due to the effect on the droplet electrophoretic force, defined in the following view [2]:

$$\bar{F}_{DEP} = 2\pi\epsilon_1 R^3 \left( \frac{\epsilon_2 - \epsilon_1}{\epsilon_2 + 2\epsilon_1} \right) \nabla E_0^2 \quad (1)$$

where  $\epsilon_1$  is the dielectric constant of the medium,  $\epsilon_2$  is dielectric permittivity of a drop,  $R$  is droplet's radius,  $E_0$  is intensity of external electric field.

In the RF field, critical intensities of electromagnetic field necessary for coagulation of individual droplet are received (Fig.1).

### **Influence of microwave electromagnetic field.**

For effective use of microwave electromagnetic field with respect to the oil system, we must correctly pick the temperature parameters. Modern measuring instruments do not measure the temperature inside the droplets with diameter of 10-20 microns. Therefore, the method of fluorescence thermometry based on the strong temperature dependence on the fluorescence of certain substances. In this experiment, a substance such as Rhodamine-B was used. In the microwave region the temperature dynamics of the emulsion droplets in the microwave electromagnetic field is obtained (Fig. 2).

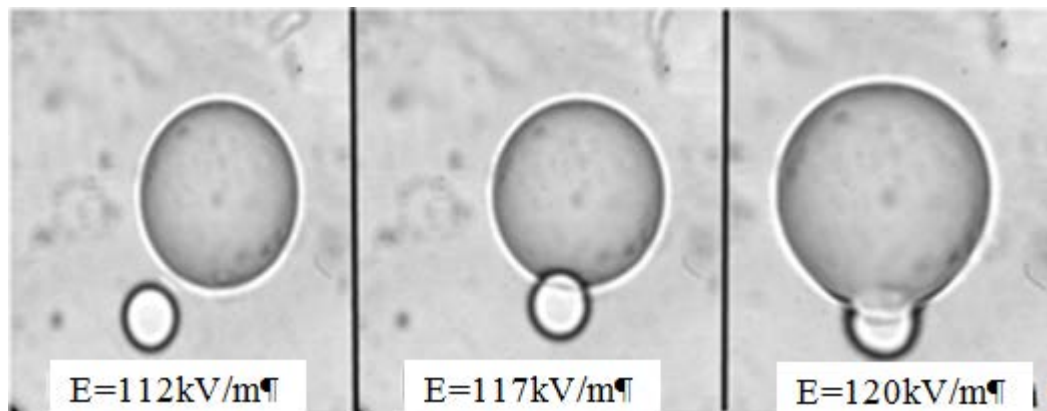


Figure 1. Coagulation of drops in the RF electromagnetic field

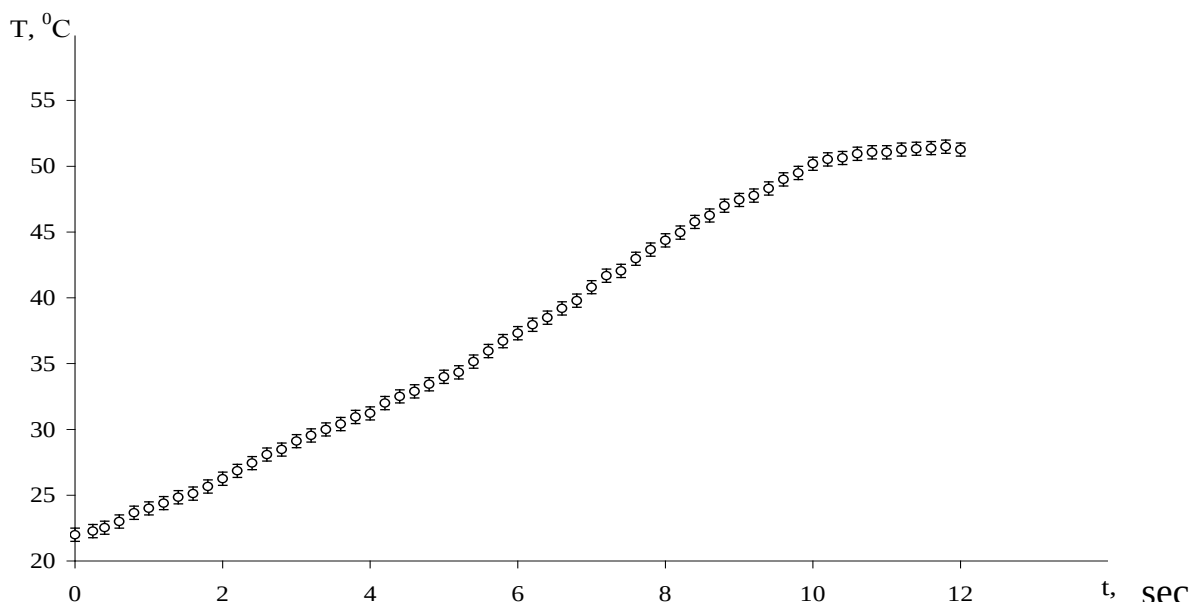


Figure 2. The curve of temperature dynamics of emulsion droplets under the influence of microwave electromagnetic field.

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#### **Die Steuerung der Kink-Dynamik der modifizierten Sinus-Gordon-Gleichung durch externe Einflüsse mit sich verändernden Parametern (Управление динамикой кинка модифицированного уравнения синус-Гордона внешним воздействием с меняющимися параметрами)**

Die Dynamik der topologischen Solitonen, insbesondere der Kinks, zieht große Aufmerksamkeit von Forschern auf sich, die in verschiedenen Bereichen der Chemie, Physik, Biophysik tätig sind. Vom größten Interesse für Anwendungen, einschließlich DNA, ist die modifizierte Sinus-Gordon-Gleichung. Sie berücksichtigt die Dissipation und die Wirkung von äußeren Kräften.

Hier sind  $\alpha$  - Koeffizient der Dissipation,  $f(t)$  - externe nicht ständige Einwirkung. Das Glied  $f(t)$  in dieser Gleichung kann sowohl natürliche Faktoren



beschreiben als auch künstliche (z. B. den Einfluss von äußeren elektromagnetischen Feldern). Für dynamische Systeme, welche die Gleichung (2) modelliert, gelingt es vorläufig nicht, genaue Lösungen zu finden und man muss zu unterschiedlichen Approximationen greifen. Es gibt eine Möglichkeit für die Steuerung der Kink-Dynamik der modifizierten Sinus-Gordon-Gleichung mittels der Änderung von Parametern der äußeren Einflüsse. Das Interesse für solche Aufgaben wird vor allem dadurch bedingt, dass sie uns an die Lösung des Problems der Steuerung der Dynamik solcher Prozesse wie Transkription, Translation und Replikation heranführen.

### ***Modell und Methode***

In der vorliegenden Arbeit beschränken wir uns auf den Fall der kleineren Werte des Koeffizienten der Dissipation  $\beta$  und der Amplitude der äußeren Kraft  $F(\tau)$ . Dieser Fall ist von besonderem Interesse in Bezug auf die Möglichkeiten der Steuerung - eine geringe Einwirkung kann zu einem großen Ergebnis führen.

Ich werde folgende Arten von äußeren Einflüssen untersuchen:

- 1) ständige Einwirkung:  $F(\tau) = A_0$  ist eine Konstante;
- 2) periodische Einwirkung mit einer konstanten Frequenz:  $F(\tau) = A_0 \cos \omega_0 \tau$ , wo  $A_0$  und  $\omega_0$  Konstanten sind.

### ***Ständige äußere Einwirkung***

Die ständige äußere Einwirkung  $F(\tau) = A_0 = \text{const}$ , die Anfangsgeschwindigkeit gleich null.

Nach der Analyse der Ergebnisse von Berechnungen der Koordinaten und der Kink-Geschwindigkeit können wir sagen, dass man durch die Änderung des Vorzeichens des Parameters  $A_0$ , das heißt, indem man die Richtung der äußeren Kraft ändert, Kink zwingen kann, sich in entgegengesetzter Richtung zu bewegen.

Beim «Ausschalten» der externen Einwirkung zu einem beliebigen Zeitpunkt wird Kink mit seiner Bewegung aufhören, und beim «Einschalten» wieder seine Bewegung fortsetzen. So kann man die Geschwindigkeit und die Richtung der Kink-Bewegung steuern, indem man die Amplitude  $A_0$  und die Zeit der Kraftanwendung ändert.

### ***Periodische Einwirkung mit einer konstanten und niedrigen Frequenz***

Berechnungen zeigen, dass die äußere Einwirkung  $F(\tau) = A_0 \cos \omega_0 \tau$  zu schwingender Kink-Bewegung in der Nähe der Startposition führt. Eine solche Einwirkung kann auch als Einwirkung vom obigen Typ mit langsam (und periodisch) wechselnder Amplitude angesehen werden. Die Änderung der Amplitude der äußeren Kraft  $A_0$  ändert proportional die Amplitude der Kink-Schwingungen.

Die Erhöhung der Frequenz des äußeren Feldes  $\omega_0$  führt zu einer Erhöhung der Frequenz der Kink-Schwingungen und zur Verringerung der Amplitude dieser Schwingungen.

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**The simulation of the fluid influx to the well taking into account the effect of the pore pressure on the reservoir filtration-volumetric parameters**  
**(Моделирование притока жидкости к скважине с учетом влияния порового давления на фильтрационно-емкостные свойства коллектора)**

The reduction of the wells productivity in fractured reservoirs may occur due to fracture network closure because of the pore pressure decrease.

The numerically simulated model of the fluid influx to the well taking into account permeability change of the fracture network from pore pressure is given consideration in this paper. The existence of cavities and low-permeability pores is left out of account. Fluid filtration in the network of intrinsic fractures is described by the following piezoconductivity equation:

$$\frac{\partial P}{\partial t} \left( \frac{\partial \rho}{\partial P} \varphi + \rho \frac{\partial \varphi}{\partial P} \right) = \frac{1}{r} \frac{\partial}{\partial r} \left( \rho \frac{k}{\mu} r \frac{\partial P}{\partial r} \right) \quad (1)$$

The dependence of the fluid density, reservoir porosity and permeability from pressure is expressed by the following equations of state:

$$\rho = \rho_0 e^{c_l (P - P_0)}, \quad (2)$$

where  $c_l$  is the fluid compressibility

$$\varphi = \varphi_0 e^{c_r (P - P_0)}, \quad (3)$$

here  $c_r$  is formation compressibility

$$k = k_0 e^{c_r (P - P_0) m} \quad (4)$$

and  $m$  is the exponent here

At the initial moment of time the following boundary conditions in the well and on formation boundaries are as follows:

$$P|_{t=0} = P_0; \quad P|_{r=r_e} = P_0; \quad \left( r \frac{\partial P}{\partial r} \right) \Big|_{r=r_w} = \frac{q\mu}{2\pi h k} \quad (5)$$

The numerical simulation of the process of the production well operation taking into account permeability change of the fracture network from the pore pressure and the recovery of fluid maintaining the reservoir pressure on the formation boundary has been implemented.

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**Modeling the influence of high-frequency electromagnetic field on oil sludge  
(Моделирование воздействия высокочастотного электромагнитного  
поля на нефтяной шлам)**

Refinery of oil sludge is a topical problem, because of the importance of the environment protection. It is well known that all the oil slimes contain water and solid admixture. They very often form a stable, inseparable emulsion. Therefore, most of the methods which are used to process oil sludge, cannot cope with the problem completely. Because of its high viscosity the oil sludge is difficult to collect and transport to the place of utilization. The thermal influence is one of the ways of reducing the sludge viscosity. That is why, the purpose of this work is modeling high-frequency (HF) electromagnetic field influence on the oil sludge.

The mathematical model includes heat equation in cylindrical coordinates:

$$\rho c \frac{\partial T}{\partial t} = \frac{1}{r} \frac{\partial}{\partial r} \left( r k \frac{\partial T}{\partial r} \right) + \frac{\partial}{\partial z} \left( k \frac{\partial T}{\partial z} \right) + q, \quad (1)$$

$$q = \frac{N_0}{\pi r^2 l \ln \frac{R_2}{R_1}}, \quad (2)$$

where  $\rho$ ,  $c$ ,  $k$  – are density, specific thermal capacity and heat-conductivity factor of the fluid;  $T$  – is temperature;  $q$  – is distribution density of heat sources in the oil sludge;  $N_0$  – is the power of HF generator;  $R_1$  – is the radius of the rod and  $R_2$  – is the internal radius of the tank wall;  $l$  – is the length of the rod.

The convective heat transfer using the introduction of the effective heat-conductivity factor is considered in the mathematical model:

$$k(T) = k_0 [1 + b(T - T_0)] \quad (3)$$

where  $k_0$  – is heat-conductivity factor at  $T = T_0$ ;  $b$  – empirical constant.

The problem is solved by the method of control volume according to the implicit scheme. The work has revealed that due to the mechanism of convective heat transfer, the time of liquid heating sufficiently reduces.

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**Experimental research of influence of electromagnetic radiation within the range of 0,35-0,7 mkm on bifidobacteria (Экспериментальное исследование влияния электромагнитного излучения в диапазоне 0,35-0,7 мкм на бифидобактерии)**

Recently, LED light sources become more popular. But the safety factor issue to use these sources remains unexplored completely in relation to biological objects and a human.

The purpose of this paper was an experimental study of the dependence effect of visible emission (0,35-0,7 mkm) on bifidobacteria, as well as the development of an automated installation for the effect study.

For the study a special computer equipment has been chosen. The equipment includes: an optical microscope with a videoocular, emitters (LEDs), study objects and ECMs. Microscope specifications enable the use of a PC-equipment complex in the quantitative structure analysis of the objects studied. 5mm LEDs were used as an emitter with a rate 0.07-0.08 W. Using white LEDs instead of incandescent lamps to illuminate samples has excluded a destructive effect of a thermal infrared part on the test samples. In the first stage of such studies it is very risky and difficult to use people as test objects, thus bifidobacteria were selected as biological test objects.

The objects of study (investigation) were dairy products (sour-milk, butter, milk) produced by various manufacturers.

A dependence effect of EMI visible spectrum on a sour-milk (lactic) product was under investigation. Besides we observed a behaviour change of streptococci, bifidobacteria and other types of various emission sticks – blue, green, yellow, red and white LEDs.

As a result, studies have found that bifidobacteria differed in activity and vitality, thus the best quality samples were taken. Bacterial vitality in the best samples occurred for a few hours, bad samples activity was observed only within 5-10 minutes.

It was established that the green emission had no significant effect on the active bifidobacteria. Yellow light emission increased the activity of bifidobacteria. Red light has intensified significantly stronger than yellow. The strongest effect on bacteria vitality was made by blue. Sufficiently intense blue emission caused strong destructive consequences in relation to living bifidobacteria. At the same time, this emission has no visible effect on inanimate micro objects of dairy products.

Due to the fact that the blue component is dominant in the white LED light sources, the possibility of the harmful source effect on health of a human, and

particularly on eyesight is a serious concern. A conclusion was made based on the result of the study to use white LEDs as a light source for street lighting expediently, one more conclusion refers to some necessary limits of a human staying at entrance halls and some offices rooms.

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### **Shock waves in saturated porous media (Ударные волны в насыщенных пористых средах)**

The aim of the present research is to determine the relation of the physical properties of the fluid that saturates the pore space of a porous medium and the characteristics of transmitted and reflected weak shock waves. For these experiments we used the installation of the "shock tube".

To solve this problem the shock tube is equipped with a section of bulk media (SBM). Besides during the experiment we used the device `L- Card`. It consists of an amplifier and an analog-to-digital converter (ADC). Piezoelectric pressure sensors were attached to the amplifier. They are installed in the section of bulk medium at different distances from each other. We used pressure sensors of LH-610 type. The first sensor was mounted in a pressure chamber at a distance of 72 cm from the diaphragm. The second sensor was installed in the SBM at a distance of 5 cm from the surface. The third and the fourth ones were mounted to the bottom of SBM registration filtration and incident waves, respectively. Preamps of the first two sensors were roughened using a capacitive shunt. Each experiment was carried out for 5 times.

Calibration was performed by comparing the calculated values of the pressure at the shock front. These values are derived from the classical wave theory of shock waves generated during the decay of a discontinuity in the gas. The experiment was conducted in water-saturated sand (90-100%). The experiment with 100% saturated sand was performed using vacuum. This was done for the partial extraction of the micro bubble mixture. Due to the evacuation of micro bubbles, the speed of propagation of the shock wave in 100% saturated sand has increased significantly. Still, it remained significantly lower than the velocity of the wave in the water.

The results of experiments on the propagation of shock waves in the air and in the water prove the reliability of the measurements.

During the experiments with water-gas-saturated sand it was found:

1. While increasing the gas phase the degree of attenuation of the wave decreases by 3 times. (Wave passes better at reducing water phase).

2. The speed of propagation of the shock wave with the increase in water saturation by 90%-99% decreases by 3 times. The value of the wave velocity increases sharply up to 200 m / s at 100% value.

3. The speed of the shock wave at 100% water saturation is significantly less than the speed of the shock waves in water. This is due to the presence of micro-bubbles on the surface of the sand grains.

The experiment may be of practical importance in the diagnosis of acoustic porous media. Besides we can estimate the percentage of the degree of saturated sands and damping of shock waves in saturated porous structures.

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### **Thaw frozen soils under the insulation layers**

**(Протаивание мерзлого грунта под теплоизоляционными слоями)**

The problem of thawing permafrost is in the presence of heat-insulating layers on the surface. To calculate the thawing depth let us consider a three-layer problem: in areas  $0 < z < h_{01}$  and  $h_{01} < z < h_{02}$  are insulating layers of different species, in  $z > h_{02}$  - frozen ground which can thaw during the warm period of the year. The process of thawing frozen ground can be divided into four stages (Fig). The duration of the first stage is determined on the basis of integrated methods for the solution of the heat equation: variational method Bio or the averaging method. These methods give similar results in accordance with the exact solution of the problem obtained by Fourier expansion. In the first method there are  $t_1 = 0,085 \cdot \frac{h_{01}^2}{a_{01}}$ ,  $h_{01}$  and  $a_{01}$  - the thickness of the thermal insulation layer.

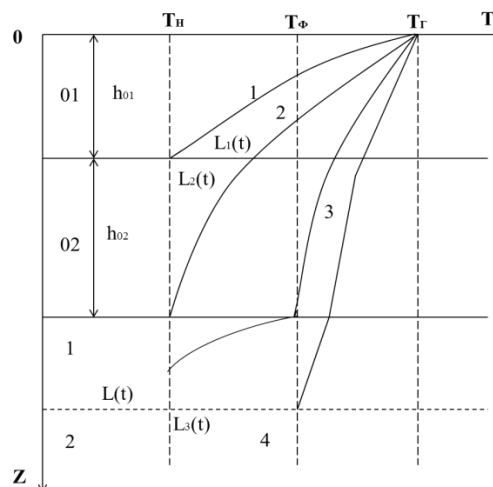


Fig. Stages of heating and thawing of frozen soil.

The temperature distribution at the end of the first (second top) phase is determined from the expression:

$$T_{01}^{(1)}(z, t = t_1) = T_{\mu} + (T_r - T_{\mu}) \cdot \frac{(h_{01} - z)^2}{h_{01}^2}, \quad 0 < z < h_{01}, \quad T^{(1)} = T_{\mu}, \quad z > h_{01}$$

In the second stage, the temperature distribution in the layer of insulation in the frozen soil is accepted according to the expression:

$$T_{01}^{(2)} = T_r - (T_r - T') \cdot \frac{z}{h_{01}}, \quad 0 < z < h_{01}$$

$$T_{02}^{(2)} = T_{\mu} - (T_{\mu} - T') \cdot \frac{(h_{01} + L_2 - z)^2}{L_2^2}, \quad h_{01} < z < h_{01} + L_2$$

Here, there is temperature  $T'$  at the interface between the insulating layer  $z = h_{01}$  determined from the condition of continuity of heat flux on this boundary:

$$T' = \frac{2\lambda_{02} \cdot T_{\mu} \cdot h_{01} + \lambda_{01} \cdot T_r \cdot L_2}{2\lambda_{02} \cdot h_{01} + \lambda_{01} \cdot L_2}$$

The third stage starts at  $t = t_2$  and goes on to  $t = t_3$ , where  $t_3$  - during heating of the surface  $z = h_{01} + h_{02}$ . This time is determined by the condition:

$$T(t = t_3, z = h_{01} + h_{02}) = T_{\phi}$$

Thus, during this phase there is a further heat insulation and heating of the layers of the frozen soil to thaw the temperature thereof.

