

45th International Chemistry Olympiad
Moscow, July 15-24, 2013

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Dmitry Livanov

Minister of Science and Education of the Russian Federation

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Victor Sadovnichy

Rector of Lomonosov Moscow State University, Academician of the Russian Academy of Sciences >> p. 4

«I remember the fireworks opening the the 28th IChO in 1996 and 39th IChO in 2007 as if it were yesterday. Now we are about to host the 45th Olympiad»

Valery Lunin

Dean of the MSU Chemistry Department, Academician of the Russian Academy of Sciences >> p. 4

The Formula of **Russia**



Amber is a unique natural decorative material, and over 90% of world amber reserve is accumulated in the Western part of Russia within Kaliningrad region. The unique amber-extracting industrial plant is located right here, therefore the regional capital of Kaliningrad city is also the world amber capital.



Ununoctium is the chemical element with so far the largest atomic number (118). It was synthesized in the Joint Institute for Nuclear Research in Dubna (Moscow region) in 2006. This town is also known as the place where one of the world's first particle accelerators (synchrotron) was built in 1957 and where a number of trans-uranic elements with atomic numbers of 104, 113, 114, 115, 116, 117 were first synthesized.



Russia is the world leader in natural gas extraction and export (mostly through Gazprom energy company). 90% of Russian and 20% of worldwide gas extraction accrues to a small region of Yamal peninsula located above the Arctic Circle.



The level of carbon dioxide emission is a measure of industry development. Russia here is the 4th in the world. Dozens of energy saving and CO_2 emission abatement projects are carried out in our country. The picture shows the world's biggest and one of the most efficient thermal power stations (located in Surgut).



Titanium, or the "black gold", is a chemical symbol of space exploration. First spaceships were made of titanium alloys. Russia was the first country to launch an artificial Earth satellite (1957) and perform a manned space mission (1961, Yuri Gagarin). To memorize this scientific breakthrough the monument to space explorers was built in Moscow. This monument is entirely covered with titanium plates.



Russia was the first country to start using nuclear energy for peaceful purposes. The world's first nuclear power station was built in Obninsk (1954). The first nuclear non-military ship (the icebreaker "Lenin", 1959) was constructed and launched in Russia as well.



Traditionally Russian orthodox churches are crowned by decorated onion-like gilded domes. In sunny days the shining gold makes domes look like burning candles. The domes are gilded either by galvanostatic plating or by coating them with thin gold leaves. The ancient Russian church of Dormition in Vladimir, one of the oldest Russian cities, was built in the 12th century.



Russian chemistry facebook



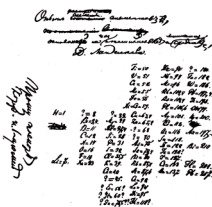
Mikhail Lomonosov (1711–1765)

The most famous Russian scientist and writer, one of the founders of physical chemistry. Discovered the mass conservation law (1748), contributed much to various natural sciences. In 1755 established the Moscow State University later named after him. The picture shows the oldest University building.



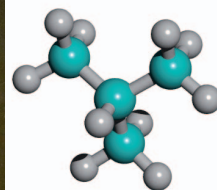
Dmitry Mendeleev (1834–1907)

The best-known Russian chemist. Discovered the Periodic law (1869), and by using it predicted 11 new elements. Later 5 of these have been found in nature or synthesized in laboratory. Predicted the existence of critical temperature for liquids. Author of the famous textbook «Foundations of chemistry».



Alexander Butlerov (1828–1886)

Famous Russian organic chemist. Made significant contribution to the theory of chemical structure of organic compounds (1861). Elaborated a number of important synthetic procedures, discovered the formose reaction (1861). The teacher for several generations of Russian chemists.



Russia has more than a thousand-year history. These centuries were rich with historical events as well as ambitious breakthroughs, periods of intense development and great scientific and cultural achievements. Nowadays Russia is an independent federal presidential state with the territory of over 17 mln square kilometers, thus being the largest of all the countries. 143 mln people of more than 200 nationalities inhabit this land; they are associated with different cultural traditions and religions, Orthodoxy being the widest-spread confession. Russia is a land of ancient culture and traditions, enormous natural resources and growing economy, currently ranked 7th in the world.

Russia has contributed to the world history as the first country to launch man into space. It is also known as the motherland of great writers and poets (Pushkin, Dostoevsky, Tolstoy, Akhmatova), artists (Repin, Shagal, Kandinsky), musicians (Chaikovskii, Glinka, Shostakovich) and scientists (chemist Mendeleev, mathematician Kolmogorov, physicist Landau, biologist Vavilov, physiologist Pavlov; see also our Chemistry Facebook).

²⁰¹Hg

As you know, mercury thermometers stem freeze at temperatures below -39°C (-38.2°F). In many regions of Russia one cannot use mercury devices throughout the whole year, as about 65% of the area is the permafrost zone. Oymyakon village in Siberia is known as the Cold Pole of the planet. The lowest temperature observed there was -67.8°C (-90°F).



⁵⁶Fe

Russia has the largest iron ore resources in the world. Since the 18th century the iron ore mining is most extensively carried out in the Ural region. Kasli, a small town in the Urals, keeps an exclusive technology of making art objects of cast iron.



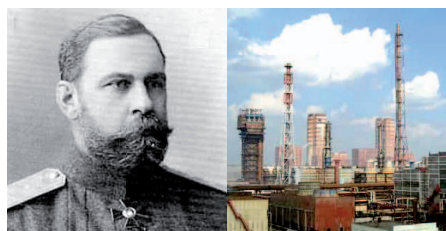
12°

25% of all world diamonds are mined in Yakutia region covering huge territory in the north-eastern part of Siberia. The "diamond capital" of Russia — the town of Mirny, was established in 1957 near the biggest diamond mine in the world (see the photo).



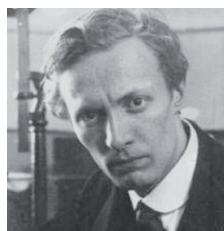
H₂O

Russia is the world's second fresh water reservoir after Brazil. The world's deepest lake Baikal situated in Siberia holds about 20% of all lake fresh water of the planet. Due to low mineralization its water is considered to be the purest natural water in the world.



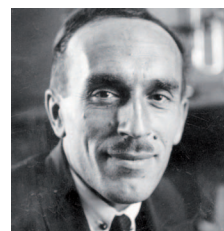
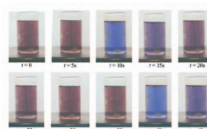
Vladimir Ipatyev (1867–1952)

Military chemist, one of the founders of chemical industry in Russia. Discovered the way to obtain butadiene from ethanol, was the first to conduct ethylene polymerization. In 1930 emigrated to the USA, where largely contributed to developing the national oil industry. Actually became one of the most important figures in the world petrochemistry.



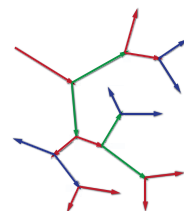
Boris Belousov (1893–1970)

Military chemist, developed new protection methods against chemical weapons. Discovered the new class of oscillating chemical reactions currently known as BZ (Belousov-Zhabotinsky) reactions. This gave rise to new branches of physics and mathematics dealing with non-linear dynamics in complex systems.



Nikolay Semenov (1896–1986)

Physicist, the only Russian Nobel Prize winner in chemistry (1956). One of the founders of chemical physics. Studied branched chain reactions and discovered both experimentally and theoretically many new regularities in this field.





To participants and organizers of the 45th International Chemistry Olympiad,

It is a great honor for us to organize the 45th International Chemistry Olympiad, which I consider an international acknowledgement of the high level of Russian science and education. Moscow will be hosting participants of the 45th International Chemistry Olympiad in summer 2013. Student teams from 75 countries will get acquainted with Russia and its capital, meet scientists, who have made a valuable contribution to the international science. The Olympiad organizers will do their best to let you show your best expertise and practical skills. Each of you has covered a long way towards the International Olympiad. Having won a number of national contests you have proved your right to represent your countries at this prestigious intellectual world-stage competition.

I have no doubt that all of you as participants of the International Chemistry Olympiad form an extremely powerful force with enormous innovation potential. It is this creative, ambitious and energetic young generation that is going to be the vanguard of the world science in the near future, ensuring global progress and prosperity of the human society. I wish you creative achievements and a lot of success in your future scientific research!

Dmitry Livanov
Minister of Education and Science of the Russian Federation



**Dear friends,
It is going to be the third time Moscow State University is hosting the International Chemistry Olympiad.**

This oldest Russian university bears the name of an outstanding Russian scientist, encyclopedist and chemist Mikhail Lomonosov, whose 300th anniversary was last year celebrated worldwide according to UNESCO decision.