The fourth stage  $t > t_3$  is characterized by further heat insulation layers and thawing of frozen soil. In the  $h_{01} + h_{02} < z < l(t)$  there is thawed soil, and in the  $z > l(t)$  is heated up to the temperature of frozen ground melting frozen ground  $T_{\phi}$ . This phase continues until the end of the warm season  $\tau$ , until the temperature at the surface is  $T_r > T_{\phi}$ .

Thus, the following relation holds:

$$t_1 + t_2 + t_3 + t_4 = \tau \quad (1)$$

In (1) the duration of the warm period of the year is a predetermined value, so if it turns out that  $t_1 + t_2 + t_3 + t_4 < \tau$ , then thawing of frozen soil is spared during the warm period of the year (heating period), the heat does not reach the front area of the frozen soil. If the thawing of frozen soil occurs, there is the depth of seasonal thawing  $L_T$  determined by the condition:

$$L_T = l(t = \tau)$$

Thus, it is necessary to determine the time  $t_1, t_2, t_3, t_4$ . Times  $t_1-t_2$  is determined from the solutions of the equations of heat conduction in these layers, which are built by the integral heat balance.

The proposed physical-mathematical model is for investigating the thermal regime of permafrost of the given thermal parameters, and besides the initial temperature of the ice content of frozen soil, air temperature, snow accumulation and dynamics parameters (thickness and thermal conductivity) of heat-insulating layers.

### **Mathematical Modeling of Interference Testing** (Математическое моделирование гидропрослушивания)

Interference is the study of the propagation of perturbations in the reservoir between wells. For this, in one of the wells, an active well, the operating regime is changed; it can be shut-in, start of production with constant flow rate or change of bottomhole pressure and flow rate. After creating momentum in the active well the pressure change in neighboring observation wells occurs. Obviously, change of pressure in observation wells is due to both perturbing pulse in active wells and formation parameters. Thus, the interference testing reveals the structural features of the reservoir, which are not always possible to reveal in the process of exploration and geological research of the oilfield.

The aim of our study was to develop a mathematical model that allows to receive and visualize the solution of the direct problem for the pressure in the active and observation wells, depending on the parameters of the reservoir and the well.

The mathematical model is as follows:

$$\left\{ \begin{array}{l} \frac{\partial p}{\partial t} = \chi \frac{1}{r} \frac{\partial}{\partial r} \left( r \frac{\partial p}{\partial r} \right) \\ p_{res}(r, 0) = P_{res}^0 \\ p_{res}(\infty, t) = P_{res}^0 \\ p_w(t) = p(r_w, t) - S \left( r \frac{\partial p}{\partial r} \right)_{r=r_w} \\ p_w(0) = P_w^0 \\ Q(t) = 2\pi\sigma \left( r \frac{\partial p}{\partial r} \right)_{r=r_w} - C_s \frac{\partial p_w}{\partial t} \end{array} \right.$$

here,  $r$  – distance,  $t$  – time,  $p$  – pressure,  $\chi$  – formation pressure conductivity factor,  $r_w$  – wellbore radius of an active well,  $S$  – skin factor,  $Q$  – flow rate of an active well,  $C_s$  – wellbore storage effect coefficient of an active well,  $\sigma$  – flow capacity coefficient. Reservoir is horizontal and homogeneous;

In the space of Laplace images, analytical solution of this problem is obtained:

$$p^L(s) = \frac{Q^L(s)}{G(s)} K_0 \left( \sqrt{\frac{s}{\chi}} r \right)$$

where

$$G(s) = 2\pi\sigma r_w \sqrt{\frac{s}{\chi}} K_1 \left( \sqrt{\frac{s}{\chi}} r_w \right) + C_s s F$$



$$F = K_0 \left( \sqrt{\frac{s}{\chi}} r_w \right) + S r_w \sqrt{\frac{s}{\chi}} K_1 \left( \sqrt{\frac{s}{\chi}} r_w \right)$$

$p^L(s)$  - change of wellbore pressure in the observation well (Laplace space),  
 $Q^L(s)$  – flow rate in Laplace space,  $r$  – distance to the observation well,  $K_0$ ,  $K_1$  - modified Bessel functions.

For inversion of Laplace transform Stehfest's algorithm is used. On the basis of the solution of the problem the interactive computer program for modeling curves of pressure change in the active and observation wells is developed.

**Example.** The example of modeling cyclic production of an active well with constant flow rate is given below.

The results of the simulation are shown in Figures 1 and 2:

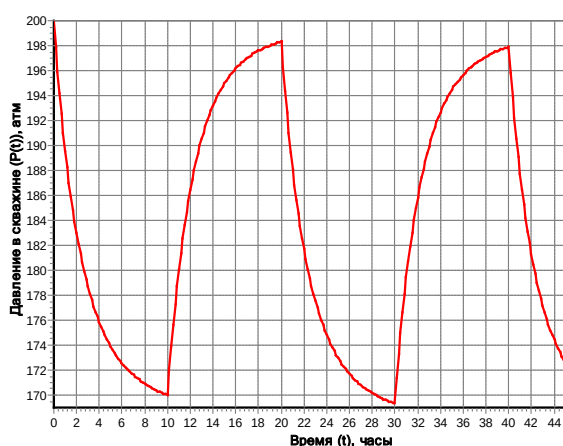


Fig. 1. – The model of the curve of pressure change in an active well

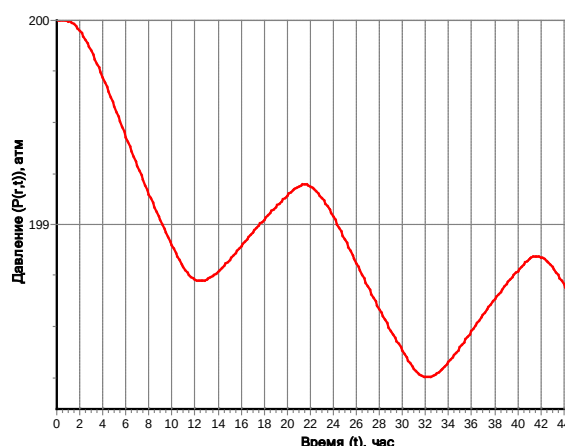


Fig. 2. – The model of the curve of pressure change in an observation well

### Conclusions:

1. The mathematical model for calculating the pressure field in the active and observation wells for technology of interference test is developed. The accuracy of the calculations is confirmed by comparison with the known analytical solutions in particular cases.
2. The model and the interactive program were used for planning interference in an oilfield of Republic of Tatarstan.
3. The mathematical model will be used in the well test processing systems GidrozonD for processing interference testing data by nonlinear regression.

## **Modeling of pumping marked liquid in a well with a technogenic crack of hydraulic fracturing** **(Моделирование закачки меченой жидкости в скважину с техногенной трещиной гидроразрыва)**

When developing low-permeability reservoirs, hydraulic fracturing is actively applied. In order to study the mutual influence of production and injection wells with technogenic cracks, in particular, to identify sources of irrigation of wells, in some cases, research is conducted by method of pumping marked liquid (trasserny researches). When planning researches it is necessary to calculate the volume of marked liquid, its concentration and forecasting of time at which the agent will reach the environment wells. The problem of modeling the process of pumping marked liquid into a well with the induced fractures is still relevant.

The equations which describe hashing of liquids in the porous environment and distribution of pressure in well-crack-layer system, are presented by the equations of convective diffusion and diffusivity and are the following:

$$\phi_f \beta_{ft} \frac{\partial P_f}{\partial t} = \frac{\partial}{\partial x} \left( \frac{k_f}{\mu_L} \frac{\partial P_f}{\partial x} \right) + \frac{q}{w_f h} \quad (1)$$

$$\phi_f \frac{\partial C_{Sf}}{\partial t} = \frac{\partial}{\partial x} \left( D_f \frac{\partial C_{Sf}}{\partial x} \right) - V_f \frac{\partial C_{Sf}}{\partial x} \quad (2)$$

$$\phi_m \beta_{mt} \frac{\partial P_m}{\partial t} = \frac{\partial}{\partial x} \left( \frac{k_m}{\mu_L} \frac{\partial P_m}{\partial x} \right) + \frac{\partial}{\partial y} \left( \frac{k_m}{\mu_L} \frac{\partial P_m}{\partial y} \right) \quad (3)$$

$$\phi_m \frac{\partial C_{Sm}}{\partial t} = \frac{\partial}{\partial x} \left( D_{mx} \frac{\partial C_{Sm}}{\partial x} \right) + \frac{\partial}{\partial y} \left( D_{my} \frac{\partial C_{Sm}}{\partial y} \right) + \left( V_{mx} \frac{\partial C_{Sm}}{\partial x} + V_{my} \frac{\partial C_{Sm}}{\partial y} \right) \quad (4)$$

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### **An experimental research of the thermal field when fluids casing flow during the process of induction heating the production tube**

**(Экспериментальное изучение теплового поля при заколонном перетоке флюида в процессе индукционного нагрева эксплуатационной колонны)**

The problem of determining of the interval and the azimuthal direction of casing flow which is solved in the control of oil and gas development is a very important. The most informative method of research is thermometry. But it is difficult to solve this problem by thermometry due to the heat exchange process in the system of well/rock/canal of casing flow. Necessary to carry out a study of thermal fields during to heat a tube for research this problem.

One of the promising direction of the development of wells thermometry is the application of artificial thermal fields. This method is called active thermometry and it deals with the formation of thermal fields which are created by artificial heat source, for example, during induction exposure [1, 2].

We created an experimental model of well with casing flow to study thermal fields (fig.1). The model represent a steel tube (1) with internal diameters of 150 mm, wall thickness is 4.5 mm and with height of 2.2 m. The heat of tube is carried out by current supply on Nichrome ribbon (6-top and 7-bottom) which is wound over the steel tube with the width of 0.4 m. The steel tube is covered with two layers of clearcole and with three layers of automobiles enamel.

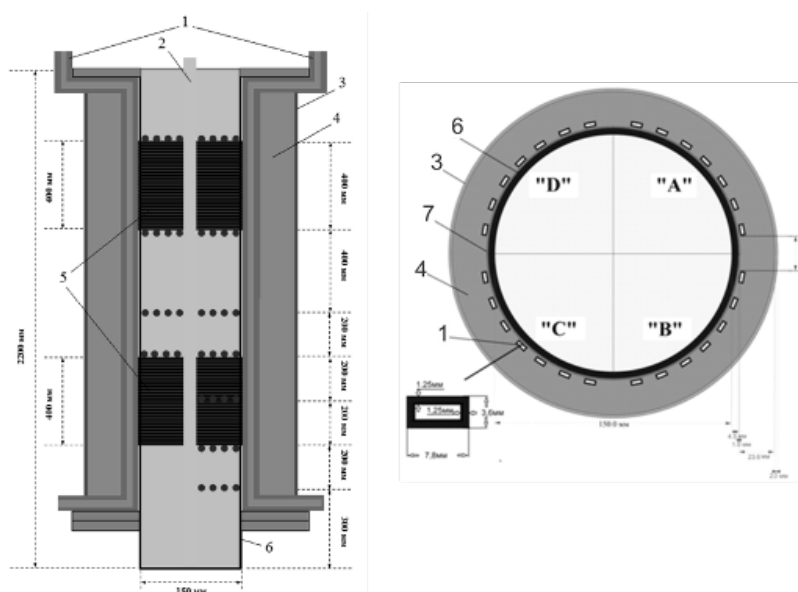


Fig.1. Vertical and horizontal section of model (pressmark: 1-copper flat tubes; 2-probe; 3-polyethylene film; 4-imitation rocks; 5-induction; 6-steel tube; 7-electroisolation).

Fig.2 shows the results of interpretation of the series of experiments to identify the borders of casing flow by the one sector “B”. There was heating of the top inductor with the capacity of 500 W during the experiment. The graphic on Fig.2 is called “involute” – it is a dependence of excess temperature on the probes orientation angle with the basic sensors. The involute on the level of the top of the lower inductor is shown here.

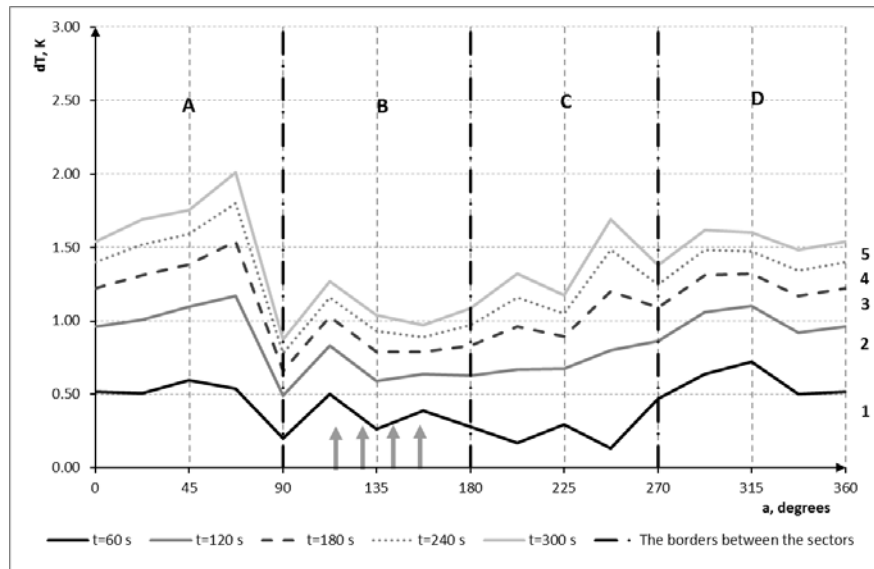


Fig.2. The distribution of excess temperature within the steel tube with the distance of 5 mm of wall on the level of 0.9 m (the top of lower inductor) (pressmark: 1-the first minute of heating; 2-the second minute of heating; 3-the third minute of heating; 4-the fourth minute of heating; 5-the fifth minute of heating). The dotted line shows the borders between the sectors.

Thus the heating of steel tube causes the decline of temperature in the sector of the casing flow. This is due to the heat exchange process with the canal of casing flow that is proved by the theoretic basis of the method of active thermometry [2].

#### Acknowledgment

The work is performed under the agreement №14.574.21.0053 (RFMEFI57414X0053) supported by the Ministry of Education and Science of the Russian Federation.

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**Magnetoelectric effect in bi-layered ferromagnetic film  
(Магнитоэлектрический эффект в двухслойной ферромагнитной пленки)**

Magnetoelectric effect predicted by Landau and Lifshitz is a very topical object of research. Magnetoelectric effects can be realized in different materials. Directly in multiferroics, in which the symmetry of the crystal structure allows for the possibility of the simultaneous existence of magnetic and electrical properties. In the multi-layer structure in which the magnetoelectric effect can manifest itself through a combination of magnetostrictive and piezoelectric materials and in structures with inhomogeneous distribution of the magnetization. Electric polarizations arising close to magnetic inhomogeneities have been studied intensively. Non – uniform magnetoelectric effect bringing about to electric properties of magnetic domain walls has been fairly well studied, while electrostatics of magnetic layered structures has been given insufficient attention.

We appeal to electric polarization induced by non - uniform distribution of magnetization in a vicinity of interface between magnetically ordered layers in ferromagnetic exchange coupled film. Our goal is to explore how magnetic anisotropy affects the magnetically modulated electric polarization in ferromagnetic bi-layers and differs by uniaxial magnetic anisotropy in external magnetic field by taking ferrite garnet films as an example.

We perform theoretical analysis in a frame of phenomenological modeling of spins structures considering two geometries of magnetic field (magnetic field oriented perpendicular to a film plane and magnetic field oriented in a film plane along “hard magnetization” axis). Our results show that the presence of cubic magnetic anisotropy ( $K_c < 0$ ) in the layers allocates the planes of magnetic inhomogeneities and correspondingly the directions of electric polarization. We demonstrate that magnetic field applied along the “hard magnetization” axis leads to the rotation of electric polarization in the  $45^\circ$  range and magnetic field applied along normal to a film influences the magnitude of electric polarization leading to the lowering of polarization after attaining the maximum value. Maximum on  $\mathbf{P}(\mathbf{H})$  dependences becomes more expressed and shifts to the higher magnetic field range with enhancing of cubic magnetic anisotropy ( $K_c$ ) and increasing of the difference between  $K_1$  and  $K_2$ .

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**Dynamic phenomena and external fields effect  
on thin multiferroic films in phase transition**  
(Динамические явления и влияние полей в тонких пленках  
мультиферроиков в области фазовых переходов)

Phase transitions in multiferroics have been studied for a long time. Present theoretical models both microscopic (based on Ising or Heisenberg model) and macroscopic adequately describe phase diagrams of real materials. At the same time, dynamic processes during phase transitions are almost out of attention. In recent years, there was significant progress in understanding of spontaneous polarization origin in multiferroics with noncollinear magnetic ordering, but microscopic causes of this phenomenon are still not completely clear. For these questions, Monte-Carlo methods give satisfactory results. In this work, we simulate magnetic properties of multiferroic thin film consisting of several atomic layers and with periodical boundary conditions using quantum Monte-Carlo method (QMC). Let's consider hamiltonian of the system in the following form:

$$H = -\frac{1}{2} J_{ij}^m s_i s_j + \frac{1}{2} J_{ijk}^{mf} p_i s_j s_k + J_{ijk}^{me} E_i s_j s_k - \mu_B H_i s_i, \quad (1)$$

where  $\vec{s}$  – spin of a site of magnetic sublattice,  $\vec{p}$  – polarization vector of a site of ferroelectric sublattice,  $J_{ij}^m$  – exchange interaction parameter,  $J_{ijk}^{mf}$  – magnetoelectric interaction parameter,  $J_{ijk}^{me}$  – parameter of linear in external electric field of magnetoelectric effect,  $\vec{E}$  and  $\vec{H}$  – external electric and magnetic fields intensities respectively,  $\mu_B$  – Bohr magneton,  $i, j, k = x, y, z$ . For crystal structure, we choose trigonal crystal system. The sum in hamiltonian (1) counts only nearest neighbor sites (in our case there're 8 neighbors for each site).

In our work, we are gradually reaching the equilibrium state of magnetic subsystem by series of spin updating operations on sites. Each iteration, using formula (1) we calculate the energy of site and by Metropolis algorithm choose the new direction for site's spin. When reach thermal equilibrium (which can be identified by minimization of mean magnetization fluctuations), we start the second phase of calculations, during which we calculate mean values of various physical parameters.

As a result, we have obtained thermal dependencies of layer and film magnetizations, diamagnetic susceptibility, heat capacity, and investigated the influence of constant external electric and magnetic fields on phase transition dynamics in multiferroics. Additionally, we have calculated phonon and electron Green functions and dispersion laws for multiferroic film with perovskite structure.

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## The simulation of the thermal field of the layer

### (Моделирование температурного поля пласта при плоскорадиальной фильтрации жидкости)

Thermal methods belong to the advanced recovery methods. They are based on increasing temperature in the layer surrounding the well. Thermal recovery methods are used in the production of high-viscosity paraffin oils and bitumen. We shall deal with the problem of heat conductor injection in the layer for parametrization of the thermal recovery method. The fluid is injected into semi-infinite layer through the well with the radius  $r_w$  with the flow rate  $Q$  and temperature  $T_c$ , which is different from initial layer temperature  $T_0$ .

Temperature and pressure distribution in the layer can be described by the following equations:

$$\begin{cases} \rho c \frac{\partial T}{\partial t} = \frac{\lambda}{r} \frac{\partial}{\partial r} \left( r \frac{\partial T}{\partial r} \right) - v(\rho c)_f \frac{\partial T}{\partial r}; & r_c < r < \infty, t > 0 \\ \frac{\rho c}{r} \frac{\partial}{\partial r} \left( r \frac{\partial p}{\partial r} \right) = \frac{\partial p}{\partial t}; v = -\frac{k}{\mu} \frac{\partial p}{\partial r}; & r_w < r < \infty; t > 0 \end{cases}$$

and boundary conditions:

$$\begin{cases} T(r, t = 0) = T_0 \\ T(r = r_c, t) = T_c \\ T(r = \infty, t) = T_0 \end{cases} \begin{cases} \left( r \frac{\partial p}{\partial r} \right)_{r=r_w} = \frac{Q\mu}{2\pi kh} \\ P(r = \infty, t) = P(r, t = 0) = P_0 \end{cases}$$

By solving this problem using automodelling method we get the following expression for the temperature:

$$T(z) = T_0 + (T_c - T_0) \frac{\gamma(\theta, z)}{\Gamma(\theta)},$$

$$\text{where: } \theta = \frac{Q}{4\pi a h} \frac{(\rho c)_\Phi}{m(\rho c)_\Phi + (1-m)(\rho c)_s},$$

and

$\Gamma(\theta) = \int_0^\infty U^{\theta-1} e^{-u} du$ ,  $\gamma(\theta, z) = \int_0^z U^{\theta-1} e^{-u} du$ , is gamma-function

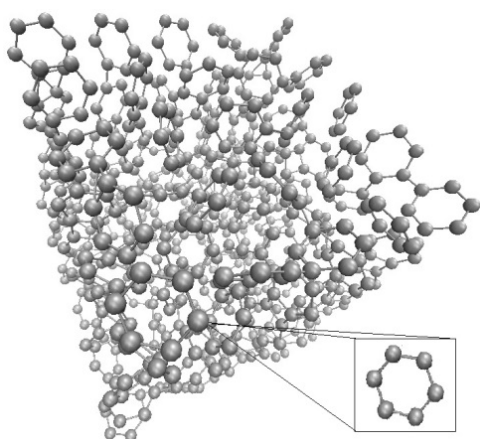
Numerical calculations of the given equation make it possible to define temperature distribution surrounding the well depending on injected fluid and the layer and heat conductor parameters.

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**Plastic deformation of bulk carbon nanostructures as a method of property control (Пластическая деформация объемного углеродного наноматериала как способ управления свойствами)**

Bulk carbon nanomaterials, formed by the action of weak interatomic forces of Van-der-Waals forces, are the subject of active research in the last decade. Such properties of these materials as superconductivity, field emission, non-wetting surface to name a few are extraordinary and very promising for the application. For material science the mechanical properties of nanostructures, opening up vast prospects for their use in nanomechanical devices, superconductors [1] or as electrodes in energy conversion devices [2] are of great interest. Effect of loading type on the mechanical properties of various bulk carbon nanomaterials was presented previously in [3]. Nevertheless, effect of severe plastic deformation, for example shear strain, is not studied properly, while it is of high importance for the understanding of structure formation for bulk carbon nanomaterials.

In this work, the method of molecular dynamics is used for the investigation of the effect of shear strain on the mechanical properties of bulk amorphous carbon for different values of hydrostatic pressure and temperature. The structural units are six-atom carbon rings packed to the simulation cell shown in Fig. 1 with the initial structure density equal to  $1.86 \text{ g/cm}^3$ . The total number of atoms is 750, which is enough to properly represent all the structural peculiarities. The structural elements of the material were oriented randomly in space. The calculations was performed using the simulation package LAMMPS with adapted empirical potential of intermolecular interaction AIREBO.



It was shown that the initial model parameters (temperature, hydrostatic pressure) can considerably affect the formation of amorphous carbon. It has been shown that large plastic deformations have a significant impact on the amorphization of carbon and alter its structural parameters.

Fig. 1. Initial structure of amorphous carbon.



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### **Numerical modeling of thermal conduction process in a three-layer structure (Численное моделирование процесса переноса тепла в трехслойной среде)**

Permafrost region covers two-thirds of our country. When frozen, loose soils - sandstones, gravels and clays - are cemented by ice and become very strong. They can withstand heavy loads and serve as a reliable basis for different foundations. At temperatures close to 0 ° frozen soils become plastic and cannot withstand the weight of constructions.

Cryogenic processes complicate building and exploitation of constructions. The two main problems encountered during the construction under permafrost conditions are:

- subsidence due to natural and human-induced heating of frozen, ice-saturated soils under the foundations of constructions, road mounds and etc.;
- bulging of piles, foundations, bridge supports, substructures of power lines because of volume extension of frozen liquid which turn into ice.

To maintain the constant temperature of the soil and minimize the negative effects, various technologies of thermal insulation are used. One of them is to use extruded polystyrene foam, which has high strength as well as low thermal conductivity. It is used in the erection of various engineering constructions, such as roads.

To obtain the temperature distribution in this medium over time, it is necessary to solve the equation of heat conduction:

$$\frac{\partial T}{\partial t} = a \frac{\partial^2 T}{\partial z^2},$$

where  $a$  – is thermal conduction coefficient.

The equation is solved by implicit finite difference method and we must know the initial temperature distribution in the system and the boundary conditions. If we

consider this system within a large time interval, the upper and lower layers experience different temperature fluctuations, associated with the seasons change.

$$\frac{\partial T}{\partial z} = A(t), z = 0.$$

$$\frac{\partial T}{\partial z} = B(t), z = L.$$

These equations are our boundary conditions. The initial temperature distribution can be found empirically.

Thus, one can obtain the temperature distribution with time in different systems and present the results in graphs.

The results of the conducted research can find practical application.

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### **Research of temperature dynamics in the High-Pressure Air Injection Process (Исследование динамики температуры в процессе внутрипластового горения)**

The increase in the proportion of hard to recover reserves of oil in the world leads to the need to find new and to improve already known methods to increase its extraction. One of these methods is that of HPAI, carried out by injection of air under high pressure (HPAI). The use of this method allows to increase oil recovery up to 50-80%. To improve the application of HPAI technology on real fields and, in particular, to identify fields of applicants it is necessary to study thoroughly the characteristics of the reservoir and its saturating fluids. This paper is devoted to the research of the influence of oil parameters on the characteristics of HPAI process.

To initiate the combustion process in the formation near the injection well bottom, heat is supplied by gas burners, electric heaters or oxidative reactions. After creating the combustion chamber, the air is pumped into the reservoir to maintain the in-situ combustion process. In this case, by making some assumptions, heat transfer process can be described by the heat conductivity equation:

$$\rho c \frac{\partial T}{\partial t} = \frac{\partial}{\partial x} (k \frac{\partial T}{\partial x}) + JQ, \quad (1)$$

where  $Q$  - calorific value of fuel, [MJ/kg],  $J$  - rate of change of oil mass per unit volume of the medium in the oil oxidation process, [kg/m<sup>3</sup>\*s],  $\rho$  - density, [kg/m<sup>3</sup>],  $c$  - specific heat, [J/kg\*K],  $k$  - the coefficient of heat conductivity [W/m\*K],  $T$  - temperature, [C],  $t$  - time, [s].

Software tool for solving the problems has been created: it consists of a module for calculating the oil composition characteristics, and a computational module for

temperature dynamics in the HPAI process. The problem was solved numerically in the MATLAB language by the control volume method on the implicit scheme.

Thus, different possible variants of the HPAI process development have been considered. The results of studies confirmed the necessity to consider the parameters of the oil in the design of HPAI technology on real fields.

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### **The methods of obtaining lithium cobalt oxide $\text{LiCoO}_2$ (Методы получения кобальтата лития $\text{LiCoO}_2$ )**

Lithium cobalt oxide  $\text{LiCoO}_2$  is the most common cathode material in lithium-ion batteries having high voltage and high energy density and capable of prolonged cycling. Lithium cobalt oxide  $\text{LiCoO}_2$  is widely used as cathode material in chemical sources of current. Lithium-based chemical sources of current are light in weight and highly energy-intensive.

Lithium cobalt oxide  $\text{LiCoO}_2$  has a rhombohedral structure (space group  $R\bar{3}m$ ) with unit cell parameters  $a = 2.82$  Å,  $c = 14.05$  Å. Its advantages compared to other cathode materials in simple synthesis include a large number of cycles and a longer battery life.

In the present paper nitrate method was applied for the synthesis of lithium cobalt oxide  $\text{LiCoO}_2$ . Lithium cobalt oxide was synthesized from aqueous solutions using heterocyclic amines (pyridine, amine) as a complex compound of nitrates. Amine nitrates were obtained by adding dilute nitric acid to pyridine ( $\text{C}_5\text{H}_5\text{N} \cdot \text{HNO}_3$ ). After the completion of the reaction the solution was evaporated on a rotary evaporator to dryness. Then crystalline hydrates were subjected to furnacing in air which removed oxides  $\text{NO}_2$ ,  $\text{CO}_2$  and  $\text{H}_2\text{O}$ . Afterwards, the samples were fired in the air in the muffle furnace at temperatures varying from  $350^\circ$  to  $1000^\circ$  C for 1 hour. Certification of lithium cobalt oxide samples was carried out on the apparatus DRON 4-07 on the radiation  $\text{Cu-K}\alpha$ . Diffractograms of compounds synthesized with the help of quinoline and pyridine indicate that the compounds are single-phase. The calculated lattice parameters correlate with the data in other scientific sources.

The study of particles distribution according to their size was carried out on the analyzer SALLD- 7101 of Company «Shimadzu», Japan .

It is shown that the sizes of the sample particles synthesized with the help of pyridine and quinoline are in the range of  $(2 \div 100)$  microns. The distribution of particles in both cases is the same, the bulk of the particles having the size up to 30 microns. Our results are similar to those described in scientific literature.

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**Magnetic vortex dynamics in the conductive magnetic nanostructures**  
**(Динамика магнитных вихрей в проводящих магнитных наноструктурах)**

Recent progress in the growth of high quality thin films of ferromagnetic materials combined with progress in modern nano-lithography techniques has renewed interests in the study of magnetization dynamics. From a fundamental point of view, spin wave excitations can now be studied in individual nanostructures with a complex spatially non-uniform ground state. This progress also opens up the possibility to control and manipulate the magnetization of small objects.

These objects are of great interest for the data storage and information processing, where one of the challenges is to be able to control efficiently the magnetization state of magnetic nanostructures. The reversal of the magnetic configuration implies a trade-off-between energy and speed. In this case resonant processes could be of great help as they bring the system out-of-equilibrium efficiently. The challenge here is to identify the normal spin wave modes of the system in a complex ground state which govern the magnetization dynamics. More recently, it was demonstrated that information processing and data storage could be achieved by using these spin waves themselves. The idea is to transfer and manipulate the energy storage in each normal mode. The new field of magnonics involves the study of the collective properties of periodic magnetic nanostructures and tries to understand the spin waves propagation and interactions in order to manipulate them in a controlled manner

In the individual nanostructures, for example, nanodisks magnetic vortexes are the ground states. In order to describe the magnetic vortex dynamics it is important to study the switching and excitation of oscillations of magnetization in magnetic structures with use of spin-polarized current of rather big density.

Frequencies that are excited by spine moment magnetization oscillations in magnetic nanostructures can be transferred with the help of external field and current, and they can be used further for perspective technical applications. Spin-transferred nanogenerator is the system where two magnetic layers are divided by a non-magnetic layer. Two magnetic layers are in a vortex state and they are interacted by fields of demagnetization and spin-polarized current perpendicular to layers plane. By using analytical approach we examined the magnetic vortex dynamics with taking into account current polarization and external magnetic field.

Studying the magnetic vortex dynamics provides valuable information to relate the modeling of switching polarity in nano-columned structures. Further investigations are going to identify the possibility of management of magnetic vortex dynamics by switching such vortex properties like polarity and chirality.

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**Thermal flooding modeling of reservoir engineering with the hydraulic  
fracturing crack**  
**(Моделирование термозаводнения нефтяного пласта с трещиной  
гидроразрыва)**

Nowadays due to permanent price increase on hydrocarbon material and gradual depletion of reservoirs with the "high-gravity resources of oils", large attention is paid to the development of high-viscosity oils (HVO) and bitumens. World experience of HVO and bitumensextraction showed that the most potential technology of their development are thermal methods of crude-oil production.

The work objective is research of thermal flooding of the layer with the hydraulic fracturing crack. In the layer, saturated by high-viscosity oil (by a bitumen), in a sole part, the horizontal hydraulic fracturing crack is created. Injection of thermophore is produced through this crack over a period of time sufficient for producing the warmed up zone of certain breadth in the layer. In this zone high-viscosity oil acquires mobility and henceforth the injection of the implacement agent is carried out. Determination of technologically important characteristics of a considered process by means of mathematical modeling presents some certain interest. They are:

- temperature distribution in a crack and in the layer, during the injection process;
- time of thermophore injection into a crack, necessary for creation the warmed up zone of the given power in the layer;

We will explain temperature distribution on the stage of thermophore injection into a crack on the basis of Lowery model.

$$T_1 = T_0 + (T_c - T_0) \operatorname{erfc} \frac{\frac{2\pi^2 \lambda_2}{z} + \frac{c_1 Q}{2\sqrt{a_2 t}}}{2\sqrt{a_2 t}} \quad (1)$$

$$T_2 = T_0 + (T_c - T_0) \operatorname{erfc} \frac{z + \frac{2\pi^2 \lambda_2}{c_1 Q}}{2\sqrt{a_2 t}} \quad (2)$$

(where T- temperature, Q and T<sub>c</sub> – fluid-flow rate and temperature injected fluid in the crack, c<sub>j</sub> is a heat capacity of fluid, λ<sub>2</sub> and c<sub>2</sub> is a heat of conductivity and a heat capacity of layer. (Index 1 behaves to the crack, index 2 - to the layer.)

The results of the research can be used for the estimation of efficiency of thermal technologies application depending on physical and chemical properties of the layer and thermophore.

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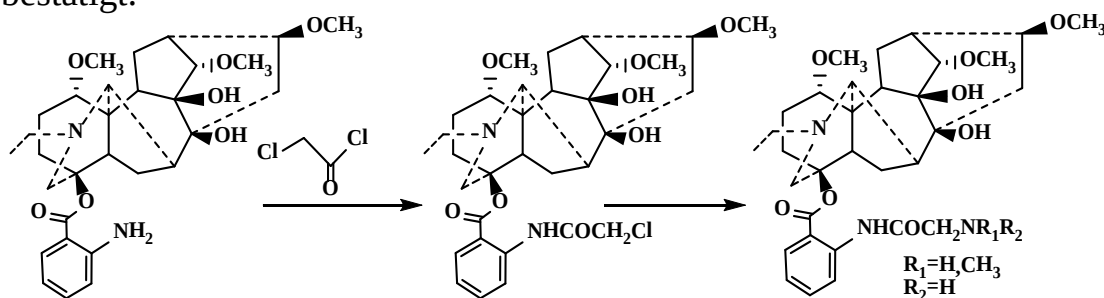
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## Auf Desacetylappakonitin basierende Amide (Амиды на основе дезацетиллаппаконитина)

Früher hat man in der Fachliteratur die Reaktion von N-Desacetylappakonitin mit Chloranhydriden der Benzoessäure, Methacrylsäure, Crotonsäure, Zimtsäure und 2-Chloressigsäure beschrieben, die zu entsprechenden N-Acyl-Derivaten von Desacetylappakonitin mit Ausbeute von 72-86% führt. Bei der Interaktion von N-Desacetylappakonitin mit dem Oxalylchlorid, mit Chloranhydriden der Bernsteinsäure oder der Terephthalsäure wurden bivalente Liganden vom Akonit-Typ erhalten (65-71%).

N'-Chloracetyl-N-Desacetylappakonitin wurde verwendet, um Derivate mit zusätzlichen stickstoffhaltigen Funktionen im aromatischen Rest des Alkaloids zu erhalten. Die Wechselwirkung von N-Chloracil-N'-Desacetylappakonitin mit sekundären Aminen (Diethylamin, Morpholin und N-Methylpiperazin) ergab entsprechende N'-substituierte Glicilamide von Diterpenalkaloiden [1] (Ausbeute: 61-74%), aber die Reaktion mit primären Aminen ist nicht beschrieben.

Wir haben die Wechselwirkung von N-Chloracil-N'-Desacetylappakonitin mit Ammoniak und Methylamin durchgeführt, um dessen N-Glycyl- und N Sarkosil-Derivaten zu erhalten. Den Ausgangs-Desacetylappakonitin haben wir durch saure Hydrolyse (10% H<sub>2</sub>SO<sub>4</sub>) von Lappaconitin hergestellt. Seine Acylierung mit Chloracetylchlorid wurde in Gegenwart von Triethylamin in Benzol durchgeführt. Die Wechselwirkung von N-Chloracil-N'-Desacetylappakonitin mit Ammoniak oder Methylamin wurde in trockenem Methanol durchgeführt, welches vorher durch Hindurchleiten des gasförmigen Amins im Laufe von 4 Stunden unter Rühren und Einleiten von Ammoniak oder Methylamin über die Lösung gesättigt wurde. Die Ausbeute der N-Glycyl-Derivate und N- Sarkosil betrug 30 und 72%. Die Struktur der erhaltenen Verbindungen wurde durch 2D-NMR-Spektroskopie bestätigt.



### **Literatur:**

Романов В.Е. «Синтетические трансформации дитерпенового алкалоида лаппаконитина»// автореферат диссертации на соискание ученого звания кандидата наук. 02.00.03 -органическая химия. Новосибирск 2011.

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### **Rheological properties of chitosan and its complexes with colloidal sol particles of silver iodide (Реологические свойства растворов хитозана и его комплексов с коллоидными частицами золя иодида серебра)**

It is known that polyelectrolyte solutions are characterized by an extended region of semidiluted solutions in which the bundles are already in contact with each other but entanglement network is not formed yet [1]. The reason for this behavior of polyelectrolyte is related to the electrostatic repulsion of like-charged chains preventing the penetration of the bundles into each other and forming entanglements.

The paper deals with the study of rheological properties of chitosan (CTZ) solutions. It reveals the presence of the area of unstructured semidiluted solutions that exist without formation of any fluctuation network. Appending oppositely charged micelles of lyophobic sol of silver iodide to a semidilute polymer solution is followed by the solution cross-linking due to the development of the additional grid formed by the polyelectrolyte complex between the polymer and the colloidal particles. As a result, the concentration range between the crossover concentration and the fluctuation network formation concentration decreases, and viscosity of semidilute solution increases.

Formation of fluctuation entanglement network is also reflected in the concentration dependence of the activation energy of viscous flow determined from the dependence of the dynamic viscosity on the inverse temperature. The kink in the concentration dependence of the activation energy of viscous flow, indicating the change in the mechanism of mass transfer in the solution, occurs at concentrations corresponding to the formation of entanglement concentration  $c_e$ . Note that the values of the activation energy of CTZ viscous flow are low, and in the case of dilute solutions in order of magnitude coincide with the activation energy of viscous flow of the solvent, which is in good agreement with published data obtained for CTZ solutions [2].

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1. Dobrynin A.V., Rubinshtein M., Colby R.H. // *Macromolecules*. 1995. V. 28. №6. P. 1859.
2. Matveenko V. N., Kirsanov E. A. // *Moscow University Chemistry Bulletin*. 2011. V.66. № 4. P. 199.

**Enzymatic destruction of chitosan in acetic acid solution in the presence of amikacin sulfate**

**(Ферментативная деструкция хитозана в растворе уксусной кислоты в присутствии сульфата амикацина)**

Natural polymer chitosan (CHT) is a promising material for producing bioactive protective biodegradable polymer materials for medical applications. One of the promising areas of using CHT is obtaining from CHT solutions the bioactive film materials for medical applications, including the treatment of burns, which are capable of biodegradation. Adding the antibiotic amikacin sulfate to the CHT film can reduce the possibility of suppuration and contributes to the suppression of infection. In the case when CHT is used in combination with drugs the fact must be considered that drugs can often have a major influence on the rate of enzymatic reaction, which dictates the necessity of individual kinetic studies.

The objects of investigation were the CHT specimens produced by the company «Bioprogress» (Russia) with a molecular weight of  $M_{sd}=113000$  and antibiotic amikacin sulfate (AMS) produced by the company «Sintez» (Russia). The hyaluronidase enzyme preparation produced by "Microgen" (Moscow, Russia) was used as the enzyme preparation.

It was found that with increasing the time of exposure to the enzyme CHT solution, the viscosity decreases regularly, indicating a decrease in the molecular weight of CHT. The most significant drop in viscosity occurs in the initial period. Increasing the concentration of the enzyme preparation leads to a natural increase in the rate of incidence of the intrinsic viscosity.

As it was shown by the study, the observed dependence of the initial rate of enzymatic degradation of the substrate concentration can be described within the scheme of the Michaelis–Menten. Submitted to double check, the coordinates (graphical method of Lineweaver-Burk) can accurately determine the values of the Michaelis constant  $K_m$  and maximum speed of enzymatic degradation  $V_{max}$  (Table 1).