Throughout its long history the University has gained recognition as one of the world scientific and educational centers, many famous scientists and researchers have graduated from here. Russian education these days is seeing significant changes with a major focus on higher education system. After joining the Bologna process in 2003 we have been taking special care of preserving the best traditions of national education: fundamental scientific background, advanced theoretical knowledge and practical skills. Still we highly value the broad international network we are a part of, which helps us taking contemporary challenges and exchanging the accumulated scientific expertise. The 45th International Chemistry Olympiad is just in line with these ambitions. So I do hope the Moscow State University will both give you a warm welcome and hospitality as the host of the Olympiad 2013, and hold a good platform for your achievements to help you in gaining a foothold on your future life. See you in Moscow!

Victor Sadovnichy
*Rector of Lomonosov Moscow State University,
Academician of the Russian Academy of Sciences*



Dear friends and colleagues,

I am honored to be the one who is in charge of arranging and holding the International Chemistry Olympiad already for the third time. Life runs fast. I remember the fireworks opening the 28th IChO in 1996 and 39th IChO in 2007 as if it were yesterday. Now we are about to host the 45th Olympiad. A lot has happened to science and education since then. The last-time prizewinners have become serious researchers determining the state of today's chemistry in Russia. As I have been organizing the IChOs for years, it is of great interest for me to follow evolution of the event, see how its weight grows, welcome new countries joining the forum, and witness increasing complexity of the IChO scientific program. These changes are inevitable, still as organizers we do our best to preserve the unique spirit of the event, its slight innocence and creative atmosphere typical of the first olympiads. The driving force in this direction is our Love to our profession and our science of Chemistry.

The IChO competition will take only two days of nine. All the rest time is expected to be used for networking. Hospitality is a true Russian feature, and I hope you will feel it and enjoy your stay in our country. Have a successful Olympiad. See you in Moscow in 2013.

Sincerely yours,
Valery Lunin
*Dean of the MSU Chemistry Department,
Academician of the Russian Academy of Sciences*



Dear friends,

I am most happy to welcome you at the MSU Chemistry Department. My best memories are associated with this place as well as with the International Olympiads I participated in. It is all about emotions: the thrill of getting to know a new country, the agitation of looking forward to the Olympiad, the anticipation of the results and, finally, the unbelievable feeling of being the winner. I sincerely wish you to live through these 10 days filled with bright impressions and exciting encounters.

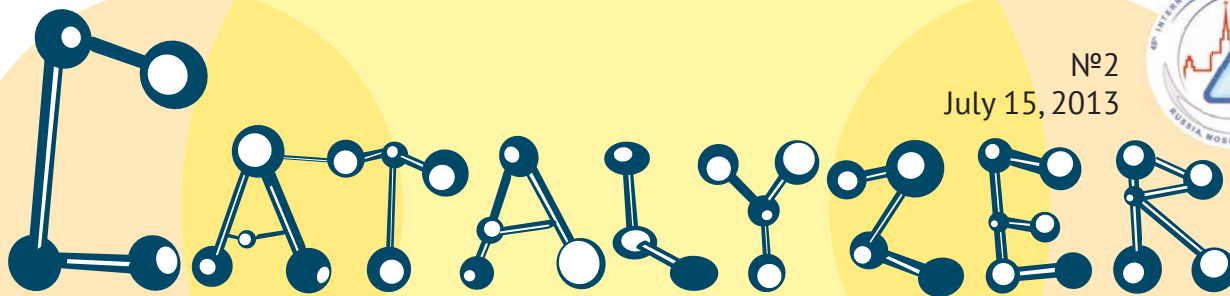
Good luck in the contest.

Alexey Zeifman
*MSU Chemistry department graduate,
the absolute winner of IChOs in 2004 and 2005*

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Anastasia Grigorieva



Boris Lukas Stolz

Switzerland



When I hear "Russia" I imagine beautiful landscapes. I also know it's pretty cold here in winter and there are a lot of mighty and crazy people. However I really like people here!

Suàrez Espinoza

Costa Rica



We thought Russia was very different from Costa Rica. And so it is! We cross the street wherever we want. Here in Moscow we didn't even know how to do it because the streets are so large! Luckily our guide showed us the underpass.

Kenneth Charles Hoffman

Canada



mentor
— When I walked in here today and saw the statues of Mendeleev and Butlerov, I suddenly realized how central Russian chemistry really is and how we tend to forget it.

It's raining men!

Out of 291 Olympiad participants this year 250 are male.

Check out the Olympiad statistics with "ICho in figures", page 4 >>



Dear friends,



Warm welcome to the participants of the 45th International Chemistry Olympiad. Contest participants gathering at the Moscow State University these days will have to face a tough competition. To win you will need deep knowledge of theoretical and practical principles of modern chemistry, creativity and out-of-box thinking. I'm sure you will succeed with the tests and find the right keys to the problems.

For many years this prestigious competition has contributed into popularizing scientific knowledge, helped awaken the interest for research in children and young people, found and supported young talents. We are most pleased to once again host it here, in Russia, in a country of traditionally

Sergey Ivanov, Head of the President Administration of the Russian Federation

Today is gonna be the day

7.30–8.30
Breakfast

One of the dishes for breakfast was pancakes, Russian national product. Pancakes are easy to recognize for their round shape because they traditionally symbolize the Sun. Have some sunlight for breakfast!

8.30–9.30
Transfer from
Planernoye to
MSU

Yesterday many of you were surprised by the width of Moscow streets. Today it's time for a real impression. After entering the city your bus will for a while go along the Leningradskiy avenue. Look out, it's the broadest street in Moscow (120 m wide).

10.00–12.00
Opening
Ceremony in the
Fundamental
Library of MSU

The Fundamental Library is the newest building of MSU. It was built in 2005 to celebrate the 250th anniversary of the University and is equipped with electronic reader service.

>> continued on p. 2

On the first day of the Olympiad Catalyzer met delegations in MSU to greet, talk and find out how they see the chemistry world of today

USA

Olympiad History

The previous competition was held in Washington, D.C. on July 21 – 30. There were 34 gold, 59 silver and 87 bronze medal winners.

Nobel Prize Winners

World leader by the number of Nobel Prize winners in Chemistry.
Over 60 scientists from the USA were recognised world's most talented chemists.
The second in the list is Germany, the UK is the third.
Will the next generations be able to repeat the success of ancestors?

United Kingdom

Guy Lewy, James Pinder

«British most famous chemist is Peter Wothers... Ok, ok, he's our Observer. We'd say it's Sir Humphry Davy because of his discoveries of alkali, and Michael Faraday of course»

Poland

Paulina Mieldzioc

«Every city and town in Poland has a street named after Maria Sklodowska-Curie. We also have a lot named after Louis Pasteur, although he was not our guy. We're also proud of our contribution into graphene studies, you know this new ultra-thin material. In 2010 our chemists together with Chinese and Russian colleagues managed to make a dimensional surface consisting of just a single layer of carbon atoms, that was a real leap!»

Costa Rica

Suàrez Espinoza

«I'm sure no one here knows that our country has its own version of periodic system»