Table 1. The values of the constants of the enzymatic degradation in the equation of Michaelis–Menten for CHT solutions in 1% acetic acid.

| The molar ratio of components CHT:AMS | $C_e$ , mg | $K_m$ , g/dl | $V_{max} \cdot 10^6$ ,<br>g/(dL*min) | $V_{max}/K_m$ ,<br>min <sup>-1</sup> |
|---------------------------------------|------------|--------------|--------------------------------------|--------------------------------------|
| 1:0                                   | 0.1        | 3.37         | 0.50                                 | 0.15                                 |
|                                       | 0.2        | 3.47         | 0.90                                 | 0.26                                 |
|                                       | 0.3        | 3.42         | 1.50                                 | 0.44                                 |
| 1:0.01                                | 0.1        | 4.09         | 0.43                                 | 0.10                                 |
|                                       | 0.2        | 4.01         | 0.80                                 | 0.19                                 |
|                                       | 0.3        | 4.03         | 1.20                                 | 0.30                                 |



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**The use of sorbents based on plants for the purification of drinking water  
from toxic impurities**  
**(Применение сорбентов на основе растительного сырья для очистки  
питьевой воды от токсичных примесей)**

One of today's priorities in the field of environmental protection is to find efficient and environmentally friendly technologies for treatment of drinking water from a variety of pollutants (heavy metal ions, organic substances, petroleum products). One promising avenue is a technology based on the use of sorbents. The most attractive sorbents are from waste plant material, because of their unlimited supply, low price, ease of production technology, environmental safety.

The aim of this work was to obtain sorbents from waste processing of sunflower and buckwheat, and to study their sorption properties in relation to heavy metal ions, organic compounds, light and heavy fractions of petroleum products. For the sorption various feedstock materials were washed to remove soluble polysaccharides, lipids and colorants by aqueous ethanol (1: 1) with hot distilled water. Subsequently was conducted soaking in concentrated hydrochloric acid followed by treatment with concentrated sodium hydroxide solution (acid-alkaline sorbent) or by boiling in 4% sodium hydroxide solution, then the material was freeze-dried at  $-20^{\circ}\text{C}$ , followed by steaming (low temperature adsorbent). The resultant preparations were subsequently carefully washed with distilled water, dried in an oven at a temperature of  $+100^{\circ}\text{C}$  up to constant weight. The dried material was ground to a particle size of 1-2 mm. Sorption activity of samples of sunflower husks and buckwheat hulls was examined regarding dissolved pollutants by photocolorimetry method.

The study showed that the most effective sorbent is buckwheat hulls treated by low temperature what makes it possible to extract from water to 85% impurities. Lower sorption capacity have acid - alkaline sunflower husks. All tested materials removed impurities 2-4 times higher than activated charcoal because of modifying the pore structure of plant materials during processing. It has been established that the plant waste can be successfully used as a high-performance, low-cost sorption material concerning different pollutants and at the same time is solved the problem of its rational utilization.

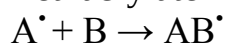
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### **Influence of fullerene C<sub>60</sub> on early stage of free-radical polymerization of vinyl monomers (Влияние фуллерена C<sub>60</sub> на начальную стадию свободно-радикальной полимеризации виниловых мономеров)**

The processes of free-radical polymerization of vinyl monomers in the presence of fullerene C<sub>60</sub> is actively being studied at present. There are differences in the influence of the fullerene C<sub>60</sub> on polymerization of styrene and methyl methacrylate (MMA). So, polymerization of styrene in the presence of C<sub>60</sub> is characterized by the induction period, herewith the polymerization proceeds at the same rate as in the absence of fullerene. In case of polymerization of MMA only decrease in rate of process is observed. This fact can't be explained by experimental research methods. It is therefore advisable to use quantum-chemical simulation of the basic stages of polymerization of styrene and methyl methacrylate in the presence of Fullerene C<sub>60</sub>. Quantum chemical calculations are made at the level of density functional theory (approximation PBE/3z).

Modeling of the interaction of initiating radicals (2-cyanoprop-2-yl and benzoyloxyl radicals) with styrene and MMA, and also chain propagation reaction was made. Heat effects and activation enthalpy of these reactions are presented in the table.

Table 1. Heat effects/activation enthalpy of the elementary stage of free radical polymerization of styrene and methyl methacrylate



| $\Delta H^{\circ}/H_{act},$<br>kJ/mol |                 | $A^{\bullet}$     |                 |                      |                                   |
|---------------------------------------|-----------------|-------------------|-----------------|----------------------|-----------------------------------|
|                                       |                 | PMMA <sup>•</sup> | PS <sup>•</sup> | PhC(O)O <sup>•</sup> | Me <sub>2</sub> C <sup>•</sup> CN |
| B                                     | MMA             | -49.5/18.1        | -               | -94.2/1.6            | -54.9/22.1                        |
|                                       | Styrene         | -                 | -63.8/18.6      | -88.1/1.9            | -61.4/18.8                        |
|                                       | C <sub>60</sub> | -29.0/18.3        | -46.4/9.5       | -74.7/3.9            | -32.2/23.6                        |

As shown in the Table 1 during the polymerization of styrene in the presence of C<sub>60</sub> chain termination reaction of growth radicals on fullerene will predominantly proceed unlike the chain propagation. It may explain the existence of induction period prior to the radical polymerization of styrene in the presence of C<sub>60</sub>. Thus, the products will be formed from the fullerene cage with short polystyrene arms. In the case of radical polymerization of MMA in the presence of C<sub>60</sub> reactions of polymer chain propagation and macroradicals termination on fullerene are equally. Consequently, PMMA chain of medium length will be attached to a fullerene core. Apparently, it can explain retarding of the polymerization of MMA in the presence of C<sub>60</sub>, but not its inhibition by fullerene C<sub>60</sub>.

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**Rheological method of studying the process of structure formation in solutions of amphiphilic copolymers of chitosan with monomers of acrylic series (Реологический способ изучения процессов структурообразования растворов амфифильных сополимеров хитозана с мономерами акрилового ряда)**

The amphiphilic polymers which are block copolymers of units of hydrophobic polymers (polymethacrylate (PMA), polymethyl methacrylate (PMMA)) and water-soluble natural polymer blocks, for example, chitosan (HTZ), are of great interest because of their ability to self-associate hydrophobically in aqueous solutions. This results in unique rheological properties of these solutions, including the ability to form a physical thermoreversible gels that are characterized by high values of modulus of elasticity and having thixotropic properties.

In our research, the hydrophobic modification of Chitosan is made by a radical-chain of blocks of hydrophilic macromolecule Chitosan and its derivatives with hydrophobic polymers chains PMA and PMMA. Chitosan with deacetylation degree of 82%,  $M_w$  80000 amu and an intrinsic viscosity of 7.8 dl/g are used. Block copolymers Chitosan with MA and MMA are prepared in aqueous acetic acid solutions of polysaccharide ( $w=3\%$ ) at concentration of 6% acetic acid, using Azobisisobutyronitrile as the initiator at 333-353 K for 4 hours.

Rheological measurements of solutions of Chitosan and its copolymers Chitosan-PMA, Chitosan-PMMA in 1% acetic acid is carried out on a modular dynamic rheometer Haake Mars III at 250°C. Flow curves and viscosity curves are obtained during continuous shear deformation in the shear rate range of 0.1 to 100  $s^{-1}$ .

It was found that concentration of polymer in solution, the appropriate concentration of forming entanglements, the viscosity solutions of Chitosan is less than viscosity of copolymers of Chitosan-PMA, Chitosan-PMMA, and dynamic viscosity curves in double logarithmic coordinates have the form characteristic of pseudoplastic fluids with a pronounced area greater than Newtonian viscosity. When transited to a concentration than greater concentration of entanglement of formation, the nature of the curves changes some and acquires the shape characteristic of pseudoplastic fluids with nonlinear behavior.

The increase in the activation energy of viscous flow of hydrophobically modified Chitosan and a significant increase in the modulus of elasticity also indicate the presence of associative effects in the systems and the creation of the fluctuation of the grid.

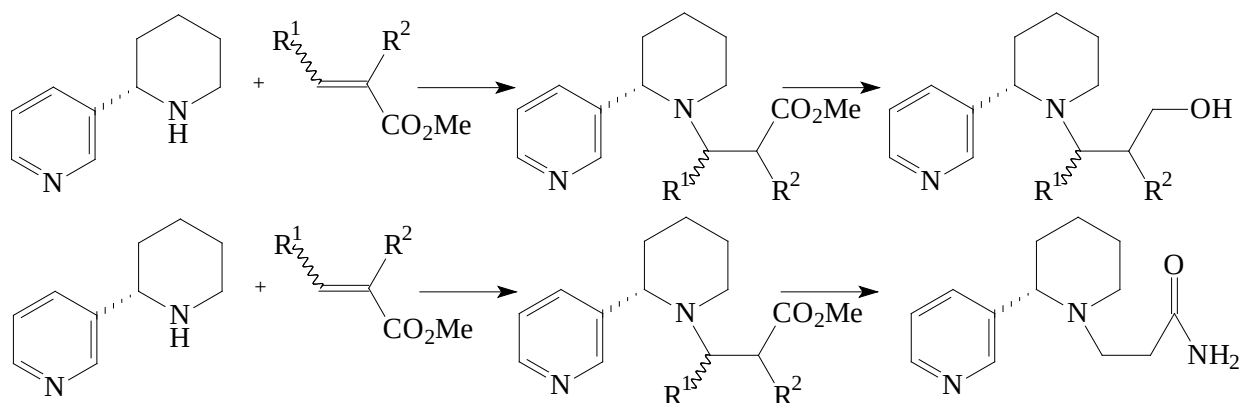
It is expected that modification of Chitosan with a certain sequence of hydrophobic and hydrophilic blocks will give biological structure characteristics to the material properties.

### The preparation of 1,3-hexahydropyrimidine derivatives and *l*-anabasine (Получение производных 1,3-гексагидропиримидина и *l*-анабазина)

The nitrogenous heterogeneous ring compounds containing pharmacophore 1,3-hexahydropyrimidine and anabasine fragments draw attention due to their high potential of biological activity.

Anabasine is an alkaloid containing in a plant of *Anabasis aphylla* L. (a leafless bur grass, goosefoot family (Chenopodiaceae)); it is used external in medicine for treatment of nicotine addiction [1]. Anabasine is a highly toxic substance, and that is why it isn't so popular in medical practice. But anabasine derivants are less toxiferous. High physiologic activity (antifungal, antibacterial, etc. [2-6]) of anabasine derivants determines the development of new techniques of the anabasine row connections which are of great interest for production of medicines.

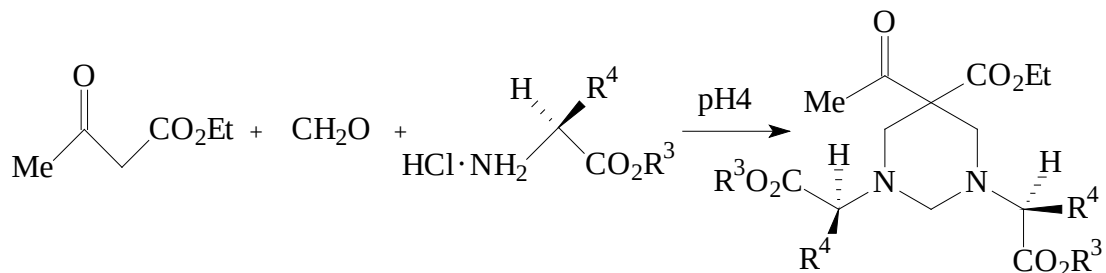
In this work is developed the catalytic method of  $\beta$ - aminoacids synthesis, containing an anabasine fragment on the basis of anabasine interaction with ethers of unsaturated acids and as a result they are synthesized in the  $\gamma$ -aminoalcohol of anbasine row.



The derivants containing a hexahydropyrimidine fragment are biologically fissile connections possessing antitumor [7-11], antiplatelet [12], antibacterial [10,13], antiarrhythmic [14] activities. The hexahydropyrimidine skeleton meets in alkaloids, such as verbametine and verbametrine [15].

In this regard development of efficient techniques of new hexahydropyrimidine derivants for the purpose of studying their biological activity is an actual task. One of the convenient methods of synthesis of new hexahydropyrimidine derivants is the Mannich reaction as the use of suitable connections with the fissile methylene group, and also various amine and aldehyde components, allows to prepare an extensive circle of polyfunctional derivants of this connections class.

In this research is offered the convenient way of synthesis N,N'-disubstituted amino acids of synthetic origin containing the hexahydropyrimidine fragment based on condensation of ethyl-acetoacetate ether with formaldehyde and hydrochlorides of natural amino acids (glycine, l-alanine and l-leucine) by a Mannich reaction.



This reaction was carried out in AcONa system – AcOH – NaOH (pH 4) at room temperature within 48 hours at a molar ratio CH acid: CH<sub>2</sub>O: amino acid equal 1: 15: 4.

Thus, in this work new approaches for synthesis of new derivants of a 1,3-hexahydropyrimidine and l-anabasine are developed, and they open new horizons for production of biological active drugs.

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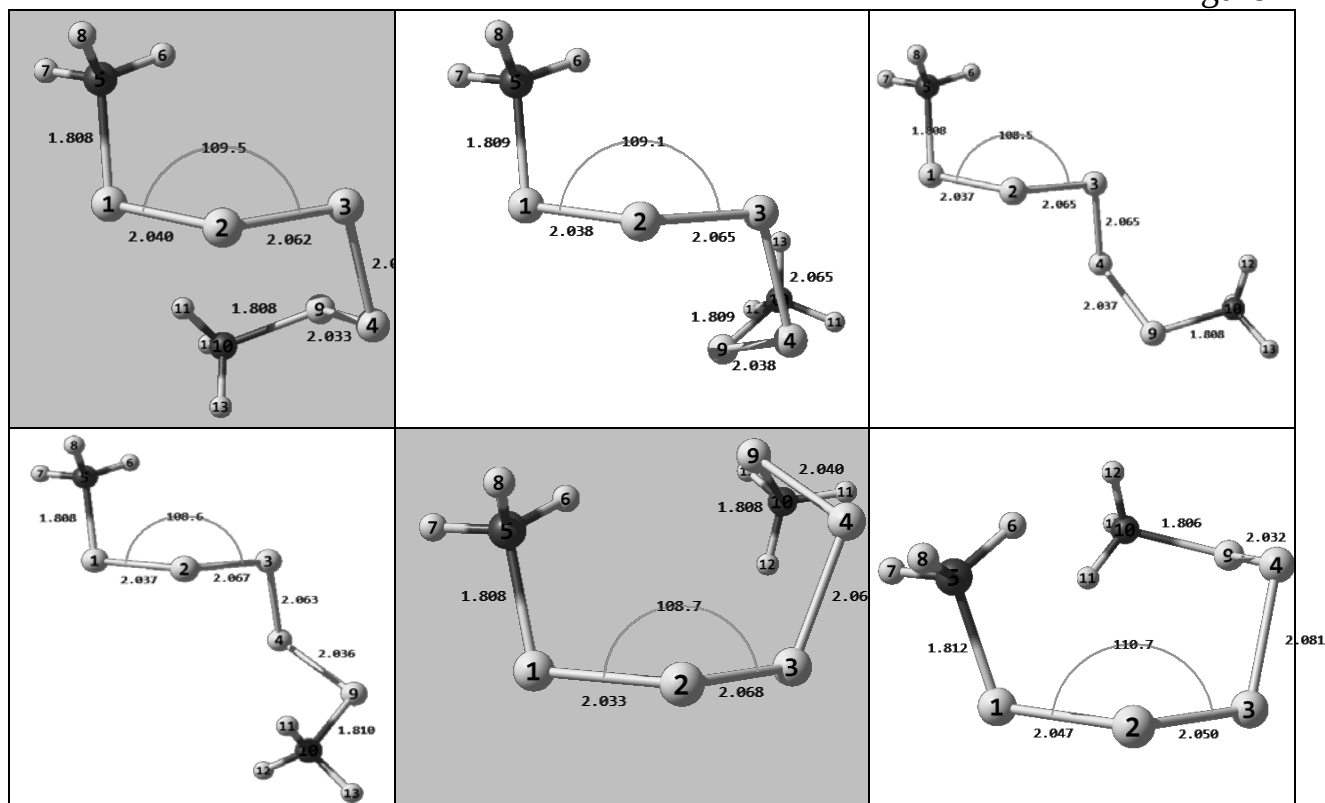
### **Evaluation of potential conformational of dimethylpentasulphide (Оценка конформационного потенциала диметилпентасульфида)**

Polysulphides are multisulphury compounds with a general formula Me<sub>2</sub>S<sub>n</sub>. In the structure of these compounds the atomic chain (dimeric/polymeric) of —S—S<sub>(n)</sub>—S is included. Polysulphides are used in analytical chemistry for division of elements, production of several rubbers (polysulphide rubbers - thiocols) etc. Some of the organic derivatives of peroxysulphide type find their use as a burning compound of solid jet fuels.

The aim of this work is to find the most stable states of the molecule of pentasulphide with its possible further use as rocket fuel, because when using several polysulphides, problems of rocket fuel, such as low efficiency, absence of ecological compatibility, inefficiency and danger can be solved.

In this regard quantum chemical calculations for different dimethylpentasulphide conformations on the DFT level with using functional B3PW91 in conjunction with the basis set cc-pVDZ were carried out. Two most stable conformations of dimethylpentasulphide were established (highlighted in grey in Figure 1.)

Figure 1



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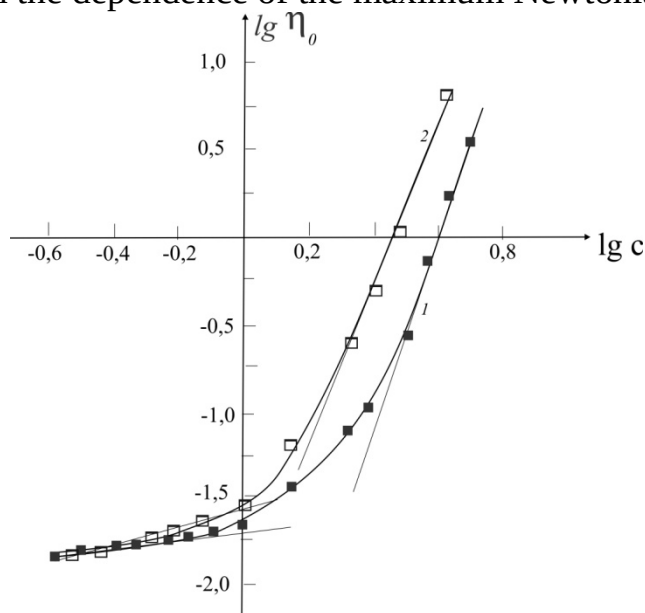
### **Concentration regime and its influence on the rheological properties of chitosan complexes and chitosan succinate with silver iodide sols (Концентрационный режим и его влияние на реологические свойства комплексов хитозана и сукцината хитозана с золями иодида серебра)**

Chitosan is a biopolymer, which has unique properties such as biocompatibility, biodegradability, non-toxicity, that determine the possibility of its wide application in medicine and biotechnology. Research of both the rheological properties of the solutions of chitosan and its salt - chitosan succinate, and their mixtures with positive and negative sols of silver iodide provides information about the degree of structuring of solutions. It is necessary to select the required concentration regime in one case or another.

As objects of research we used the solutions of chitosan in 1% acetic acid in the concentration range 0.2 – 5%, the solutions of succinate of chitosan in the concentration range 0.2 – 10%, as well as their solutions in positive and negative sols

of silver iodide. Rheological method on a modular rheometer Haake Mars III was chosen as a method of research.

Dependence  $\lg \eta_0 - \lg c$  on the concentration curve of pure chitosan (Pic.1) is divided into two sections with a transitional area. At the same time, the concentration of the formation of the fluctuation grid of links  $c_e$  does not coincide with the point of crossover  $c^*$ , which conforms to the hypothesis on the specific nature of polyelectrolyte complexes. And the presence of the transition area means that the macromolecules have contact with each other, but the grid of links has not been formed yet. Addition of sols is accompanied with some increase in viscosity. In such case, the transition area is reduced, and the concentration of the formation of grid of links approaches the crossover point. By nature of dependence of the shear viscosity on the shear rate (Pic.2) it can be clearly seen that the degree of the solutions structuring changes as the concentration of the solution increases. Thus, in the dilute field the viscosity curves have a form similar to a Newtonian fluid, in the field  $c^* < c < c_e$  - have a form characteristic of pseudoplastic fluids, then in passing to the concentration range above  $c_e$  the type of dependence of the shear viscosity on the shear rate for the solutions becomes similar to the non-linear plastic behavior with the ultimate shear stress. Formation of a fluctuation grid of links also affects the concentration dependence of the energy of activation of viscous flow determined from the dependence of the maximum Newtonian viscosity from the temperature.



Pic.1. The concentration dependence of the maximum Newtonian viscosity of chitosan (1) solutions and of systems of chitosan-sol AgI(2). Рис.1 Концентрационная зависимость наибольшей ньютоновской вязкости для растворов ХТЗ (1) систем ХТЗ-золей AgI (2)

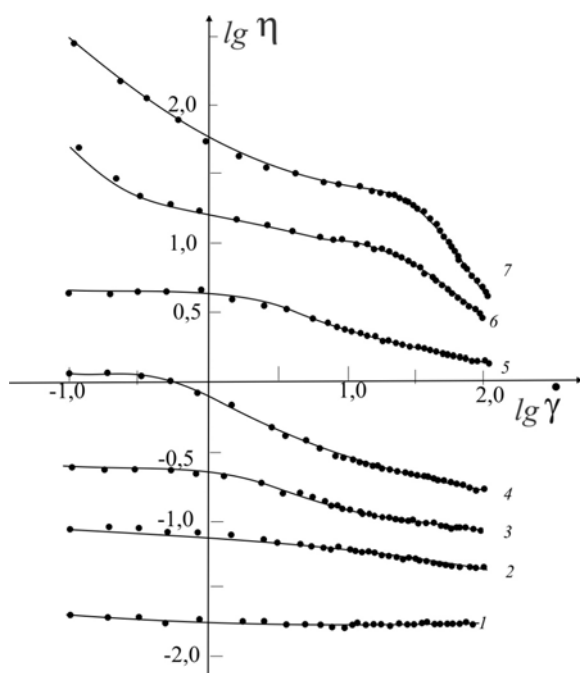


Рис. 2. The curves of viscosity of chitosan solutions (1,3,5) and succinate chitosan solutions (2,4, 6,7) of different concentration: 0,2(1,2), 3(3,4), 5 (5) ,7 (6) and 10 (7)%. Рис.2. Кривые вязкости для растворов ХТЗ (1,3,5) и СХТЗ (2,4, 6,7)

концентрации 0,2(1,2), 3(3,4), 5 (5) и 7 (6) и 10 (7) % масс.

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### **Imidazoline corrosion inhibitors (Имидазолиновые ингибиторы коррозии)**

Nowadays the study of corrosion phenomena has become an important industrial and academic topic. Corrosion leads to huge losses of metals, with complete decomposition of about 10% of the produced iron. According to the Institute of Physical Chemistry, every sixth furnace in Russia works for nothing – all the melted metal turns to rust. Destruction of metal structures, agricultural and transport machinery, industrial equipment causes downtime, accidents, products quality degradation. Possible corrosion consideration leads to higher costs of metal in the manufacture of high-pressure steam boilers, metal containers for toxic and radioactive substances, etc. All the above is a total loss from corrosion. A lot of money is spent on corrosion protection.

The use of corrosion inhibitors is one of the most effective methods to protect metal surfaces against corrosion, especially in acid media. Development of corrosion inhibitors is based on organic compounds containing nitrogen, oxygen, sulfur atoms, and multiple bonds in the molecules that facilitate adsorption on the metal surface.



Corrosion inhibition efficiency of organic compounds is related to their adsorption properties. Adsorption depends on the nature and the state of the metal surface, on the type of corrosive medium and on the chemical composition of the inhibitor. According to the latest research, the adsorption of organic inhibitors depends mainly on some physicochemical properties of the molecule, related to its functional groups, to the possible steric effects and electronic density of donor atoms. Adsorption hypothetically depends also on the possible interaction of the inhibitor p-orbitals with d-orbitals of the surface atoms, which induce greater adsorption of the inhibitor molecules onto the surface of carbon steel, leading to the formation of the protecting film corrosion.

Various imidazoline derivatives are employed as steel corrosion inhibitors. Even though they have been employed in oil industry, only recently extensive research has been carried out to understand the principle of their functioning.

Imidazolines are thermally stable organic nitrogen-containing compounds. Being lipophilic, they are soluble in nonpolar solvents and disperse in aqueous systems. Their ability to form cations leads to their adsorption onto negatively charged surfaces, and as a result these hydrophilic surfaces are converted into hydrophobic ones, which results in the film-forming and anticorrosion properties. Imidazolines are actively used in various industries. It is widely known that imidazolines are used as corrosion inhibitors.

Salts of imidazolines are much more hydrophilic than imidazolines themselves. They are compatible with aqueous systems and are able to form a thin film. Thus, the contact surface with water or aggressive medium is reduced, which reduces corrosion. Imidazoline salts of stearic and oleic acids are used to reduce friction while amidoetilimidazolines are known for their anticorrosive effect. Imidazolines quaternary salts, particularly chlorides and acetates, have the ability to reduce friction and possess anti-corrosion properties.

Thus, imidazoline compounds have a wide range of application, but they have a high cost (200 rubles). In this context, the development of samples of imidazoline compounds on the basis of waste vegetable oils is essential.

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**The interaction of methyl ester of maleopimaric acid with hydrazines**  
**(Взаимодействие метилового эфира малеопимаровой кислоты**  
**с гидразинами)**

Natural compounds are very promising in terms of their availability and toxicity.

Resin is resinous liquid, released when the coniferous trees are wounded, promoting wound healing. It consists of monoterpenoids and diterpene acids (also

known as resin acids). Pine oleoresin is an effective treatment agent widely used in modern medicine. The therapeutic agent exhibits a sufficiently high bactericidal activity decontaminating wide range of microorganisms and bacteria.

Oleoresin pine (various dosage forms) is also used in the treatment of scurvy, boils, weeping eczema, septic wounds, cuts and burns. From this natural therapeutic agents are produced such pharmaceutical preparations for treatment of atherosclerosis, hypertension, cardiovascular disease, gastric cancer, lip cancer, tuberculosis (as expectorant drug).

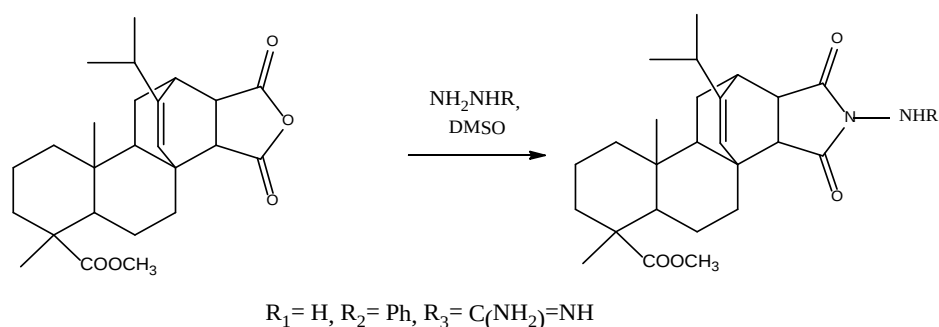
It is difficult to find an adequate substitute to resin acids and their derivatives in the production of synthetic rubber, rubber, paints, inks, paper, special varieties, and many other materials and products of practical importance. They are used in the synthesis of natural hard-to-get metabolites having high pharmacological value [1].

Huge interest is given to the development and introduction of drugs with high antiviral activity. This problem is especially important because of the increasingly wide spread of viral hepatitis. Naturally occurring substances and their synthetic analogs may become such compounds. In this respect levopimaric acid, which is part of the natural resin, is undoubtedly promising. Maleopimaric acid can be easily obtained from levopimaric acid by the reaction of Diels-Aldrich.

Maleopimaric acid and its derivatives exhibit high biological activity [2] due to the fact that the stereochemical features of their structure resembles the stereochemistry of A, B and C rings of steroid hormones [3]. It is also known that used in our reactions methyl ester of maleopimaric acid (MEMPA) shows antiinflammatory and antiulcer activity [4].

We obtained the substances with residue of MEMPA as a convenient synthon for further transformation and access to new bioactive compounds.

MEMPA Interaction with hydrazines extends under condensation in oil bath in the medium of DMSO at the temperature 160 °C.



Scheme. The interaction of methyl ester of maleopimaric acid with hydrazines

Table. Yields of imides on ultrasonic treatment and condensation in DMSO

| R                | H   | Ph  | C(NH <sub>2</sub> )=NH |
|------------------|-----|-----|------------------------|
| Oil bath, 1 hour | 28% | 52% | 53%                    |
| US, 20 min       | 60% | 93% | 87%                    |

Sonication favorably affects the reaction, which is evident from the table.

Thus a convenient route for the synthesis of imides MEMPK using ultrasound is offered, allowed to increase the yield of target products and reduce the process time.

The structures of the compounds were proved by  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR and mass spectrometry.

*This work was financially supported by a grant competition in 2014 in priority direction of activity of the RSF "Conducting fundamental research and exploratory research by individual research groups" (Reference number 14-13-01307). Information support - RFBR grant 13-00-14056. Spectral part of the study was carried out on the equipment CCU "Chemistry" UIC RAS.*

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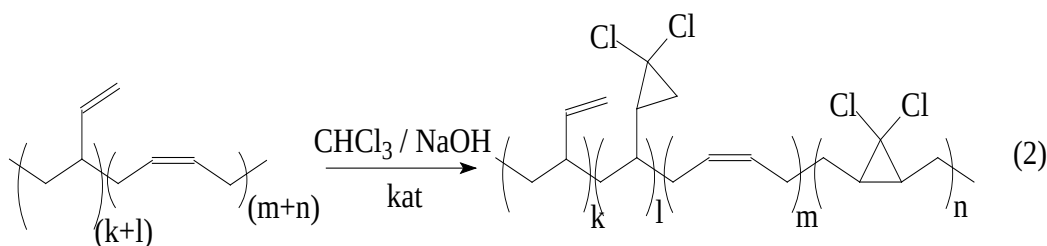
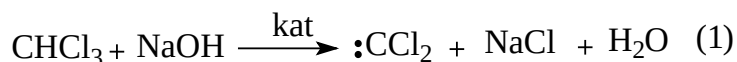
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**Preparation and properties of polymer composites based on  
dichlorocyclopropane 1,2-polybutadienes containing nanocarbon  
(Получение и свойства полимерных композиций на основе  
дихлорциклопропанированных 1,2-полибутадиенов,  
содержащих наноуглерод)**

One of the important directions in the chemistry and technology of nanoscale composites is the synthesis of new polymeric products by chemical modification of existing polymers.

The aim of this work was to obtain polymer compositions based on dichlorocyclopropane 1,2-polybutadienes containing nanocarbon and study the properties of modified polymers.

Syndiotactic 1,2-polybutadiene (1,2-PB) is a polymeric substrate suitable for chemical modification. Due to the presence of reactive carbon–carbon double bonds, this polydiene may be involved in different polymer analogous transformations. 1,2-PB was modified by using of dichlorocarbene generated by the Makosh method. Modification was performed via the interaction of chloroform with a sodium hydroxide aqueous solution in the presence of a phase-transfer catalyst followed by addition of the resulting dichlorocarbene in situ to the double bond of polydiene to give rise to the polymer containing dichlorocyclopropane unit.



The synthesis was performed at 40–45°C under intense stirring (a stirrer speed of 500 rpm); to a solution of polymer and catalyst in chloroform, a solution of sodium hydroxide was gradually added for 5–30 min. 1,2-PB solutions in chloroform (3 wt %) and NaOH aqueous solutions (50 wt %) were used. Triethylbenzylammonium chloride (TEBAC) (1% based on the polymer weight) was used as a phase-transfer catalyst. Modification was performed at 1,2-PB : CHCl<sub>3</sub> : NaOH = 1 : 14 : 1–6 (mol/mol). Chloroform was a common solvent for the polymer and reagent. After completion of the synthesis, the organic layer was separated and washed with 5% aqueous HCl and water; polymer was precipitated from the organic phase with ethanol and dried in vacuum.

Modified polymers were obtained with a chlorine content of 21% to 25%, which corresponds to a degree of functionalization between 41% and 49%. Then, in this dichlorocyclopropaned polymer we entered nanocarbon parts. Dissolved in chloroform, the solution was injected into the nanocarbon and thoroughly stirred at 25°C for 4 hours, whereupon the polymer is precipitated with ethanol. Polymer with a content of ≥ 10% nanocarbon is a hard, brittle material. Nanocarbon chipping is observed in the form of fine powder from the surface of the sample.

#### Conclusions:

1. Introduction of nanocarbon is accompanied by a reduction of glass transition temperature on dichlorocyclopropane 1,2-polybutadiene at 10–50°C.
2. The presence of nanocarbon composed on dichlorocyclopropane 1,2-polybutadiene leads to a shift interval polymer degradation by higher temperatures. Composites containing 10% nanocarbon are characterized as high energy ones.

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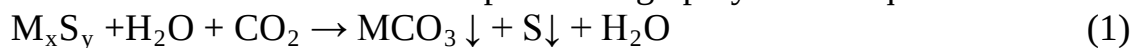
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**Methods of synthesis of calcium carbonate, strontium and barium nanoparticles from polysulfide solutions**  
**(Методы получения наночастиц карбонатов кальция, стронция и бария из растворов полисульфидов)**

The possibility of simultaneous precipitation of two kinds of sulfur nanoparticles and carbonates salts by passing carbon dioxide through polysulfide solution was found out. It has an important practical application.

Due to the above, the aim of this research was to obtain nanoparticles with the use of the method of carbon dioxide pass through polysulfide aqueous solution:



The reaction resulted in the formation of dispersion that contained a mixture of carbonate salt and sulfur particles that further precipitated. Next, the precipitate was separated by a filter and dried. To isolate the carbonate particles from the mixture it was necessary to mix the precipitate with hydrazine hydrate and monoethanolamine mixture, which dissolved the sulfur at room temperature. Subsequently, the carbonate particles were filtered and isolated as a dry powder. After that the sulfur dissolved in the mixture of hydrazine hydrate and monoethanolamine was also isolated by mixing with hydrochloric acid, then filtered and dried consequently.

The particles size measurement was performed by a laser analyzer Shimadzu SALT 7101, the particles shape and size were analyzed by a probe microscope Solver PRO-M, the structural characteristics analysis was conducted by a Rigaku Ultima IV X-ray diffractometer, the infrared absorption (IR) spectrum analysis was performed using a Bruker-Optic GMBH Vector 22 spectrometer, the biological activity – growth-regulatory effects of sulfur and calcium carbonate nanoparticles mixture – was also studied.

Integral and differential particles size distributions were measured for each powder. Previously it was found out that primary sulfur nanoparticles with an average size of 20 nm precipitated from polysulfides solutions when mixing them with acid solutions. These particles then grew in two steps to micron sizes. Calcium carbonate, barium carbonate and strontium carbonate particles size distribution, measured at different moments of time are shown on Figure 1, Figure 2 and Figure 3 respectively.

The peculiarity of our method is that two target products are obtained. The developed method differs from the existing ones and has a lot of advantages: availability, cost effectiveness and simplicity of implementation. It was found out that the particles size could be adjusted by adding various stabilizers.

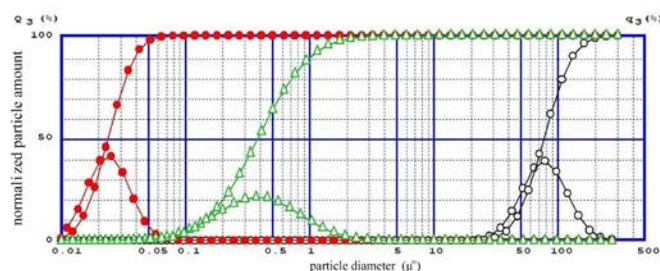


**Figure 1.** Integral and differential calcium carbonate particles size distributions derived from calcium polysulfide by passing it through the solution of carbon dioxide with hydrochloric acid, that were observed immediately after the formation of particles (curve ●), after the first enlargement (curve ▲) and after the second enlargement (curve ○).

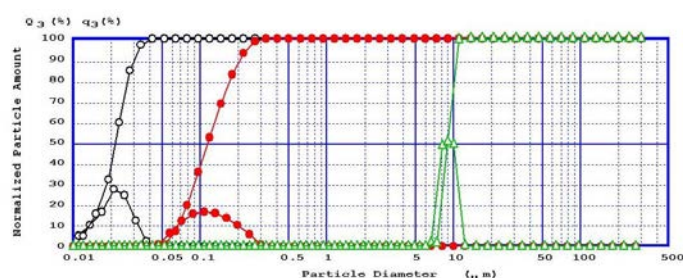


**Figure 2.** Integral and differential barium carbonate particles size distributions derived from barium polysulfide by passing it through the solution of carbon dioxide with hydrochloric acid, that were observed immediately after the formation of particles (curve ○), after the first enlargement (curve ●) and after the second enlargement (curve ▲).

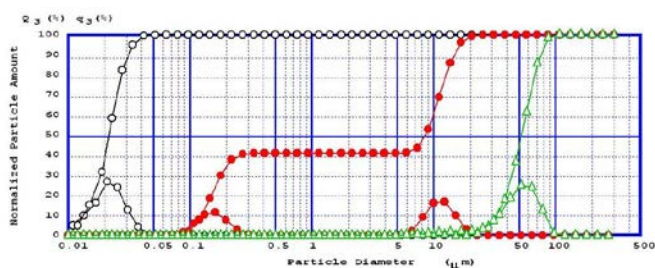


**Figure 3.** Integral and differential strontium carbonate particles size distributions derived from strontium polysulfide by passing it through the solution of carbon dioxide with hydrochloric acid, that were observed immediately after the formation of particles (curve ○), after the first enlargement (curve ●) and after the second enlargement (curve ▲).

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**Theoretical investigation of the role of formaldehyde dimers  
in the Prins reaction (Теоретические исследования роли димеров  
формальдегида в реакции Принса)**

The Prins reaction is an organic reaction consisting of an electrophilic addition of an aldehyde or ketone to an alkene or alkyne followed by capture of a nucleophile.

Some features of adding a formaldehyde dimer to alkenes by the Prins reaction with the formation of oxygen-containing heterocycles are studied at the MP2(fc)/6-31G(d) computational level. The structure of the transition states and key intermediates are established, and thermochemical reaction parameters are determined. It is shown that this interaction in the gas phase or nonpolar media with the formation of 1,3-dioxanes is a single-stage pseudo synchronous syn-addition. Alkyl substituents at the double bond reduce activation energy. It is revealed that the hydrogenated pyrans formation by the Prins reaction is possible not only with the participation of formaldehyde monomers, but with its oligomers either. However, the activation energy of this reaction is higher than that of 1,3-dioxane formation. As a multichannel reaction, the Prins reaction is a convenient technique of the formation of oxygen-containing heterocycles. However, in some cases, this multipathing is considered to be a drawback. For instance, the first stage of the isoprene synthesis by the “dioxane” method is accompanied by the formation of a large number of by-methyldihydropyrans (up to 20 %), which decreases the efficiency of this method. Obviously, in order to find new way to increase the selectivity of the first stage, the mechanism of Prins reaction should be understood better. Product formation by way of cascade involvement of one or two molecules of formaldehyde monomer is considered one of the generally accepted mechanisms of the Prins reaction. The selectivity of this reaction can be defined not only by the structure of alkenes, but the ratio of formaldehyde monomer to oligomers, too.

Experimental and theoretical data, clearly demonstrate that the presence of formaldehyde oligomers (FO) is a prerequisite for the 4-alkyl-1,3-dioxanes formation, whereas FO are much more reactive than the monomer. It is shown that FO can play an important role in the formation of dihydropyrans from alkenes with endo-double bond in non-aqueous solvents. In water, dihydropyrans become a major product of the Prins reaction only in the interaction of formaldehyde monomer with alkenes with exo-double bond.

It is assumed that the FO addition at the double bond can be described as sequential, or pseudo synchronous.

The implementation of the two mechanisms corresponds to the experimental data on a stereoselective Prins reaction for a series of cycloalkenes. However, the role

of FO in the Prins reaction and its reactivity in addition to the alkenes with various structures are still poorly described.

In this work, we studied some features of FO and alkene interaction resulting in the formation of oxygen-containing heterocycles. The geometric structures of the key intermediates and reaction transition states are considered depending on the alkene structure. The following alkenes were used as model compounds: ethylene (1), propylene (2), 1-butene (3), isobutylene (4) and trans-2-butene (5). A formaldehyde dimer (FD) served an example for FO calculation. PC GAMESS v7.1 programs were used in carrying out quantum and chemical calculations. Searching for the equilibrium geometry of the transition states was carried out by the MP2 (fc)/6-31G (d) approximation. Verification of the transition state was made by calculating vibrational parameters for the obtained transition state geometry with the subsequent analysis of the calculated frequencies of the IR spectrum, as well as modeling the found transition state into the starting materials and final products by means of the IRC procedure. The degree of asynchrony in the cyclization reaction was calculated by the method. Bond orders were calculated by a literature method .