Venezuela

Ricardo Mathison

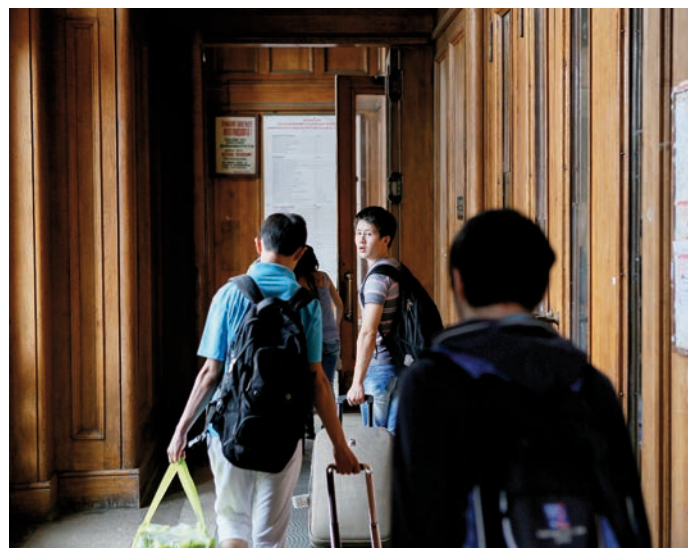
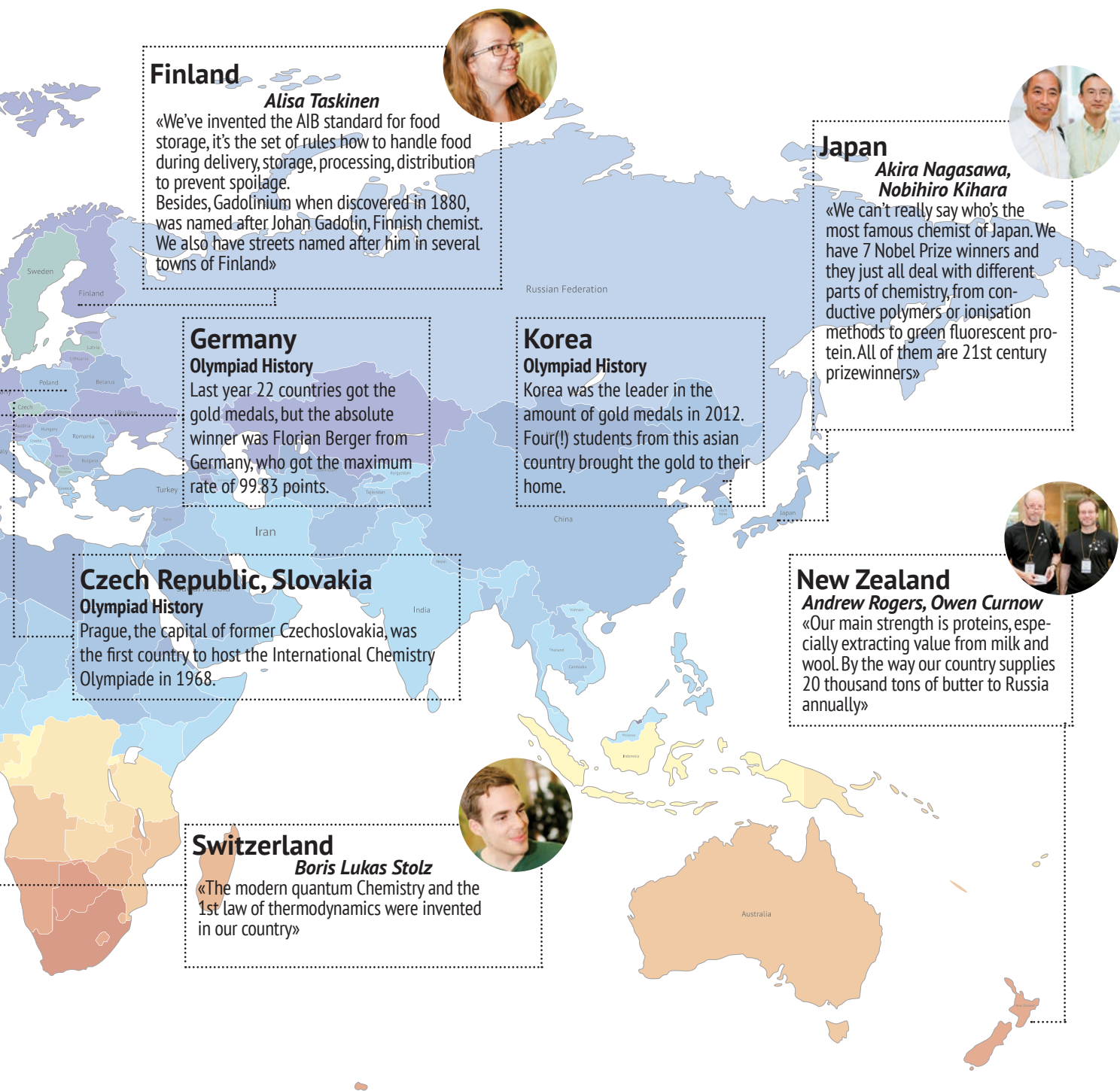
«Our country invented the remedy for a chronic infection called Leprosy»

>> from page 1

12.00-13.00 Buffet dinner in MSU	MSU main building has a nice lobby with a huge statue of Ivan Michurin (FYI he was a biologist and selectionist). Those who study Russian may start reading wise sayings on the marble slabs.
13.30-18.00 Moscow city tour	City sites is what your guides will show you. Catalyzer advises you to count the means of transport you come across in Moscow streets. You're likely to see buses, trams, trolley-buses, motorcycles, a monorail road, bikes and scooters – everything but the metro, which is by the way the world's most beautiful Underground.
18.00-19.00 Transfer to Planernoye	Approaching the hotel you might notice that we're staying at a suburb with a weirdly special name. The district is called Khimki which sounds pretty close to "Khimiki" which is a Russian for "chemists". In fact the name has different origins, so it's no more than a consonance – still a good one.
19.00-21.00 Dinner	Have you ever tasted boiled buckwheat? Every now and then we meet foreigners who don't know what it is, although it's very popular in Russia. Hurry up! You might never have a chance to taste it again. Buckwheat is a brown-gray crop rich in phosphorus.
21.00-23.55 Dance party	... and be sure the DJ plays at least one song of Ivan Dorn. He's very popular in Russia and Ukraine and people say the music is really good.



PHOTO



CHRONICLE

ICHO in figures

45 times the International Chemistry Olympiad has been held since 1968

3 countries: Czechoslovakia, Poland and Hungary, have taken part in the very first Olympiad in 1968

7 is the maximal amount of the Absolute Winners a country has ever had at IChO in the Third Millennium (since 2001), and the country was China. The second on the list is Russia, it has had two absolute winners within these twelve years.

27 countries have hosted the Olympiad through 45 years of its history

77 countries are taking part in the 45th IChO.

5 times IChO was held in Russia, which is the maximal amount of Olympiads held in one and the same country. Two times out of five took place in the USSR period. The Olympiad was also held 4 times in Hungary, 4 times in Germany / GDR, 3 times in former Czechoslovakia.

6270 school students have taken part in IChO over time.

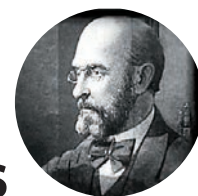
Note, that the amount of participants doubles every decade. There were 350 students who took part in the first ten Olympiads, events number 11-20 altogether hosted 760 people, events 21-30 had 1480, then it went up to 2300 participants at the 31st - 40th Olympiads. The 41st to 45th events already had 1380 people.

3 countries are new to IChO this year: Uzbekistan, El Salvador and FYR of Macedonia.

291 students are taking part in the IChO this year.

40 of them are girls.

Meet Russian Chemists



Alexander Butlerov
(1828-1886)

First steps in chemistry

As an undergraduate of a boarding school along with his friends got some black powder and detonated it. Was punished by teachers for three days: had to stand in the corner of the dining room while everyone was enjoying the lunch, with a ridiculous sign on his neck «A Great Chemist.»

Contribution to chemistry

A co-founder of the Theory of Organic Compounds Structure (1861). Explained the phenomenon of isomerism (1864). Discovered the principles of reversible isomerization (1862), laying down the foundations of tautomerism.

Was the first to study polymerization mechanisms in theory. Performed a number of important organic syntheses such as hexamine and formaldehyde polymer. He has also which ethyl alcohol from ethylene, that was the first total synthesis of an artificial sweetener.

Interests

Teaching: founded the first Russian school for Chemists.

Experiments in gardening, floriculture and agriculture.

Insects. Had one of the world's best butterfly collection. Has published a book about bees.

Quote: "A good chemist should be able to make complicated glass devices by his own hands"

What we thought it would be and what it really is

Catalyzer interviewed 34 IChO newcomers about what they thought and knew about Russia before coming and whether the reality met their expectations.

What Russian word can you say?