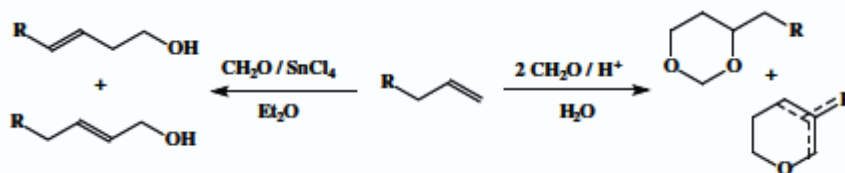


Fig.1 The Prins reaction products.

Due to the analysis of the calculated data of the transition state structures of 4-alkyl- 1,3-dioxane formation from FO and alkenes, it is found that 1,3-dioxane structures are formed in the result of direct isomerization of p-cation on the first stage. A freer-cation formation is not observed here.

It is shown that interaction of FO with alkenes in gas phase or non-polar solvents, accompanied by 1,3-dioxane formation must occur as a pseudo synchronous synaddition.

Only FO addition to ethylene can be considered as a synchronous interaction. The highest activation energy is observed in the case of the ethylene reaction. The introduction of alkyl substituents at the double bond leads to lower activation energy.

The calculations show that the formation of hydrogenated pyrans can be carried out by FD and alkenes reaction accompanied by 1,3-dioxanes formation as well.

However, the activation energies of these reactions are higher than the ones of 1,3-dioxanes formation.



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**Associative polymers for physicochemical methods of enhanced oil recovery  
(Ассоциативные полимеры для физико-химических методов  
нефтеотдачи)**

The consumption of oil products increases every year and the efficiency of oil recovery from oil reservoirs by modern industrial methods is considered to be insufficient. The approximate oil recovery in different countries and regions is on an average between 25 and 40%. The residual oil reserves account for 55 to 75% from the initial stock. For that reason, the problem of application of new technologies in oil production is important today.

Generally, 3 phases can be considered in oil recovery. The first one suggests natural energy of the oil reservoir for oil production. The amount of the recovered oil in this case accounts for 5 to 15%. On the second phase the methods of maintaining reservoir pressure are realized by the injection of water or gaseous substances. Here the incremental value of the recovered oil is between 10-20%. And the third phase suggests the method of chemically enhanced oil recovery (MCEOR). It consists of thermal treatment, non-thermal treatment such as electrical, miscible, steam and chemical methods. The aim of these methods is to increase oil recovery from 10 to 35%.

One of the urgent problems of enhanced oil recovery with the use of polymer compositions is the organization of processing of water-washed areas of the reservoir by injection wells in non-uniform permeable reservoirs, unseparated by permeability barriers. In this case, it is necessary to organize gel screens placement when filtering on an extended distance from the injection well. Among the promising areas of impact on the washed out areas in the inter-well space currently one shall note the use of associative polymers.

Associative polymers are being actively studied in connection with the necessity of creating polymers possessing a higher thickening power than conventional water-soluble polymers (for example, polyacrylamide). These polymers are copolymers of a hydrophilic acrylamide monomer with a small (0.5 to 3 meaulnes.%) content of a hydrophobic monomer (for example, N-alkyl - or N-arylacetamide).

When using associative polymers it is possible to create a viscoelastic system without introduction of additional delayed crosslinker, but only due to the interaction of hydrophobic sections of the circuit. Moreover, associative bonds of hydrophobic clusters, unlike chemical bonds between polymer chains and crosslinking agents, dissolve reversibly and are able to recover. It is assumed that the solution of such a polymer subjected to high shear deformations upon dissolution, injection both into

the reservoir and the bottomhole formation zone will gain viscosity due to the restoration of associative relations, as it moves into the reservoir and decreases the flow rate.

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### **Fullerenes (Фуллерены)**

A fullerene is a molecule of carbon in the form of a hollow sphere, ellipsoid, tube, and many other shapes. Spherical fullerenes are also called buckyballs, and they resemble the balls used in football (soccer). Cylindrical ones are called carbon nanotubes or buckytubes. Fullerenes are similar in structure to graphite, which is composed of stacked grapheme sheets of linked hexagonal rings; but they may also contain pentagonal (or sometimes heptagonal) rings. The first fullerene molecule to be discovered, and the family's namesake, buckminsterfullerene ( $C_{60}$ ), was prepared in 1985 by Richard Smalley, Robert Curl, James Heath, Sean O'Brien, and Harold Kroto at Rice University. The name was homage to Buckminster Fuller, whose geodesic domes it resembles. The structure was also identified some five years earlier by Sumio Iijima, from an electron microscope image, where it formed the core of a "bucky onion".

Fullerenes have since been found to occur in nature. More recently, fullerenes have been detected in outer space. The discovery of fullerenes greatly expanded the number of known carbon allotropes, which until recently were limited to graphite, diamond, and amorphous carbon such as soot and charcoal. Buckyballs and buckytubes have been the subject of intense research, both for their unique chemistry and for their technological applications, especially in materials science, electronics, and nanotechnology.

Another fairly common fullerene is  $C_{70}$ , but fullerenes with 72, 76, 84 and even up to 100 carbon atoms are commonly obtained. In mathematical terms, the structure of a fullerene is a trivalent convex polyhedron with pentagonal and hexagonal faces. In graph theory, the term fullerene refers to any 3-regular, planar graph with all faces of size 5 or 6 (including the external face). It follows from Euler's polyhedron formula,  $V - E + F = 2$  (where  $V$ ,  $E$ ,  $F$  are the numbers of vertices, edges, and faces), that there are exactly 12 pentagons in a fullerene and  $V/2 - 10$  hexagons.

The smallest fullerene is the dodecahedral  $C_{20}$ . There are no fullerenes with 22 vertices. The number of fullerenes  $C_{2n}$  grows with increasing  $n = 12, 13, 14, \dots$ . For instance, there are 1812 non-isomorphic fullerenes  $C_{60}$ .

One should note that only one form of  $C_{60}$ , the buckminsterfullerene alias truncated icosahedron, has no pair of adjacent pentagons. Trimetasphere carbon nanomaterials were discovered by researchers at Virginia Tech and licensed exclusively to Luna Innovations. This class of novel molecules comprises 80 carbon atoms ( $C_{80}$ ) forming a sphere which encloses a complex of three metal atoms and one nitrogen atom. These fullerenes encapsulate metals, which puts them in the subset referred to as metallofullerenes.

Fullerenes and carbon nanostructures have already shown a wide range of unique physical and chemical properties that make them attractive for the synthesis of new advanced materials. Applications encompass a wide spectrum of technologies and many developments rely on new materials and our ability to understand their properties. More research in this area is clearly needed to fully explore the possibilities offered by these materials, for example, in nanoscience, biosensors, and photovoltaics.

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### **Polymer composite materials**

#### **(Полимерные композиционные материалы)**

Composite materials are materials made from two or more constituent materials with significantly different physical or chemical properties. Being combined, they produce a material with characteristics different from the individual components. The individual components remain separate and distinct within the finished structure. The new material may be preferred for many reasons. Common examples include materials, which are stronger, lighter and less expensive when compared to traditional materials.

Composites with a polymer matrix are composites in which the matrix is a macromolecular compound. As a matrix for the creation of composite materials of this type different types of polymers are used: thermoplastics (polyolefins, aliphatic and aromatic polyamides, etc.), thermosets (phenolics, aminoplasts, epoxy, polyester, silicone and other polymer binders), elastomers (vulcanized natural, NBR, butyl rubber, and other rubbers). Use of fillers allows to modify the mechanical, electromagnetic, physical and chemical characteristics of the starting polymer, and in some cases reduce the cost of the final composite, as compared to the cost of the polymer through the use of a cheaper filler such as chalk than the polymer. Plenty of commonly used materials are composite polymer materials, e.g., general-purpose constructional materials based on thermosetting fibrous fillers, automobiles tires, dental fillings, various coatings. A special class of polymer composites are polymer

nanocomposites. In this case fillers varying on both chemical composition and morphology of individual elements are used as an additive to the polymer matrix. The distinctive feature of these fillers is the size of their constituent elements, which should preferably be less than 100 nm. Properties of composites of this type are subject to change at very small changes in the filler concentration due to its large specific surface area and intense intermolecular interaction with the polymer. At present, new methods for the preparation and study of the properties of various polymer nanocomposites are being actively developed.

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**Anti-inflammatory activity of the acetylenic derivatives of levopimaric acid and products of their transformations (Противовоспалительная активность ацетиленовых производных левопимаровой кислоты и продуктов их превращений)**

The rational use of plant metabolites as a platform for the discovery of new medicinal agents takes advantage of the structurally unique building blocks provided by nature for the rapid increase of molecular complexity. Diterpene resin acids (DRA), produced by conifers, combine an unusual stereochemically defined hydrocarbon scaffold with the possibility for possible functionalization via reactions at the carboxyl group. Levopimaric acid (LpA), the main component of pine oleoresin, is one of the most important in this family.

The relative content of Levopimaric acid in the resin of Scots pine *Pinus sylvestris* and its relative *Pinus hamata* reaches 27% and 36%, respectively. Along with the other diterpene resin acids, it plays a key role in providing defense against insects and microbial pathogens. In general, the abietene types of diterpene resin acid display a broad spectrum of biological activity. In particular, derivatives of Levopimaric acid show antibacterial, The rational use of plant metabolites as a platform for the cardiovascular and antioxidant activities. The general mode of biological activity of abietene derivatives is related to their antiinflammatory properties. These properties are based on the suppression of inflammatory cytokines production and COX-2 expression. Dehydroabietic acid significantly decreases the production of pro-inflammatory mediators (MCP-1, TNF $\alpha$ , NO) in LPS-stimulated RAW264 macrophages and in mixed cell line of macrophages and adipocytes. Abietic acid was used as a building block for the preparation of heterocyclic derivatives close in activity to prednisolone but less toxic. Synthetic transformations based on the natural compounds expand medicinal potential of the nature's molecular

treasury. For compounds of levopimaric acid family, an important role is played by the Diels-Alder reaction, usually with various benzo- and naphthoquinones. This efficient transformation provides a very convenient method for the isolation of LpA from complex mixture of product derived from the pine oleoresin. Furthermore, the recently reported adducts of LpA with benzoquinones display activity comparable with orthophen. The derivatives of dihydroquinopimaric acid show a particularly attractive combination of high antiinflammatory activity with low toxicity. These examples illustrate the potential of abieticditerpenoids as a structural scaffold in the design of anti-inflammatory agents. In this aspect, LpA remains the less studied in this family of compounds. As a part of our ongoing research program dedicated to the investigation of plant metabolites produced by trees and herbs of Siberia, we present the first synthesis of acetylenic derivatives of LpA, selected transformations of these compounds, and studies of the anti-inflammatory activity with the aim of better understanding of the structure-activity relation. Presence of acetylenic moiety into natural and designed medicinal agents can play important role in the mechanism of their biological activity. Furthermore, it introduces possibilities for the further structural modifications. This strategy has been successfully applied to natural compounds of triterpenoid family.

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**New approaches to improve the efficiency of isoprene production  
by "dioxane" method (Новые подходы для повышения эффективности  
производства изопрена по «диоксановому» методу)**

The production volume of isoprene, which is one of the most important monomers in the manufacture of synthetic rubbers, is increasing year to year. Synthetic isoprene rubber is widely used in various industries: automotive, electrical, aviation, engineering and others.

In industry isoprene is produced in two ways: dehydrogenation of isopentane fraction and "dioxane" method. Each of these methods has its advantages and disadvantages. Due to the energy price increase and scarcity of isopentane, used in the production of motor gasoline, the first method is losing its economic profitability.

An alternative method for producing isoprene is represented by a two-stage process based on the pyrolysis of 4,4-dimethyl-1,3-dioxane, which is synthesized at the first step by the Prins reaction. The advantage of this method is a high purity of the resulting isoprene and small energy consumption. The disadvantage is the formation of a large amount of by-products at the first step, up to 30%. At the

moment the possibility of increasing the selectivity of 4,4-dimethyl-1,3-dioxane formation by optimizing production technology has practically been exhausted.

Long-term studies conducted at the Department of Organic and Bioorganic Chemistry aimed at clarifying the mechanism of the Prince reaction, have shown that the reaction of formation of 1,3-dioxanes mainly involves formaldehyde oligomers, which are more reactive than a monomer.

Reduced activation energy of this reaction will enhance the selectivity of 1,3-dioxanes formation. This can be achieved by the use of co-catalysts promoting the reaction by selectively binding to the transition state. To create such a co-catalyst, we performed quantum chemical calculations in order to clarify the Prince reaction mechanism, we also found the transition state of the reaction and determined its structural parameters. This enabled us to determine the structure and characteristics of the heterogeneous co-catalyst capable of selectively adsorbing the transition state of formation reaction of 1, 3-dioxanes and as a consequence to catalyze selectively this very reaction.

We have conducted a number of experimental studies wherein the effect of the found co-catalyst on the reaction and its optimum amount in the reaction mixture necessary to improve the selectivity of 1,3-dioxane.

Introduction of the co-catalyst will increase the profitability and environmental compatibility of the dioxane method due to the increase of the yield of 4,4-dimethyl-1,3-dioxane, reduction of energy consumption, reaction time and the amount of byproducts that will ultimately reduce the cost of isoprene production.

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### **Synthesis of oxime, acetals and alcohols on the basis of 3-formil-12-N-metilcytisine**

**(Синтез оксимов, ацеталей и спиртов на основе 3-формил-12-N-метилцитизина)**

The synthesis of new derivatives of quinolizidine alkaloid (-)-cytisine, the natural ligand of nicotinic acetylcholine receptor (nAcChR), is interesting from the point of view of their neuropharmacological activity. More than thousand of (-)-cytisine analogues are obtained by chemical transformations, based on the reactions of its secondary amino group, but derivatives obtained by functionalization of his 2-pyridring have not been systematically investigation. Thereupon we decided to make an attempt to synthesize new derivatives of (-)-cytisine with formil moieties at the 3d position.

Aldehydes play a prominent role in synthetic organic chemistry and reliable methods to prepare this versatile functional group are consequently of great importance, because the versatility of aldehydes as starting material for the synthesis of various bioactive molecules is of pharmaceutical interest. Moreover, the aldehydes easily enter the condensation reaction.

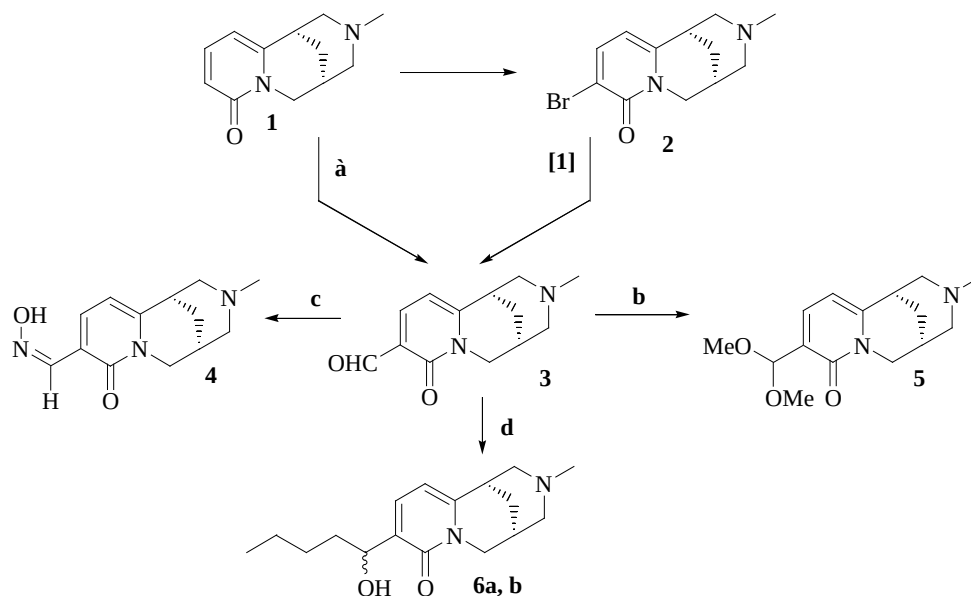
During the course of our research related to the synthesis of aldehydes we tested various methods reported in literature such as the reaction of Gatterman, Gatterman - Koch, Vilsmeier - Haack, and Rimera - Timman for aromatic and pseudoaromatic systems. However, the above mentioned methods suffer from various drawbacks such as long reaction times, low yields, drastic reaction conditions, use of hazardous, expensive and easily inaccessible reagents and some of them also involve tedious workup procedures.

It has only been reported that aldehydes of quinolizidine alkaloid (-)-cytisine were prepared via carboxylic organic magnesium compounds obtained from the corresponding halide [1]. We use efficient and simple method for direct formylation of *N*-methylcytisine. In the Duff reaction, a mixture of **1**, hexamethylenetetramine and trifluoroacetic acid was heated at reflux for 12 hr. The product was isolated by column chromatography (80%).

Obtained in the previous series of experiments, 3-formyl-12-*N*-methylcytisin **3** is immediately transformed into acetal **5** (50%) in contact with methyl alcohol in an acidic medium.

The interaction of aromatic aldehydes with amines is a convenient method of synthesis oximes. Thus aldehyde **3** was involved in the reaction with hydroxyl amine in pyridine at room temperature to give the oxime **4** (30%).

The chemical reduction of aldehydes to the corresponding alcohols is a well-known and easy reaction that can be performed using many different reagents. Organic lithium and magnesium compounds were used in our investigation.



**Reagents and conditions:** a)  $\text{CF}_3\text{COOH}$ , hexamethylenetetramine, 70 °C; b) MeOH, p-TSA, 20 °C; c)  $\text{NH}_2\text{OH}\cdot\text{H}_2\text{SO}_4$ , Py, 20 °C; d) BuLiилиBuMgBr,  $\text{Et}_2\text{O}$ , 20 °C.

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#### **Hopfenberg- Hixson-Crowell model** **(Модель Хопфенберга-Хигсена-Кроуелла)**

Among all drug delivery systems, oral drug delivery is the most preferred route for administration for various drugs. Recently, pharmaceutical research has focused on controlled drug delivery. Controlled delivery systems that can provide zero-order drug delivery have the potential for maximizing efficacy while minimizing dose frequency and toxicity. Systems such as multilayered tablets and other geometrically altered devices have been created to perform this function. The multi-layered matrix system overcomes inherent disadvantages of non-linearity associated with diffusion controlled matrix devices by providing additional release surface with time to compensate for the decreasing release rate. This technology also demonstrates a wide flexibility for various applications. Polymeric materials play an important role in the functioning of these systems. Hydrophilic polymers are mainly used for preparation of matrix type controlled delivery systems. Mathematical models are used to determine the kinetics of drug release from drug delivery systems. The quantitative analysis of the values obtained in dissolution/release rates is easier when mathematical formulae are used to describe the process.

Hopfenberg developed a mathematical model to correlate the drug release from the surface of eroding polymers so long as the surface area remains constant during the degradation process. The cumulative fraction of drug released at time  $t$  was described as:  $M_t / M_\infty = 1 - [1 - k_0 t / CL]^n$ , where  $k_0$  is the zero order rate constant describing the polymer degradation (surface erosion) process,  $CL$  is the initial drug loading throughout the system,  $a$  is the radius for a sphere or cylinder, and  $n$  is an exponent that varies with geometry  $n = 1, 2$  and  $3$  for slab (flat), cylindrical and spherical geometry, respectively. Application: this model is used to identify the mechanism of release from the optimized oil spheres using data derived from the composite profile, which essentially displayed site-specific biphasic release kinetics.

Hixson and Crowell recognized that the particles regular area is proportional to the cube root of its volume. They derived the equation:  $W_0^{1/3} - W_t^{1/3} = \kappa t$ , where  $W_0$  is the initial amount of drug in the pharmaceutical dosage form,  $W_t$  is the remaining amount of drug in the pharmaceutical dosage form at time  $t$  and  $\kappa$  (kappa)



is a constant incorporating the surface volume relation. The equation describes the release from systems where there is a change in surface area and diameter of particles or tablets. To study the release kinetics, data obtained from in vitro drug release studies were plotted as cube root of drug percentage remaining in matrix versus time. Application: this expression applies to pharmaceutical dosage form such as tablets, where the dissolution occurs in planes that are parallel to the drug surface if the tablet dimensions diminish proportionally, in such a manner that the initial geometrical form keeps constant all the time.