нет / no – 7 answers

да / yes – 6

привет / hey – 6

здравствуйте / hello – 5

разрешите мне передать горячий, горячий привет / let me send a warm, warm regard – 1

до свидания / good bye – 2

спасибо / thank you – 4

пожалуйста / please – 4

ванна / a bath – 1

я немного говорю по-русски / I speak Russian a little – 1



150 Years
Science For A Better Life



Contacts

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№3
July 16, 2013



**Kazak song
for English
speakers**
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**Swiss and Liechten-
stein mentors about
the new generation
of chemists**
page 3 >>

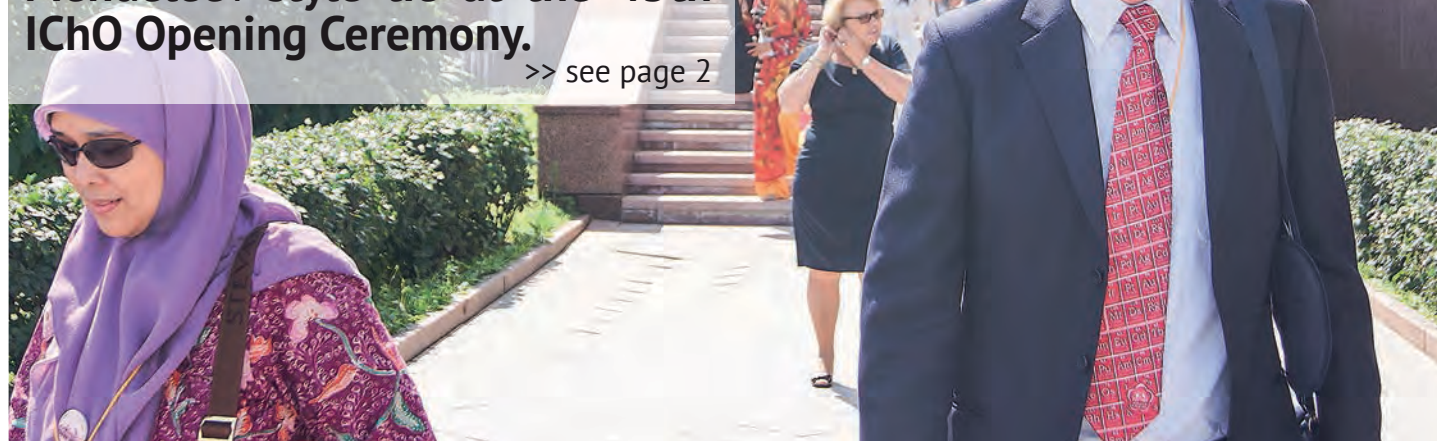


**Kremlin stars
under chemical
examination**
page 4 >>

Now it all ties up

Periodical system turned out to be widely used among chemists as a fashion design template. Peter Wothers wearing his favorite Mendeleev-style tie at the 45th IChO Opening Ceremony.

>> see page 2



Today is gonna be the day | *Catalyzer's tips*

8.00-9.00 Breakfast	Taste the white cheese pudding. White cheese (aka cottage cheese or curds) isn't very popular outside Russia, and this way of cooking is just exclusive. We add semolina and sour cream so that the dish tastes like pudding.
9.00-12.00 Free time	Breathe the air of freedom before the experimental tour starts.
12.00-13.00 Lunch	Try borsch. It's Russians' and Ukrainians' favorite red beetroot soup.
13.00-14.00 Transfer to Kremlin	When entering the city our bus crosses a river. It's the same river you saw yesterday near the Red Square. Moskva river twists a good deal across Moscow, so you can even try to count how many times you'll cross it today.
14.30-17.30 Tour around Kremlin	Most muscovites don't even know that there's a new attraction in Kremlin: a helicopters pad in the corner of the ancient fortress with two helicopters belonging to President Putin and Premier Medvedev.
17.30-18.00 Walking around Alexandrovsky	Walking around the Alexandrovsky garden ask the guide how is this possible that there's a river right under your feet.
18.00-19.00 Transfer to Planernoye	So, how many times have you crossed the Moskva river today?
19.00-20.00 Safety training before the experimental tour	Just listen.
20.00-21.30 Dinner	Try boiled potatoes with dill, Russians love it both as garnish and main course.

IChO Opening Ceremony

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Cossack choir and Russian folk music brought a certain Slavic zest into the international ceremony. The big hall of the Fundamental Library aka "MSU Think Tank" was decorated with ethnic suits of 77 countries. The MSU Rector **Victor Sadovnichy** wished success to the whole Olympic movement. Chemistry faculty Dean **Valery Lunin** promised the contestants will like the tests. Chairman of the IChO International Steering Committee, **Peter Wothers** confessed that what has always amazed him most about chemistry was Mendeleeev's great beard, and afterwards showed his tie designed in the periodical system style.

Alexander Rodenberg Germany

Those Cossacks' funny dancing are very thrilling. I suppose Cossacks were singing about life, partying and drinking... What impressed me was russian «balalaika». And I can't deny that Russian musicians are really talented.

Tas Yusoontorn Thailand

Now I know Russian people are pretty good dancers. Cossacks were really impressive and energetic. I was especially shocked when they were doing it with those sharp swords. Russian women were beautiful and their dresses were very peculiar.

After the Opening ceremony folks were wondering what the foot-tapping Cossacks were singing about. Catalyzer tried to transliterate and translate the song so that you could try and sing it.

The song lyrics

Розпрягайте, хлопці, коней,
Тай лягайте спочивать,
А я піду в сад зелений,
В сад криниченьку копати.

Маруся раз, два, три, калина,
Чорнявая дівчина
В саду ягоду рвала...
и т.д.

How you can sort of pronounce that all if you're an English-speaker

Rose-pray-guy-tea chloe-p-tsi co-nay
Thai lie-guy-tea spore-cheer-watt
Are ya pea-doo f sard zee-lonely
V sard crane-itching-coo co-part

Morose-say Ross! Dwarf! Tree! call-
leaner
Chir-narwal dif-chin-are
F sudden ya-go-door-wall-are...

Philip Zoran Ilievski FYR of Macedonia

It was a great show. As I'm fond of russian culture I heard the song Cossacks were singing, the one about the horses, so I was very excited. We also know your national song "Kalinka"... By the way, what does Kalinka actually mean?

And the meaning:

Guys, unhitch your horses
And go to bed,
As to me, I'll go out into the
green garden
To try and dig a well
Marusya, one two three.
arrowwood,
A black-haired girl
Was picking up the berries
etc.

A Country in Brief

Every day Catalyzer picks a random delegation and goes to meet the team.



The French team consists of four friendly guys. Two of them are from Paris, the other two come from Clermont. We asked them to tell us about each other.

Team about Dorian Canham

He's the eldest guy of the team. He's good at chemistry and physics. Except science he's interested in badminton and music. Fond of organic food.

Dorian on his country's great inventions in chemistry: "The coolest ones were Antoine Lavoisier who studied mass changes during chemical reactions, and Yves Chauvin who developed methods of synthesis in organic chemistry"

Team about Valdo Tatitscheff: He's the tallest of us! He enjoys table tennis. He's keen on music, he can even compose... He likes singing and whistling!

Valdo on chemistry education in France: "The level of chemistry is a little low, it is not as good as it should be. We begin to study chemistry at the age of 15 or 16 and I think it is really a little late. The subject is compulsory. But what I really like about chemistry in France is that there is a lot of organic chemistry!"

Team about Clement Robert: He enjoys climbing. Unlike many Europeans he really likes reading books, especially science-fiction.

Clement chooses the most typical frenchman of his team: "The most typical would probably be Valdo, because he is a bit impatient, sometimes complains a lot; he also likes cheese and wine, and he is very romantic..."

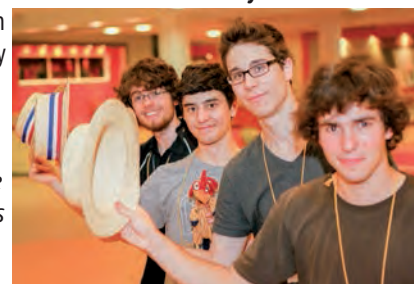
Team about Jean Michallad: He loves asking questions. He enjoys volleyball and is pretty good at playing violin.

Jean on how he'd like to contribute to chemistry: "I want to work with solar energy. Using modern materials I want to get more energy out of the sun"

Loving Chemistry in French

Mild version *J'adore la chimie*

Tough version *J'abhorre tous que la chimie*



What's chemistry coming to?

Catalyzer regularly talks to mentors about how they see the present and the future of chemistry, chemical education and the role of their country in the world scientific progress.

Basil Wicky,
Sebastian Keller,
Switzerland

Lucia Meier,
Michelle Frei,
Liechtenstein

The future of chemistry

Basil: Chemistry is obviously getting more and more merged with other sciences: material sciences, biology. Most probably it's finally stop existing for its own sake. The only purely chemical science might be organic synthesis.

Lucia: Wait, there's always pure chemistry in the base of everything. But I agree that the research are moving towards studying something that can be directly applied.

Sebastian: And I, as a theoretician, will say that chemistry is moving towards becoming a predictive science rather than empirical. Maybe in 50 years there will just be a super computer building molecules, so the chemistry will all be in interfaces.

Basil: Yeah! It will be amazing if we get able to predict the reaction rather than conduct it.

Michelle: Haha, i hope i can see this before I die.