Reviews of the kinetic modeling on drug release show that these models have been established to describe the relationship between drug dissolution and geometry on drug release patterns mathematically. It is evident from the pharmaceutical literature that no single approach is widely accepted to determine if dissolution profiles are similar. The application and evaluation of model dependent methods and statistical methods are more complicated, whereas the model dependent methods present an acceptable model approach to the true relationship between the dependent and independent variables of the dissolution data. The disadvantages of the model independent methods are the values of M1 and M2 which are sensitive to the number of dissolution time points and the basis of the criteria for deciding the difference or similarity between dissolution profiles is unclear. The limitation is that only when the within-batch variation is less than 15%, M2 equation should be used.

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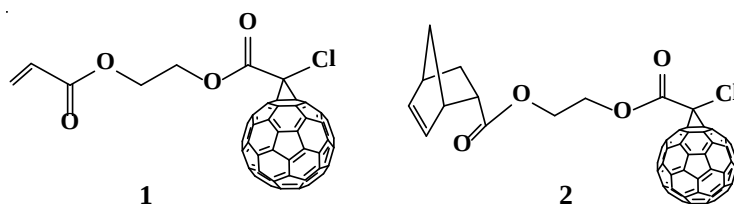
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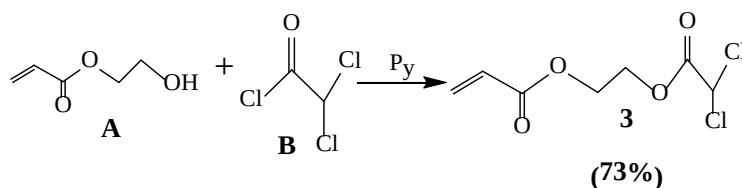
**Synthesis of fullerene-containing monomers and copolymers  
based on derivatives of dichloroacetic acid (Синтез  
фуллеренсодержащих мономеров и сополимеров  
на основе производных дихлоруксусной кислоты)**

Fullerene thin polymer films are requested as acceptor components of the body-type heterojunction photovoltaic devices. Although the organic solar cell materials noticeably inferior to traditional silicon batteries on light conversion efficiency (PCE), nevertheless, a number of advantages (low cost and simplicity of manufacturing, flexibility, PCE growing from year to year), allow to consider them as a possible alternative to conventional silicon batteries in perspective.

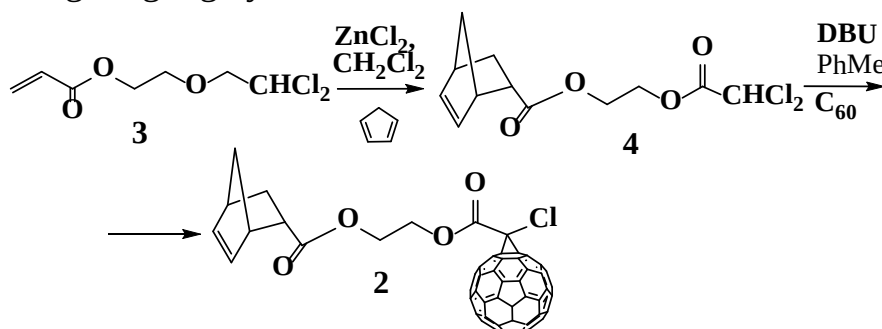
In this paper we consider the synthesis of a new monomer **2** and a polymer on its basis, formed by metathesis ring-opening polymerization (ROMP).



The key precursor in the synthesis of target adducts was Compound **3**, obtained by controlled esterification of ethylene acrylic acid in the presence of iodine and subsequent esterification of the resulting alcohol formed by dichloroacetic acid chloride.



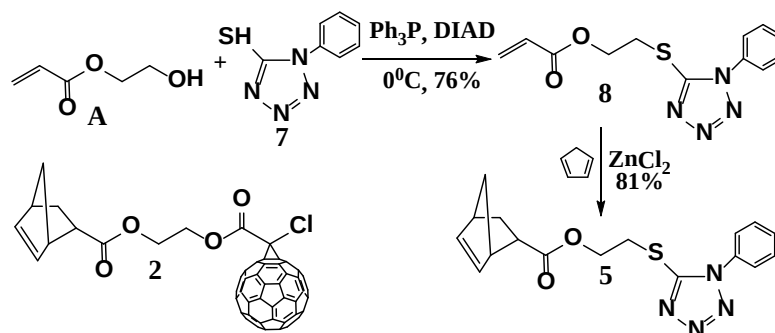
In the synthesis **2** we proceeded from block **3**. The experiment showed that the  $\text{ZnCl}_2$ -catalyzed Diels-Alder reaction with cyclopentadiene **3** smoothly proceeded at room temperature, giving high yields of endo-adduct **4**.



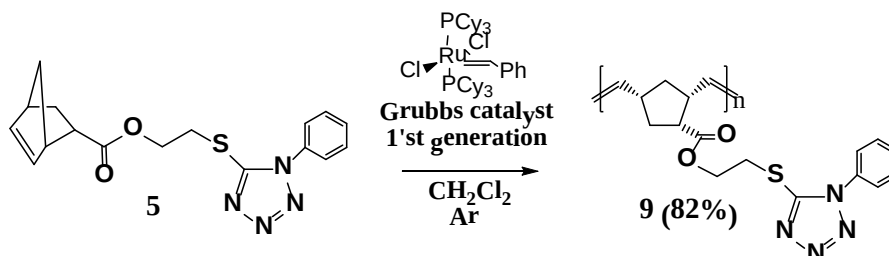
Ester **4** is a strongly activated CH-acid that reacts smoothly with fullerene  $\text{C}_{60}$  in Bingöl-Hirsch conditions, and after purification by column chromatography with  $\text{SiO}_2$  with a good yield the target monomer **2** was obtained.

Fullerene Polymers are valuable with their unique technological applications and, above all, as n-type conductive materials in optoelectronic devices with bulk heterojunction (BHJ).

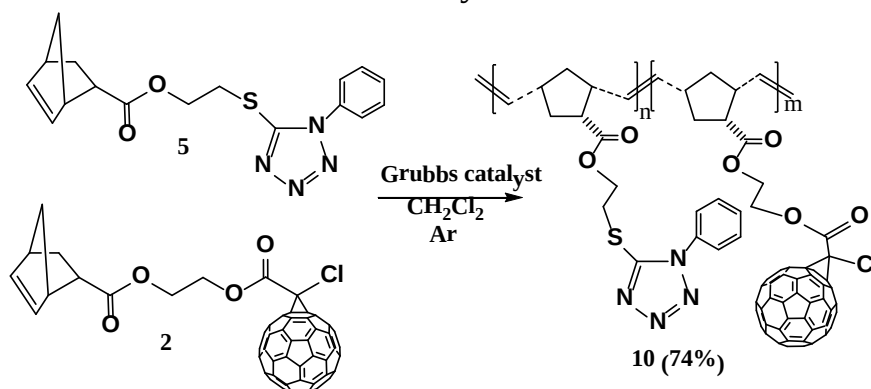
One possible embodiment of instant polymers in this series is obtaining copolymers **2** with other soluble monomers. For this purpose we synthesized block **2** similar to **5**, wherein metanfullerene part **2** is replaced by feniltetrazolsulfanile, which possesses electrophilic properties analogous to fullerene. Monomer **5** is synthesized in two steps from monoakryl glycol ether. Towards **5** initially condensing ether **A** with phenyltetrazolthiol **7** by Mitsunobu we received thioester **8** which reacted with cyclopentadiene, resulting in the target block under mild conditions with catalysis  $\text{ZnCl}_2$ .



Polymerization of monomer **5** was carried out in the presence of the 1st generation Grubbs catalyst in the solution of  $\text{CH}_2\text{Cl}_2$ , the reaction was monitored by TLC. After consumption of the starting monomer **8** ethyl vinyl ether was added to the reaction mass to remove residual amount of the catalyst. The resulting light-green powdery macromolecular compound **9** is soluble in benzene, o-dichlorobenzene, chloroform.



In the next step polymerization of equimolar amounts **2** and **5** in similar to product **9** conditions resulted in the formation of copolymer **10** soluble in particular organic solvents such as chloroform and methylene chloride.



The copolymer **10** that combines in its structure both fragments of a fullerene and feniltetrazolsulfide, is of interest due to possible  $\pi$ -stacking interactions influencing the morphological properties of the films.

### Synthesis of (+) - enantiomeric Corey lactone diol (Синтез (+)-энантиомера лактондиола Кори)

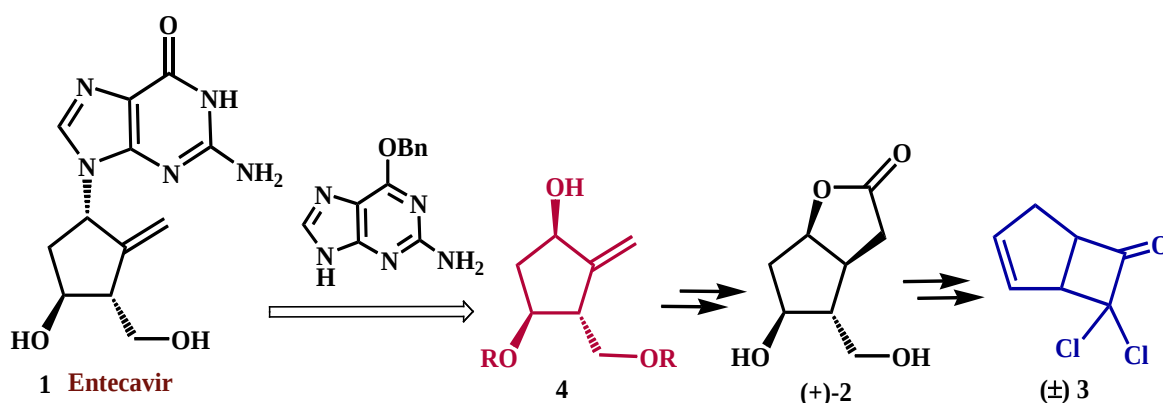
The most part of native and synthetic biologically active compounds contains functionalized cyclopentane and cyclopentenone rings. They include cyclopentenone antibiotics, prostanoids, carbanucleosides and others used in medicine. Entecavir **1** has special interest among cyclopentanoids. It has activity against hepatitis B virus (HBV).

The HBV has affected more than 2 billion people worldwide, over 350 million of them are living with chronic infection. HBV infection can cause serious complications such as liver failure, cirrhosis and eventually hepatocellular carcinoma, resulting in approximately 0.5-1.2 million deaths every year. Entecavir displays mainly an anti-HBV activity but also acts against HIV, HSV-1, VZV (varicella-zoster virus) and influenza. Entecavir has effective concentration (EC<sub>50</sub>) 3.75 nM against HBV. For comparison, one of the major and related antiviral drugs lamivudine has EC<sub>50</sub> 116.26 nM against the same virus. Important feature of entecavir is also its low cytotoxicity. Its 50% cytotoxicity is 3 M, which is 8.000 higher than its effective concentration.

Entecavir is a cyclopentyl guanosine nucleoside analog with the chemical name 2-amino-9-[(1S,3R,4S)-4-hydroxy-3-(hydroxymethyl)-2-methylidenecyclopentyl]-1,9-dihydro-6H-purin-6-one [1].

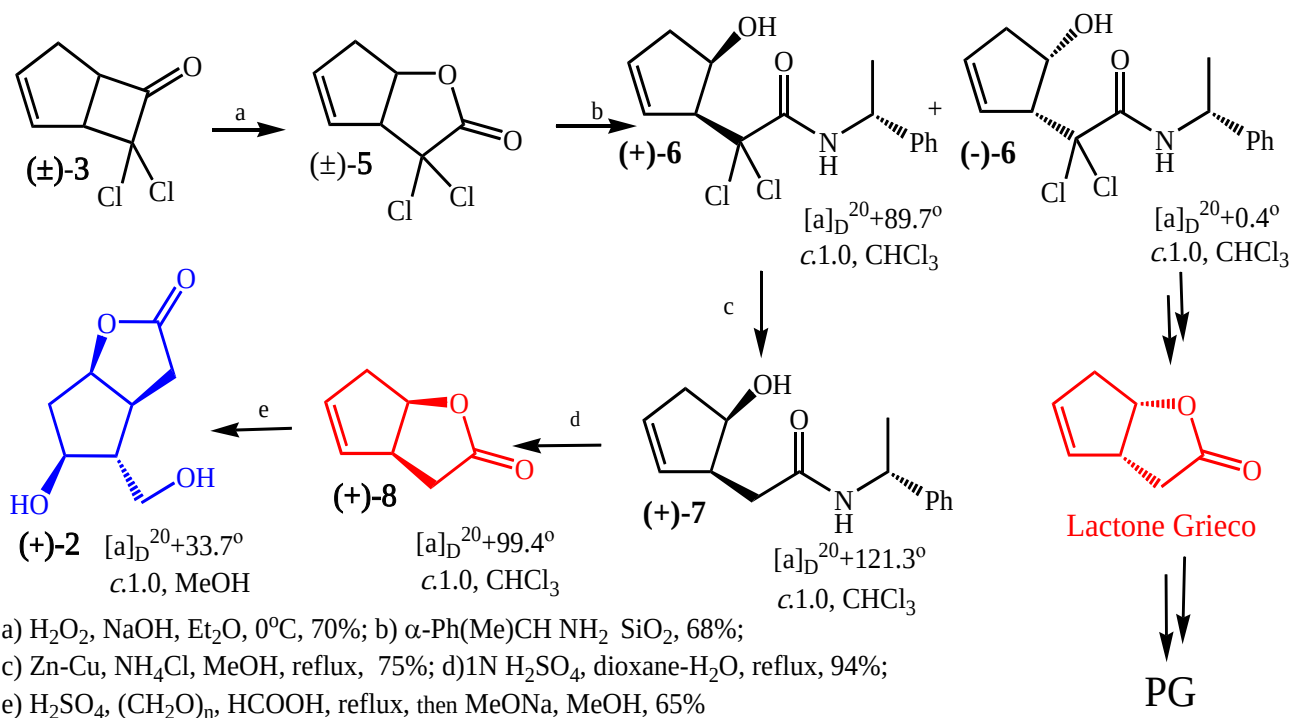
There are several approaches to entecavir at the moment, however multistage use of expensive and toxic reagents, low yields of the known general synthetic schemes make them impractical. Development of new approaches with the use of available and cheap starting materials relevant at this time.

This research is devoted to the synthesis of enantiomeric Corey lactone diol **2**, suitable for the formation of optically active entecavir **1**.



At first, lactone **5** with 70% yield was obtained by Baeyer-Villiger oxidation of adduct **3** in the system  $\text{H}_2\text{O}_2$ -NaOH- $\text{Et}_2\text{O}$ . Then we synthesized easily separated by silica enantiomerically pure amides **6** from the adduct **5** using the approach of the lactone ring disclosure by (+) -  $\alpha$ -methylbenzylamine [2] in the presence of 2-pyridinole.

The amide (+) - **6** was converted to the compound (+) - **7** by reductive dechlorination using Zn-Cu in MeOH. Refluxing the latter in dioxane in the presence of 1N aqueous solution of  $\text{H}_2\text{SO}_4$  enantiomeric (+) - **8** Grieco lactone was received. It was then transformed into the target enantiomeric Corey lactone diol (+) - **2** by the Prins reaction.



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### **Energetic heterogeneity and polarity of MCM-41 sorbent surface and its modified analogues (Энергетическая неоднородность и полярность поверхности сорбента МСМ-41 и его модифицированных аналогов)**

One of the most promising modern adsorbents are highly-ordered silica-gels of MCM-41 type (Mobil Composition Materials). In order to decrease their excessive hydrophylicity, surface derivatization by various nonpolar groups is applied. In this paper a comparative polarity evaluation of both unmodified MCM-41 and MCM-41

modified by methyl and phenyl groups with regard to heterogeneously porous silica-gel C-120 was carried out, and functions of surface heterogeneity of these sorbents were studied.

Mesoporous silica-gel MCM-41 was used as a stationary phase. Grafting of trimethylchlorosilane (MMet) and dihlrometilfenilsilane (MDC) was performed on its surface. Specific retention volumes were determined in the mode of infinite samples dilution on a chromatograph " Tsvet 500M" with a thermal conductivity detector, on a column with the size 300 \* 3 mm, at a flow rate of the carrier gas (nitrogen) 30 ml/min.

To estimate the polarity of the studied adsorbents the dependency graph of the Helmholtz free energy of adsorption on the polarizability of n-alkanes was plotted. The contribution of different types of interactions to the energy of specific interactions was assessed by the method of linear decomposition of the energy of adsorption. Heterogeneity function was calculated by asymptotically correct condensation approximation.

It was found out that the polarity of MCM-41 is lower than in case of C-120. The modification of MCM-41 by methyl and phenyl groups results in the decrease of the surface polarity, moreover MMet sample is less polar than that of MDC. Decrease in the polarity as a result of the modification is determined by reducing the induction and orientation interactions. The surface maintains the ability to form hydrogen bonds after the modification.

Presence of the heterogeneity function on n-butanol and absence of the latter on n-hexane suggests that geometric surface heterogeneity for MCM-41 sorbent is absent. Homogeneous structure of MCM-41 is practically not affected after methylation, while the surface becomes heterogeneous after modification by phenyl groups.

The results obtained will further allow to tabulate the values of sorption characteristics of the samples, and also to extend the range of application of silica-gels of MCM-41 type due to the proven improved kinetics of mass transfer.

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**Kinetic modeling on drug release from controlled drug delivery systems**  
**(Кинетическое моделирование системы контролируемого**  
**высвобождения лекарственного препарата)**

Over the past few decades, significant medical advances have been made in the area of drug delivery with the development of controlled release dosage forms. There are large variety of formulations devoted to oral controlled drug release, and also the varied physical properties that influence drug release from these formulations. The

release patterns can be divided into those that release drug at a slow zero or first order rate and those that provide an initial rapid dose, followed by slow zero or first order release of sustained component. The purpose of the controlled release systems is to maintain drug concentration in the blood or in target tissues at a desired value as long as possible. In other words, they are able to exert control on the drug release rate and duration. For this purpose, generally, controlled release system initially release part of the dose contained in order to attain rapidly the effective therapeutic concentration of the drug. Then, drug release kinetics follows a well defined behavior in order to supply the maintenance dose enabling the attainment of the desired drug concentration. In the light of wide versatility of application of controlled release formulations, in the field of medical sciences, they are unavoidable tools for the exploitation of the modern concept of therapeutic treatment whose aim is to increase drug effectiveness and patient compliance, to reduce the administration frequency and side effects connected to dosing. As a matter of fact, controlled release formulations bring engineers and pharmacists to work together with the common aim of realizing more and more effective products. For this purpose, the use of mathematical modeling turns out to be very useful as this approach enables, in the best case, the prediction of release kinetics before the release systems are realized. More often, it allows the measurement of some important physical parameters, such as the drug diffusion coefficient and resorting to model fitting on experimental release data. Thus, mathematical modeling, whose development requires the comprehension of all the phenomena affecting drug release kinetics, has a very important value in the process optimization of such formulation. The model can be simply thought as a mathematical metaphor of some aspects of reality that, in this case, identifies with the ensemble of phenomena ruling release kinetics. For this generality, mathematical modeling is widely employed in different disciplines such as genetics, medicine, psychology, biology, economy and obviously engineering and technology.

Model dependent methods are based on different mathematical functions, which describe the dissolution profile. Once a suitable function has been selected, the dissolution profiles are evaluated depending on the derived model parameters. In order to determine the suitable drug release kinetic model describing the dissolution profile, the nonlinear regression module of Statistica 5.0 was used. In non-linear regression analysis the Quasi-Newton and Simplex methods minimized the least squares. The model dependent approaches included zero order, first order, Higuchi, Hixson-Crowell, Korsmeyer-Peppas, Baker-Lonsdale, Weibull, Hopfenberg, Gompertz and regression models.

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**Ultrafine systems on the basis of chitosan and its derivatives' polymer-colloid complexes with particles of silver iodide sols and their hemocompatibility**  
**(Ультрадисперсные системы на основе полимер-коллоидных комплексов хитозана и его производных с частицами зольей йодида серебра и их гемосовместимость)**

The problem of creating of stable disperse systems based on lyophobic sols stabilized by non-covalent interaction of colloidal particles with macromolecules of natural and synthetic polymers is topical in the task of obtaining of nano- and micro-sized polymeric containers for targeted delivery of slightly soluble drugs.