Fields of human activity where chemistry will gain importance

Michelle: Green and sustainable energy.

Sebastian: Food and additives.

Lucia: Pharmaceuticals.

Basil: It would also be cool if chemistry developed in connection with information processing,



you know, if it can be silicon-based...

The substance your country is associated with

Lucia: Well, in Liechtenstein chemistry is not very developed. We can't say the substance.

Basil: Why not lignin?

Lucia: Oh, right, lignin. It's the thing you get from wood, something like resin.

Basil: You can use it to print banknotes. Which Liechtenstein is obviously doing!

— And Switzerland?

Sebastian: Well, LSD was invented in our country...

Michelle: Erm... Maybe chocolate is better?

Country's recent discoveries and future role

Basil: In the last couple of decades we've got two Nobel Prizes: Richard R. Ernst got it for developing nuclear magnetic resonance spectroscopy and Kurt Wüthrich was awarded for determining the three-dimensional structure of biological macromolecules in animal proteins. So if we keep doing what we're doing I guess we'll be in charge of fine chemicals and biotech.

What makes a good chemist?

Passion.

The new generation of chemists

Basil: This generation is different in a way that these guys are more willing to accept computational theoretical studies than the old professors tend to do. So chemistry is going to become more about bio interfaces. I still see people who don't believe computer simulations of natural processes, they say "show us the actual experiment". That's going to gradually disappear, people will get used to computational modeling type of world and that's what predictive sciences will look like. Quote: "Make your students swim in deep waters, at least those who float are of promise"

Records | Moscow Tour



Gatis Ogle from Latvia was sure the Red Square would be pretty red.

A common misbelief about Red Square is that it's called so because of the brick color. In fact the modern Russian word "red" — красный [krassny] — used to mean "beautiful" in the old Russian, so the square was in fact called awesome.

Croatian **Filip Kozlina** said the Kremlin "was smaller than he thought it would be, but still amazing and really beautiful". He compared Red Square with the main square in his native town and found Red Square pretty big.



Bana Josipa Jelačića square is the main city square of Zagreb named after Croatian-born Austrian commander and Croatian ban (governor).

Swiss team reported they feel very small near Lenin's Mausoleum, because they "feel the pressure of history at this place".

No wonder Lenin Mausoleum size and construction are so oppressive. Made of reinforced concrete with brick walls, lined with granite, decorated with marble, quartzite and labrador, the Mausoleum has a 100m² Hall inside and a 60-ton (!) granite slab.

Maria Fala, Cyprus: «I liked the architecture of Moscow, there are totally different buildings. Ones are very old, others are new, and they're all mixed! I'd like to come back".

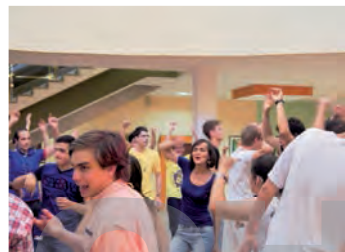


photo by Ada Maria Krzak, Denmark

Chemical composition

Cu

The first stars of the Moscow Kremlin towers were made of **high-alloy stainless steel** and **red copper**.



In the middle of each star there used to be a hammer-sickle symbol made of **semi-precious stones** covered with **gold**.

H₂O

But they quickly faded because of **rain and snowfalls**, besides they looked awkward in the overall composition of the Kremlin. In 1937 they were replaced by new glowing stars made of **ruby glass**.

×3

Triple glazing: **crystal glass**; **milk glass** – 2 mm thick to scatter light and hide the **tungsten wire** of the lamps; covered by **ruby glass**, 6-7 mm thick, 500m² used. Contains **selenium**.

Se

In the bright sunlight the red color of the stars would appear black. To avoid that engineers used to add gold to get the necessary ruby color. But selenium is cheaper and gives a deeper color.

Spasskaya Tower Star
You had a chance to see it in the Red Square

Au

Gilt. 40 micron thin. 11 kilograms of gold was used to cover the frame of all stars.

XYZ

3,75m long (end-to-end). Wind pressure up to 200 kgs/m².

W

Lamps. 5 kW. Each has 2 paralleled **tungsten** wires to backup if one burns out.

Cr

Steel backbone in the shape of a multi-faceted pyramid. Framework: **stainless steel**.

Si

Star arms: lower density **glass** at the ends to scatter light. Initially there was an idea to put several lamps inside the star, but it was finally given up, so the star structure helps scatter light better and the lamp itself is surrounded by many glass prisms.



To safeguard the stars against overheating there's a special vent system with **air** filtering and two fans, one of which is a stand-by.



* Self-contained power protects from power cut-off.

Meet Russian Chemists



Vladimir Markovnikov
(1837–1904)

First steps in chemistry

Studied law at Kazan University, but then got impressed by practical studies in the chemical laboratory guided by Alexander Butlerov and changed for the science department.

Contribution to chemistry

Investigated the mutual influence of atoms in organic compounds. In 1869 formulated the rules of pathway for the reactions of substitution, elimination and addition on the double bond and the isomerization depending on the chemical structure (Markovnikov's rules).

In 1883 discovered a whole new class of organic compounds – naphthenes.

Proved the existence of cycles with the carbon atoms number from 3 to 8.

Was the first to synthesize cyclobutanedicarboxylic acid (1879), and cyclic ketone – suberon (1889).

Interests

Investigated the composition of Caucasian oils, derived a number of individual substances from them.

Took the first attempt to chemically classify the oils.

Organized a health service in the army during the Russian–Turkish War of 1877–78.

Studied the nature of salt lakes (geology).

Quote: “Make your students swim in deep waters, at least those who float are of promise”

What we thought it would be and what it really is

Catalyzer interviewed IChO guests about the hosting country.

Which thing is extremely necessary to be taken to Russia? (number of answers)



umbrella – 7



warm sweater – 5



passport – 4



dictionary – 2



map – 2



teddy bear – 2



gumboots – 1



repellent – 1



calculator – 1



spicy korean food – 1



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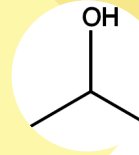
"Birthday is my best accomplishment here"

Lamanto Valerio celebrates 18 on page 2 >>



A typical citizen is a driver

Meet the New Zealand Olympiad team page 3 >>



Burn after reading

Something you'd better not know about chemical weapon page 4 >>

Salvadorans walk the talk



After claiming that playing football is a must for every male citizen of El Salvador, Salvadorans took the field and indeed showed a great game.

>> see page 2

Today is gonna be the day | *Catalyzer's tips*

7.00-8.00 Breakfast	We in Russia have an idiom: when you can't do a thing or do it with difficulty, people will say "You've eaten too little porridge". In Russian it sounds like "Каша мало ел" [car-she marla yell]. Guys, you'll face a big challenge in MSU today, eat more porridge! By the way, while English porridge is traditionally made of oats, here in Russia we cook it with everything: rice, semolina, peas, pearl barley and millet.
8.00-9.30 Transfer to MSU	Spend some quality time on your way, prepare for the experimental tour. Russian students have a superstition: if you put a 5 rouble coin inside your shoe (under the heel), you'll have luck at the exam. There's no statistics on how this thing works with Olympiads, so you can check for yourself.
10.00-15.00 Experimental tour, MSU	Both sides of the entrance to the faculty are marked with two statues of great Russian chemists: Mendeleev and Butlerov. Again there's a superstition: touch Mendeleev's foot to succeed in non-organic chemistry exam, for organic chemistry go touch Butlerov's feet.
15.00-17.00 Lunch in MSU	There are 37 food points over the whole area of MSU, the main building alone has 5 canteens. Enjoy not only the meal, but the atmosphere of the place, which was designed at the time when Soviet Union was launching the first spaceman Gagarin and developing nuclear energy.
17.00-18.30 Transfer to Circus	You'll most probably have a chance to see the famous Moscow traffic jams.
19.00-22.00 Circus Performance	You're lucky to be visiting one of the oldest – still the coolest – circuses in Russia. In front of it there's an unusual monument to a great clown Yuri Nikulin with a permanent queue to take a picture. The third superstition for today – rub his nose for luck.
22.00-23.00	Transfer to Planernoye, dinner... This is where we run out of space!

Salvadorans walk the talk

>> from page 1

Yesterday morning the future chemistry gurus proved science is not their only strong point. The pre-dinner break was enough for over a half of all IChO male Olympians to show up at the pitch. Multinational teams played in the come-and-go “sudden death” mode, meaning that every match was played until the first scored goal.



According to the names on T-shirts among players from Armenia, Lithuania, Turkmenistan, Kyrgyzstan, Poland, Venezuela and Sweden there were real stars: **Alberto**, Peru (Nº9) and Argentinian **Del Grosso** (Nº10). The fans were delighted to greet Real's halfback **Angel Di Maria** (Nº7) who came to play, although very soon turned out to be an Azerbaijani **Balagardash Bashirov**. The same happened to the player named Jesus Christ, on whose behalf, as it turned out, a Salvadoran **Rodrigo Dueñas** was playing.

Catalyzer was watching Salvadorans pretty closely. The thing is the evening before in an interview to us they've claimed that football is their country's national sport and real El Salvador male citizens are great at football.

Let's say El Salvador did not let us down.

No sooner said than done, in one of the games **Rodrigo José** was the one to score the decisive goal, in yet another game his compatriot **Edwin Ariel** did the same. By noon Catalyzer journalists – to their amazement – spotted a girl at the pitch. A beautiful representative of Switzerland named **Josephine Pratiwi** was chasing the ball in sandals, easily beating the guys. “Weren't you afraid to play against her?” – we asked a virtuoso Venezuelan **Johel Arteaga**. “Not me, because we're in one team, but other teams really should! – he said. – Yeah, playing football with girls is actually pretty awesome”.



“Getting 1 kg of cesium for birthday would be pretty cool”

Valerio Lamanto, Italy

18 years old

Born: Rive, a small village

80 km from Turin

Lives with his family: mother, father and a younger sister.

Speaks Italian and English

Studies chemistry for 3 years.

Believes it to be the second purest science after physics.



Valerio Lamanto appears to be a fine judge of strict and logical beauty. Maybe this is why he doesn't normally celebrate his birthdays. “What's the point, if I want to have a party I can anyway have it”, he says.

When Valerio turned 18 on July 17th he didn't even care for phone calls (left his cellphone back at home in Italy). But since Russia is one of the countries he's always wanted to visit, this birthday, Valerio admits, looks a little like celebration.

– Eighteen years old in Italy mean you're of age – with all that it implies. It also means that in a year I'll be finishing school and when I do, I'll try to enter Scuola Normale Superiore in Pisa.

– I can't say that much changed over this year since my last birthday. But one thing is definitely different: I'm here at IChO. I didn't get there last year, even though I applied and was the fourth in my country. This time I was luckier.

– I love organic chemistry. There's so much beauty in these reactions, they're logical, yet complicated, and this all challenges me incredibly.

– There is a person I admire, his name is, I mean was Alan Turing. The father of computation and the first guy to realise what we can do with electronics! Only his destiny is something I wouldn't like to repeat.

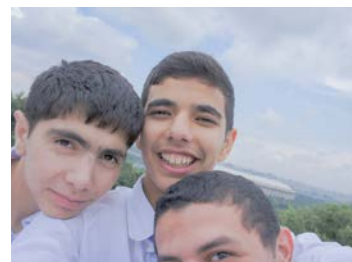
– If I could get a Nobel Prize, I'd love to get it for inventing a cure for cancer. Though I don't think it's possible, I'm not very much into pharmaceuticals, I'm more about theory and I don't really care how it's applied.

– My favorite chemical reaction is Fluorine + Cesium, because it's intense. It goes between the strongest metal and non-metal elements, it gives out no gas, it can go at low temperature and it gives the beautiful proper flame.

– If I could get a free ticket, I'd go to Iceland. Ice, fire, you see, I like contrasts :)

– The substance I'd like to be associated with is tungsten. Because it has the highest melting temperature ever. It never fuses.

– I haven't celebrated birthday for 5 or 6 years. I don't even remember what it is to get presents, except for birthday cards. I don't know what present I'd like to get... What? A kilogram of cesium? Haha, well, sounds nerdy, but that actually would be pretty cool!



A Country in Brief

Every day Catalyzer picks a random delegation and goes to meet the team.

New Zealand

The New Zealand team consists of three guys and one girl. We asked them to introduce each other.

Team about Cindy: Cindy is the only girl in the team. She can play viola.



Cindy on her country's great inventions in chemistry: Ernest Rutherford who was born in New Zealand postulated planetary model for atomic structure. He was the first chemist to try splitting up an atom and it's nucleus.

Cindy chooses the most typical New Zealander of her team: Probably Frank probably, because he is pretty relaxed and he really creative in the way he solves problems. Besides, Frank drives, although he's pretty young.



Team about Frank: Frank is very smart. And has an amazing talent to sleep in different places – in the bus, in the plane, at the station – mostly everywhere!



Frank finds differences between Moscow and his own city: Moscow University is so huge comparing to Portland, where the university is all spread-out, so the buildings can be located all over the city. And your transport seems a bit more efficient than ours.

Team about Ka Yin Keniel Yao: Keniel plays saxophone, he's fond of music. He dreams of inventing a time-machine, because he'd like to use his time more efficiently. He wants it to be made of radioactive compounds because this would be real fun.



Keniel about his favorite substance: Luminescent substances because they shine in the dark and I like this blue light.

Team about Scott Huang: Scott is very quiet. He enjoys playing badminton! He is really very good at maths.

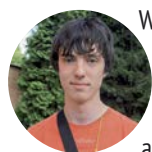


Scott on chemistry education in New Zealand: Children start studying chemistry at 13 or 14 years, and it is compulsory until they are 16. We have 5 science classes a week and 2 of them are chemistry lessons.

Kremlin insights

Olympians shared what they discovered during the Kremlin tour. Catalyzer shares something too.

Alexander Matthew Turner, Australia



We've learnt a lot about Russian medieval history today, I was surprised to learn that there wasn't just one Kremlin in Moscow, there are a lot of kremlins all over Russia.

Cat → The word "kremlin" itself means "a steep bank" and was used for Russian fortresses built on river banks. The most famous Russian kremlins are situated in Moscow, Pskov, Novgorod, Nizhny Novgorod, Kolomna, Tula, Kazan, Rostov, Astrakhan and Ryazan.

Roman Beránek, Czech Republic



We've learnt that Ivan the Great Bell Tower is the highest building in Moscow Kremlin, it's over 60 meters high. And the icon wall there is also very high and really impressive. We also noticed Russians really like gold, there are so many golden things there in Kremlin. And the size of those treasures is a bit...enormous!

Cat → The height of the Bell Tower is in fact over 80 meters. After it was built in 16-17th century, there was a longtime ban prohibiting the construction

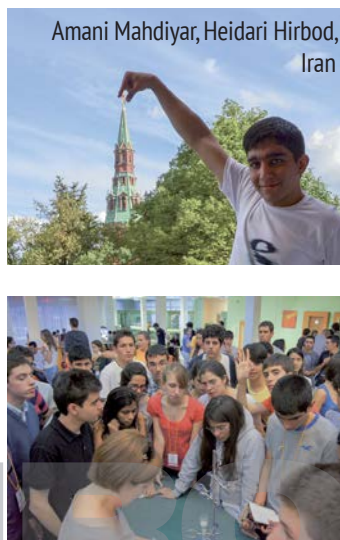
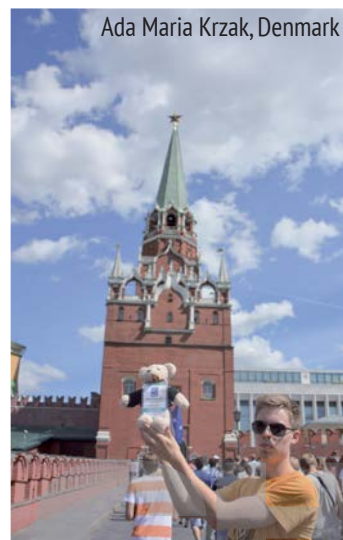
of buildings higher than it. So till the turn of 18th century it really was the tallest building in Moscow.

Kim Kristian Kuntze, Finland



It was very curious to know that Catherine the Great had about 15000 dresses and over 1500 carriages.

Cat → Catherine (Ekaterina) the Great (1729-1796) was a Russian Empress whose court is known for particular splendor.