Using of ultrafine systems is especially effective while introducing new ways to targeted delivery of drugs to the affected area of the body and new methods of prolonging of drugs' therapeutic effect. Nanosized systems based on natural and synthetic biodegradable biocompatible polymers, including chitosan (CTZ) and its derivatives are often used as a means of targeted delivery of drugs with prolonged action.

One of the approaches for establishing stable nanostructured systems with adjustable sizes may be using of the ability of macromolecules to self-assembly by intermolecular association via non-covalent bonds – on the example of a CTZ and its derivatives' polymer-colloid complexes (PCCs), such as sodium salt of chitosan succinylamide (SCTZ) with inorganic colloidal particles of lyophobic sols, e.g., sol of silver iodide. Disperse system on the basis of sols in the presence of the polymer solution is essentially organic-inorganic nanocomposite in which the polysaccharide macromolecules form shields around inorganic nanoparticles.

It seemed appropriate to obtain the PCC on the basis of water-soluble natural CTZ and SCTZ polymers with silver halide sols in aqueous media and to study the influence of the samples of CTZ, SCTZ solutions and the resulting dispersion PCC on the structural and functional properties of erythrocyte membranes. Taking into account that the main reaction of erythrocytes in contact with a foreign surface is lysis, acid hemolysis is selected as a model for evaluating the effects of these drugs on cells.

As a result, the method of obtaining of stable nano- and micro-sized PCCs on the basis of water soluble natural polymers CTZ and SCTZ with sols of silver halide in aqueous media was developed. It was found that CTZ and SCTZ solutions and dispersions of PCC's of CTZ and SCTZ with colloidal particles of silver iodide have a stabilizing or destabilizing effect on erythrocyte membranes depending on the composition of the sample, that is show their different hemocompatibility and points



on the urgency of further search of chitosan and its derivatives' complexes with inorganic colloidal particles having potentially protective properties. The results of these studies are promising at the obtaining of nano- and micro-sized polymeric containers for targeted delivery of slightly soluble drugs.

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**Polycomplexes based on N, N-diallyl-N, N-dimethylammonium chloride  
copolymer with maleic acid functionalized by isoniazid  
(Поликомплексы на основе сополимера N,N-диаллил-N,N-  
диметиламмоний хлорида с малеиновой кислотой,  
функционализированного изониазидом)**

Polyelectrolyte complexes with opposite-charged surfactant - polymer-colloid complexes (PACs) - are a special class of amphiphilic compounds with alternating freeze-lyophobic balance, which can be adjusted by changing the compounds of the complex [1]. PACs are important for production of new forms of drugs.

The object of investigation was to develop methods of functionalization of the copolymer N, N-diallyl-N, N-dimethylammonium chloride with maleic acid (PE), and evaluating the effect of isoniazid on the dimensional characteristics of polymer particles of colloidal complexes.

Functionalization PE with isoniazid was performed by polymer- analogue transformations. In the course of study there were obtained the optimal conditions for stability, solubility of isoniazid and completeness of the reaction. Optimal conditions: solvent - water or methanol, the reaction temperature - 60 ° C, reaction time - 5 hours. The composition and structure of the resulting polymer conjugate are installed using methods of elemental analysis and NMR spectroscopy.

It has been established that the functionalization reduces capacity of lyophilized PE. Modified PE samples form PAC particles of smaller size and relatively narrow size distribution, unlike the complexes based on unmodified polyethylene.

Analysis (measurements, calculations) are made on the equipment NBI "Chemistry"- Institute of Organic Chemistry, Ufa Science.

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**Physical and chemical properties of materials based on copolymers of chitosan and succinimide of chitosan with monomers of acrylic series**  
**(Физико-химические свойства материалов на основе сополимеров хитозана и сукцинамида хитозана с мономерами акрилового ряда)**

Hitozan (HTZ) and its derivatives can achieve new properties if chemically modified by appropriate substitutes. If the main skeleton of a polymeric chain and a part of functional groups are not affected, valuable properties of HTZ remain. Introduction to HTZ of hydrophobic substitutes is very perspective. They create hydrophobic domains which can adsorb poorly soluble medicinal substances in water that will expand possibilities of use of HTZ as the carrier of drugs.

Earlier we performed optimization of conditions of producing copolymers on the basis of blocks of hydrophilic macromolecules of HTZ and its water-soluble derivative – sodium salt of a succinimide of a chitosan (SHTZ) with monomers of hydrophobic polymers (methyl acrylate (MA), methylmethacrylate (MMA)) by radical chain copolymerization. Viscoelastic system can be created when using of the similar hydrophobic modified copolymers without introduction of any additional stapling machine only due to the interaction of hydrophobic sites of the chain. So, structurization of the obtained copolymers in the semi-diluted area, owing to formation of a grid of gearings, is followed by manifestation of viscosity anomaly. The nature of dependence of viscosity shift on the speed of the shift reveals that the degree of structure of solution changes in the process of concoction. Upon transition to the area of concentration at which the steady grid of gearings is formed, nature of dependence of viscosity shift on the shift speed for solutions becomes similar to nonlinear plastic behavior with the limit tension of the shift.

Also, by hydrophobic modification of HTZ and SHTZ it is possible to directly regulate some volume and surfacial properties of materials on the basis of the modified samples. So, for the film materials received from solutions of copolymers of HTZ and of SHTZ copolymers with MA and MMA the regional corner of wetting on 20-30 ° is less, than for films made of not modified polysaccharides. Sorption properties on vapors of water and other polar liquids change as well.

**DFT study of adsorption activity on the example of graphene complexes with aniline and benzene derivatives (DFT исследование адсорбционной активности на примере комплексов графена с производными анилина и бензола)**

In this paper we calculated the energy and geometric characteristics of graphene complexes with aniline and benzene derivatives. Calculations were performed using Gaussian09 approximation PBE0/6-31G(d,p).

As the substrate for the study the adsorption 14.055x13.597Å size fragment graphene was taken. A test molecule in the original structures is located parallel to the plane of graphene at a distance of 3Å. It was found that depending on the type and position of the substituent on the benzene ring  $\pi$ - $\pi$  stacking interactions such as "the plane to plane" are observed (Fig. 1b) and "end-to-plane" (Fig. 1a).

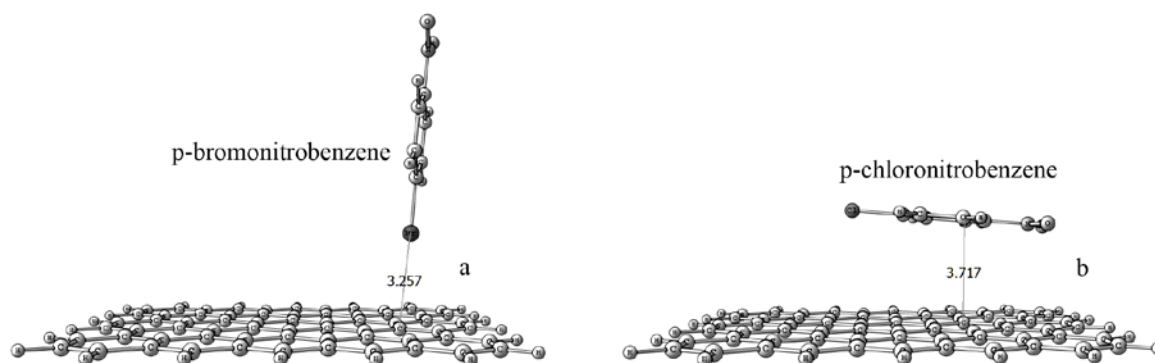


Fig. 1. Some  $\pi$ - $\pi$  complexes graphene with molecules from the test set.

Based on the rows of stability it was found that the most stable complex graphene is formed with *p*-nitroaniline (Table. 1).

Table 1. Energy of graphene complexes formation with aniline and benzene derivatives, kJ/mol.

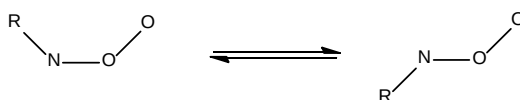
| Test molecule           | $E_{\text{formation}}$ | Test molecule                | $E_{\text{formation}}$ |
|-------------------------|------------------------|------------------------------|------------------------|
| aniline                 | 0.4                    | 2-bromo-4-methylaniline      | -18.7                  |
| <i>m</i> -nitroaniline  | -9.1                   | <i>p</i> -bromonitrobenzene  | -10.9                  |
| <i>m</i> -chloroaniline | -7.0                   | <i>p</i> -chloronitrobenzene | -10.4                  |
| 2,6-dinitroaniline      | -15.3                  | <i>o</i> -nitroaniline       | -11.6                  |
| 2,6-dimethylaniline     | -8.0                   | <i>p</i> -nitroaniline       | -20.5                  |
| 3,5-dichloroaniline     | -13.6                  | <i>o</i> -chloroaniline      | -10.6                  |

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### **The choice of calculation method for the study of structures and reactions involving nitroso oxides (Выбор метода расчета для исследования структур и реакций с участием нитрозооксидов)**

Nitroso oxides are 1,3-dipolar peroxides containing an –NOO functional group. Nitroso oxides are highly reactive intermediates formed in the interaction of triplet nitrenes with molecular oxygen. It is known[1] that nitroso oxides exist in two quasi-degenerated isomeric forms: *trans* and *cis*, as distinguished by the position of the terminal oxygen atom.



The choice of methods of density functional theory correctly describing the structure and energetic properties of nitroso oxides was performed in this paper. Choosing the methods of calculation, we used the agreement of theoretical and experimental data as the main criterion. IR and UV spectroscopy are the main tools of experimental research of nitroso oxides. Therefore it is of concern to compare spectral characteristics. We used *trans*-HNOO as model compound, because experimentally obtained infrared spectrum data are known [2].

Quantum-chemical calculations were performed using the *Gaussian09* rev.C01 program in cluster serversupercomputer in Ufa Institute of Chemistry. The ChemCraft program was used for visualization of the obtained results. We used split-valence triple-zeta basis sets developed by Dunning - cc-pVTZ and by Pople - 6-311+G(d,p) to construct wave function.

We chose generalized gradient approximations (UM06-L, UmPWPW91, UOLYP and UHCTH). These approximations have revealed good applicability for theoretical analysis of structures and reactions involving nitroso oxides.

Calculations of the energy characteristics of conformational transition of the aromatic nitroso oxide with selected approximations showed that the UOLYP and UHCTH approximations overestimate the thermodynamic stability of the *trans*-PhNOO. It's not in agreement with experimental data. Thus, the results obtained by the UM06L and UmPWPW91 levels of theory agree with the results of theoretical and experimental studies of nitroso oxides which allows us to use them in further research.

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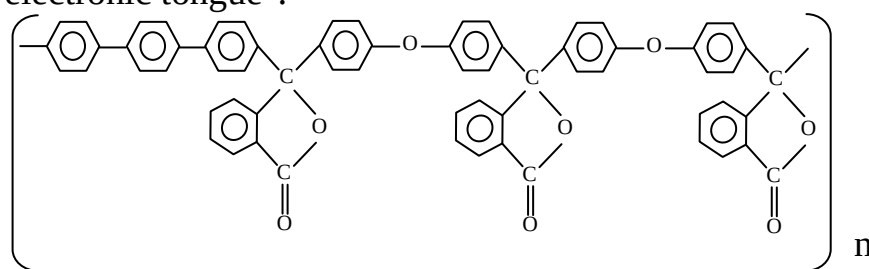
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**Voltammetric “electronic tongue” for identification of antiarrhythmic drugs using carbon glass electrodes modified by polyarylenftalides**  
**(Вольтамперометрический «электронный язык» для идентификации антиаритмических препаратов с использованием стеклогуглеродных электродов, модифицированных полиарилефталидами)**

Due to the increased requirements for the quality of medicines, the importance of the use of modern standardized methods for their analysis grows. Along with the use of chromatographic, optical methods of determining organic compounds electrochemical analysis methods are commonly used, in particular voltammetry.

In recent years, the formation and practical application of chemically modified electrodes became interesting. Sensors based on these electrodes are used for determination of a large number of different substances, particularly medicinal compounds. For modifying different chemical compounds, polymer films are applied to the surface of the electrode material. They significantly change the ability of the electrode to the voltammetric response. Such modified electrodes are often used in multisensory systems as "electronic tongue". Its basic idea – the use of an array of non-specific sensors that have cross-sensitivity and data processing using chemometric by which the analyzed objects attributed to the appropriate classes [Budnikov 2009: 154].

New three-electrode multisensory system are proposed for voltammetric analysis of antiarrhythmic drugs using three polyarylenephthalides as modifiers (TO, TOO, TOOO) (Scheme 1). The use of three different modifiers provides cross-sensitivity condition of electrodes required for the functioning of the voltammetric systems as the "electronic tongue".



**Scheme 1.** Molecular structure of modifier TOOO.

Solutions of atenolol, propranolol and amiodarone were taken as analytes. The electrochemical experiments were performed with CH Instruments, USA

(Model1110A, Version 4.01). Electrochemical Analyzer and were carried out in a 10 ml single compartment three-electrode glass cell with a 3mm diameter glassy carbon electrode as the working electrode (PartNo.CHI104). Platinum wire was used as a counter electrode and Ag/AgCl electrode as a reference electrode.

Voltammetric measurements were carried out with a potentiostat/galvanostat Elins P-8-Nano and conventional three-electrode cell. The working electrode was the carbon glass electrode modified polyarylenftalides and the counter and reference electrodes were glassy carbon rod and Ag/AgCl electrode respectively. The background solution was 0.1 mol/L<sup>-1</sup>NaOH, scan rate 1 V/s.

Processing of the obtained voltammograms of antiarrhythmic drugs was carried out using chemometric methods: principal component analysis (PCA) and the method of soft independent modeling of class analogy (SIMCA) [Pomerantsev 2014: 187].

The use of polyarylen ephthalides as modifiers provides a clear separation of the response signals of antiarrhythmic drugs on the plot of PCA-modeling (Figure 1). SIMCA-classification showed that the proportion of correctly identified antiarrhythmic drugs varies between 67-100%. Thus, using a voltammetric "electronic tongue", express-identification of medicines can be carried out with high accuracy.

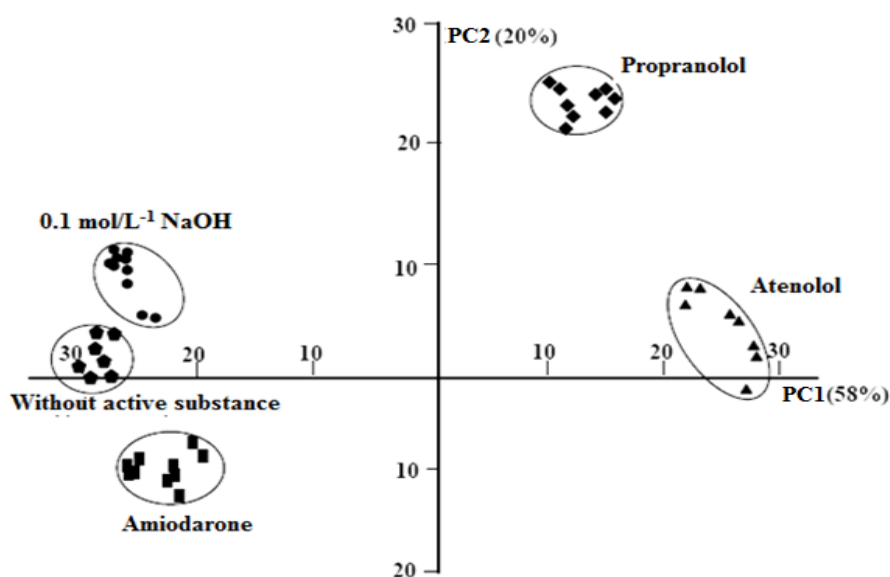


**Figure 1.** PCA plot of antiarrhythmic drugs, inert components, and the background solution 0.1 mol/L<sup>-1</sup> based on cyclic voltammograms.

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### **Inter-agency and inter-layer problems of interaction in the provision of public and municipal services (Проблемы межведомственного и межуровневого взаимодействия при предоставлении государственных и муниципальных услуг)**

Resolution of the Government of the Russian Federation from September 8, 2010 № 697 "On the uniform system of interagency electronic interaction," contains points of establishing the position of a single electronic system of interagency cooperation, as well as the publication of the Federal Law from July 27, 2010 № 210 FZ "On the organization of state and municipal services" – which has marked the formation of interdepartmental cooperation in the provision of public and municipal services in Russia.

At the same time, this identify a number of problems in the field of cooperation between the federal state bodies and public authorities of the Russian Federation, as well as with other bodies of municipal management in the organization and operation of the system of state and municipal services.

First of all - it is the lack of legislation and mechanisms to unify titles and contents of state and municipal services.

Another problem, essentially precluding proper interaction between the various levels of public authority is the difficulty of joining different databases of different agencies.

Provided by paragraph 3 of Article 1 and other provisions of the Federal Law №210 registries of public and municipal services - is the secondary phenomenon in relation to the rendering state or municipal services (at service first is introduced, and then is entered into the register) [1]. However, it is necessary to have either the basic lists, or classification of types and forms of state and municipal services, which will eliminate contrary in interpretations, which, in turn, will eliminate corruption-factors.

Thus, we can conclude that the practical implementation of the Federal Law from 27 July 2010 N 210-FZ "On the organization of state and municipal services" brings out problems related to the violations of the principle of distinctness of law and the inconsistency of some existing regulations of this law [2]. In order to improve the legal regulation of public and municipal services it should be necessary to do the systematization of normative acts regulating relations in the sphere of inter-agency cooperation in the provision of public and municipal services.

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**Features of state unitary enterprise taxation on the example of the assets tax  
(Особенности налогообложения государственных унитарных  
предприятий на примере налога на имущество)**

The improvement of the taxation of the state unitary enterprise is one of ways to increase country development efficiency.

Thus the existence of special taxation conditions only for state unitary enterprise is impossible. Despite this there can be certain tax credits for state unitary enterprises and we will consider these tax credits on the example of the property tax.

The organizations which are not subject of taxation:

- 1) land plots and other nature facilities;
- 2) assets belonging to federal executive bodies on the basis of a right of operational management in which both military and similar to it services are provided and used by these executive bodies for international and home defence, for security and order in the Russian Federation;
- 3) cultural heritage objects (historical and cultural monuments) of different nationalities of the Russian Federation which are of federal significance in accordance with the procedure established by the legislation of the Russian Federation;
- 4) nuclear facilities used for research, nuclear facilities for storing nuclear materials and radioactive substances and radioactive waste;
- 5) ice-breakers, atom-powered vessels and nuclear maintenance ships;
- 6) spacecrafts.

Thus the enterprise is not the subject to taxation is in makes the list mentioned above.

Incentivization is the following issue to consider in the article. Chapter 30 of the Tax Code says that the following organizations are free of the property tax:

- 1) assets used for functioning of organizations and institutions of the correctional system;
- 2) assets of organizations responsible for federal public roads and constructions being their integral technological part.
- 3) assets of State scientific centres;
- 4) Others.



Thus taxation of State Unitary enterprises is a controversial item. From one side these organizations do not have any tax credits, from the other side it's possible to find the ways of tax advantages in the tax legislature.

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### **Financial results of organizations (Финансовые результаты организаций)**

As a result of production and sale of products organizations can get financial results such as profit.

Profit is the difference between the purchase and the component costs of delivered goods and/or services and any operating or other expenses. Profits, in short, resulting from the relationships of costs to prices, not only tell us which goods it is most economical to make, but which are the most economical ways to make them.

The functions of profit are as follows:

1. A test of performance. It is the result of the performance of the company in marketing, innovation and productivity;
2. Equal importance. It is the main for the risk of uncertainty;
3. Source of budgetary incomes;
4. Making economic effects of company's activity;
5. Managing and channeling the factors of production to apportion the relative output of thousands of different goods in accordance with demand;
6. Putting constant and unremitting pressure on the head of every competitive business to introduce further economies and efficiencies.

Types of profit:

1. Gross profit = Revenue – cost
2. Operating profit (profit sales) = Gross profit - commercial expenses - management expenses
3. Balance profit = Operating profit (profit sales) ± balance of miscellaneous income and expenses
4. Net profit = Pre-tax profit - profit tax

Gross profit describes efficiency of an organization. Operating profit (profit sales) is the index of principal activity of organization.

The main goal of a company is to get maximal profit. Also it must rationally use the part of profit which stays at its disposal. In modern conditions we don't have definitely some channel for allocation of profits. However, for example, stock company is obligated to form capital reserves and produce dividend payment.

*Научное издание*

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В ПРОФЕССИОНАЛЬНОЙ КОММУНИКАЦИИ**

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