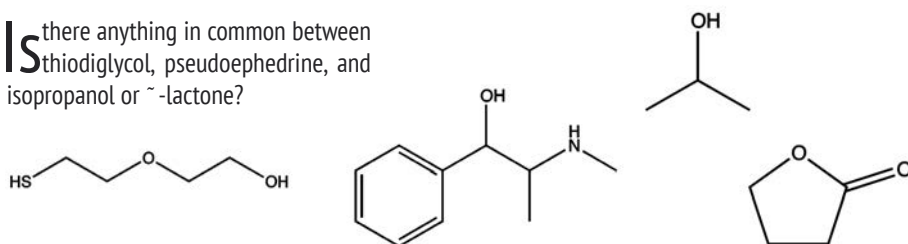


Burn after reading

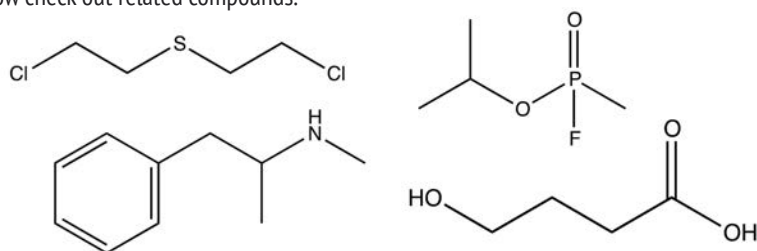
How is chemical weapon made

By Jan Apotheker, member OPCW Temporary Working Group on education and outreach, chair organization IChO 2002, Groningen

Is there anything in common between thiodiglycol, pseudoephedrine, and isopropanol or γ -lactone?



All substances are fairly common. **Pseudoephedrine** is the active substance in some cough syrups, originally extracted from Chinese plant Ephedra. **Thiodiglycol** is used for water-based dyes in cloth manufacturing industry, especially in developing countries, as well as for printing inks and felt-tipped pens. **Isopropanol** is the main component in glass cleaners and a solvent for many innocent purposes. γ -**lactone** is a widely used industrial detergent. Now check out related compounds.



It shouldn't take you too long to figure out how to convert compounds in chart 1 into those of chart 2. The trouble is that compounds in chart 2 are respectively: **mustard gas**, **methamphetamine** (crystal meth), **sarin** and **gamma hydroxyl butyric acid** (party drug GHB). As you can guess, all four are dangerous and strictly forbidden in most countries of the world.

Not only chemicals pose these problems. Whole chemical plants can be misused in much the same way. This is what has happened several times over the last 30 years, when certain countries have supplied to others equipment then used to produce weapons and toxins like mustard gas, sarin and VX. The problem of the dual use of chemicals (for both innocent purposes and doing harm to others) is rather ethical than scientific. How does the international community deal with the problem?

>> To be continued in the next issue.

Happy Birthday!



Fang Haitian,
student, Singapore



Alex Eremin,
organizer, Russia

What kind of souvenirs did you buy?



magnets – 12



postcards with
Moscow view – 7



mugs – 4



T-shirt – 2



nothing – 4

khokhloma-style spoon, egg (Faberge imitation), matryoshka – 1

Meet Russian Chemists



Nikolay Zinin
(1812–1880)

First steps in chemistry

Was studying maths at the University of Kazan, when his rector, an outstanding mathematician Nikolay Lobachevsky, persuaded Zinin to do with chemistry. You could think it was a fail for a young guy to be advised not to keep on with maths by a great mathematician of his days. But in fact Lobachevsky said: "If you're brilliant at math, you'll be good in chemistry, and we are now in a great need for chemists".

Contribution to chemistry

In 1842 discovered the reduction of aromatic nitro compounds into aromatic amines (Zinin reaction). Basing on it, synthesized aniline. Zinin's syntheses became the basis for creating the industry of synthetic dyes, explosives, pharmaceuticals, fragrances. He discovered the hydrazobenzene regrouping when exposed to acids and called it "benzo-benzidine rearrangement". In 1852 synthesized isothiocyanate acid allylether, commonly called "volatile mustard oil". Discovered ureides (1855).

Interests

Contemporaries about Zinin: "Chemistry, mineralogy, botany, geology, astronomy, physiology, — he was familiar with all that, and fundamentally. He had amazing memory — he would quoted whole pages of Schiller in German and in translation".

Quote: "Your Alfred Nobel just snatched the dynamite from under our noses!"

Alfred Nobel, the future inventor of dynamite, was Zinin's countryside neighbor and saw Zinin's experiments with nitroglycerin.



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“This false sense that chemistry works...”
Mentors from Canada on the future of science on page 1 >>



“He can read 100 pages over night!”
Czech team introduced on page 3 >>



He who invented the gas mask
Meet Nikolay Zelinsky on page 4 >>

Synthesize this!

Through the lack of time, unfamiliar equipment and filtering hardships we're finally there: aldehydes synthesized, viscosity measured, first mission performed.
>> see page 2



photo: Filipp Napolskiy

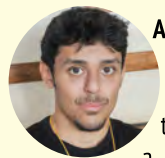
Today is gonna be the day | *Catalyzer's tips*

7.30-9.00 Breakfast	A Russian can be quickly identified by the manner of drinking tea. If other nationalities after stirring sugar take the spoon out, a Russian teadrinker – for some unknown reason – leaves the spoon in the cup and holds it out while drinking so that their finger protects their eye from being poked out... When you see Russians doing it, don't try to repeat, it's dangerous.
10.00 Transfer to Planetarium 11.20-14.30 Excursion to the Moscow Planetarium	Planetarium is a special place to show stars and planets. Moscow Planetarium is one of the oldest in the world (since 1929). In 2011 it was reconstructed and now it's one of the trendiest places in Moscow. Getting there is not easy, there's always a queue. Must-see: the world's most powerful projector in the Star Hall. Must-do: try and guide the giant robot arm in the interactive hall. Look through the largest public telescope in Moscow. Note that the building of the Planetarium is built in the shape of a giant egg which makes it a world-class architectural monument.
14.30 Lunch in Planetarium	Well... Hard to say. None of us has ever eaten in Planetarium.
15.30-17.30 Moscow Zoo	Moscow Zoo is one of the biggest in the world and it's already 150 years old. Must-see: a red panda that looks just like the “Kung Fu Panda” (a unique species in Russia), Father David's deer (they don't exist in the wild). Say hello to the suricates. Taste Moscow ice-cream (for some reason in the Zoo it's incredibly delicious).
17.30 Transfer to Planernoye	Taste the beetroot salad or “винегрет” [win-a-grate]. It's a Russian national salad with a French name (comes from “vinai-gre” – vinegar), made of simple vegetables: beetroot, potatoes, carrots, peas. Russians love it so much that the name became a common word for... a mess in one's head. When you see a person doing something stupid like solving glycine in cyclohexane, tell him: “You've got Russian salad in your head” / У тебя в голове винегрет! [Ooh tea-birth-f-goal-of-hay win-a-grate!]
19.00-21.30 Dinner	

Synthesize this! >> from page 1

Yesterday the olympians had to endure a five-hour marathon of the experimental exam. The work consisted of three tasks: organic chemistry, analytical chemistry and macromolecular chemistry.

The first task required to synthesize and identify two aldehydes. For that carbonyl compound mixture in question were added to the solution of 2,4-diphenylhydrazine. The mixture was heated on a water bath and, after cooling, beautifully colored crystals of 2,4-dinitrophenylhydrazones precipitated, which could be identified by their melting points.



Abdullah Alotaibi, Kuwait

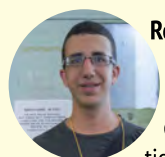
I prepared only theory, studied a lot of advanced books, but I didn't do any experimental things. The tasks were really very challenging; I think that they are quite useful in our daily lives.

Jela Nociarova, Slovakia

I enjoyed doing this work, although I didn't have time to finish everything. I feel tired but happy to have done it here in Moscow University.



In the analytical chemistry part Olympians had to study a water sample to measure and calculate a number of parameters: hardness, acidity, etc. The challenge here was working with a pH meter and especially with a titration burette.



Roli Elia, Israel

I've prepared since March. We've done a lot of practice in labs. Still I was a little surprised, mostly by the equipment. I've never used paper to check the amounts of ions in the water. But it's fine, my secret is having a good nap the night before.

Gadam Muratgeldiyev, Turkmenistan

The only challenge was that I had to work with equipment I'd never used before. We had to grasp the way it works very quickly.



Finally, in the third task Olympians were given samples of polymers in solvents. Using a viscometer they were supposed to define the time it takes the solution to go through a sensor capillary, and the recorded time was used to define certain parameters of the polymer, i.e. degree of polymerization. Working with the viscometer was new for most participants, which resulted in the loss of part of the viscometers park of the MSU Chemistry Department.



Arturo Martinez-Flores, Mexico

The viscosity task is of real industrial use. If you measure the viscosity, you can easily define what polymer is it.

Jean Michalland, France & Nicolas Remiche, Belgium

It was so short and we also had to draw some curves! The filtration was a bit difficult, because we'd never done it before. And the viscometer was very unusual.



What's chemistry coming to?

Catalyzer regularly talks to mentors about how they see the present and the future of chemistry, chemical education and the role of their country in the world scientific progress.



Andrew Dicks

Kenneth Charles Hoffman
Canada

Chemistry education trends

Kenneth: I'd say the focus is becoming less on the content and more on the context, on **why** are we learning chemistry. There's even a bit of tension between academic and educational sides over that separation, about what's the real purpose of teaching chemistry at school.

Andrew: There's also the greenification of chemistry in higher education, showing its potential in sustainability to high school students and undergraduates – because they are the people who will be making big decisions in that area...

About Russian Chemistry

Kenneth: Until I saw the bust of Markovnikov today I didn't realize how central Russian chemistry really was. It was powerful to see him and remember. He was a real person.

Andrew: I've again noticed the impact the Chemistry faculty building has on me. Our chemistry departments are nothing like here, yours are all huge and impressive, you're representing the accomplishments and the people, that doesn't exist in North America.

Canada's future role in world chemistry

Kenneth: We used to be leaders in carbohydrate chemistry back in 1970s.

Andrew: We did spectroscopy, got a Nobel Prize for electron transfer reactions in chemical systems in 1990s and dynamics of chemical elementary processes back in 1980s.

Kenneth: But I think Canadians are not the people to take over the world in anything. Apart from hockey.

There are just certain things we want to do well and make a meaningful contribution into. I really hope we'll become leaders in alternate fuels, i.e. hydrogen based. I'd rather the world stopped focusing so much on fossils.

The new generation of chemists

Andrew: They know a little about a lot of things. We used to be more focused, tended to know something deeply rather than a lot but superficially...

Kenneth: Yes, for sure, there's a tendency towards superficial interaction with things. I guess, it's because of the quantity of information kids have access to, it's overwhelming. The way they socialize is also dominated by the social media type of interaction. And it also extends to learning... Although you know what, every older generation at any times says the current young one is different and somehow wrong... I'm sure back then when the first people were learning to read and write, parents must have been saying: "Oh, that's gonna be the downfall of society! Kids are writing all the time, they're reading books!"

What makes a good chemist

Kenneth: Kids today have this false sense that chemistry works. But the reality is that you can do the reaction 20 times and it will work the 20th time...

Andrew: So yes, perseverance – and open-mindedness. And the ability to take principles from other sciences and apply here.

A Country in Brief

Every day Catalyzer picks a random delegation and goes to meet the team.

The Czech team is four very cheerful and talkative guys. They are different but get on really well and form a very harmonious group.



Team about Kamil Maršálek:

Kamil lives in South Moravia, he is going to study chemistry at Masaryk University in Brno. His main hobby is reading. Can read more than 100 pages over night. Loves listening to Pink Floyd. Enjoys tourism and walking at long distances.

Kamil on his country's inventions in chemistry:

"The most important discovery is the invention of pharmaceuticals that help cure lots of illnesses".



Team about Roman Beránek:

He has a beautiful girlfriend. He is going to study medicine. Roman is a DJ! He also enjoys programming. Such a versatile guy!

Roman chooses the most typical czech of his team: "Adam Přáda. He likes pork meat, he is a bit lazy and relaxed".

Roman explains why he loves chemistry: "It describes everyday life and helps understand how diverse our world is. Chemistry is difficult and demanding, but I'm good at it".



Team about Kryštof Březina:

He is an amazing piano player. He can speak German, French and English.

Kryštof invents something special:

"I want to invent something that works against illnesses that kill people all over the world".

Kryštof chooses his favorite substance: "Azurin because it has nice deep blue color and interesting structure".

Team about Adam Přáda: This guy is a fantastic mathematician.



He is really very talented. Does athletics and can run very fast.

Adam Přáda on how chemistry is studied in Czech Republic: "We start studying chemistry at the age of 14, and it's compulsory. We have practical classes every 2 weeks".

Loving Chemistry in Czech

Mild version: Miluji chemie

Tough version: Nenávidím vše kromě chemie

What's in your bag?

Dilshoda Artikbaeva,
Uzbekistan



National Uniform

(elegant dark blue jacket and a skirt trimmed with the national emblem)

Sunflower seeds

(In Russia you can often see «babushkas» (old ladies) eating the seeds in the streets. Here we learnt that Asians like these seeds too. These are from sunny Uzbekistan, she was sure Uzbek seeds are tastier.)

Uzbekistan flag

(the tricolor with red lines symbolizes peace in the world, innocence and power in each person of Uzbekistan)



This bag travels with its owner for the first time. The 4-hour flight from Uzbekistan to Moscow gave them a tough time

Catalyzer investigates IChO participants' bags and tries to find a national zest there. This time we're rummaging in suitcases together with Uzbek delegation.

Bread «Patyr»

(a round piece of bread with plat center is Uzbek national dish)

Books

(Dilshoda is very serious, so the first thing she showed us were textbooks on nanotechnology. Still, the biggest misbelief about young Olympians is that they are fond of nothing but chemistry. Dilshoda likes reading the poems by Abdulla Aripov and Pirimqul's Qodirov historical novels)



Exam photos by Filipp Napolski

Burn after reading, part 2

Chemical weapon

In the previous issue we saw the way innocent industrial chemicals like diodiglycol, pseudoephedrine, isopropanol or γ -lactone can be turned into dangerous substances like mustard gas, methamphetamine, sarin and GHB.

Imagine how easily, by just buying relatively innocent components and slightly modifying them, one can produce actual chemical weapon or hard drugs. Sadly, this is exactly what some countries do, setting up the whole lethal machinery, while other countries supply the necessary components, unaware of what they're used for – or sometimes intentionally.



Some of the greatest personalities in the history of chemistry are known to have used their skills against their fellow men. Fritz Haber, the “father of chemical weapon”, developed the usage of chlorine gas, Victor Grignard worked on phosgene. These substances, as well as tear gas and hydrogen cyanide, were used for mass destruction in the 1st World War between 1914 and 1917. This was when most warring countries got engaged in a chemical arms race, which resulted in horrific chemicals affecting lungs, skin, eyes. Some were specially designed for homicide at the battle field.

As a reaction to these atrocities in 1925 several European states initiated the so-called Geneva Protocol “For the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare”. By 2013 there are 138 states having ratified, acceded to or succeeded to the treaty.

For the same reason there exists a special Or-

ganisation for the Prohibition of Chemical Weapons, briefly named OPCW with headquarters in Hague. It monitors the production, import and export of certain types of chemicals.

At present, the direct threat of chemical weapons is low, although several countries still are suspected of possessing them. They can also be used by radical groups within society.

You are the chemists of the future. We put hopes on you as the soon-to-be decision makers. We want you to be aware of the risk posed by the dual use nature of chemicals. Please, whatever you do for the science, keep your eye on the combined purchase of chemicals that may be dangerous when mixed.

On behalf of the OPCW I wish you good luck at the Olympiad.

Jan Apotheker, member OPCW Temporary Working Group on education and outreach, chair organization IChO 2002, Groningen, specially for Catalyzer

Meet Russian Chemists



Nikolay Zelinsky
(1861-1953)

First steps in chemistry

Known to have been conducting chemical experiments at the age of 10.

Contribution to chemistry

Synthesized cycloalkanes with number of atoms 3 to 9 in cycle (1901–1907), and then even with 40! Completed the dehydrogenation of cyclohexane and its homologues in the presence of aromatic hydrocarbons in the platinum and palladium catalysts (1911) and used this reaction as an industrial method to produce the aromatic hydrocarbons from oil. One of the discoverers of the organic catalysis. Discovered the reaction of producing the α -amino acids from aldehydes or ketones (1906).

Fact

Zelinsky invented the gas mask with coal filter in 1915. For that he got a special appointment with the Russian Tsar Nicholas II to demonstrate the gas mask effectiveness. In 1916 gas masks have been included in the inventory of Russian Army.

Quote: “Working in a group requires the ability to accept criticism and the ability to criticize the others...”

Happy birthday!



Maurocélío Rocha Pontes from Brazil is 16 today!

No wonder Brazilian team loves Maurocélío. He's a man of principle, always knowing what to do and how to behave. He is a real gentleman and – coincidentally – a crazy party-goer.



So they wish him all the best:

Nicholas: “Successfully entering the Unicamp University!”

Victoria: “Benefit from the Olympiad experience”

Altogether: “Meet a cutie and fall in love with her!”



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Lena Yudina
Zoya Vysotskaya



1.5 mln km,
-266° C

Figures on James
Webb-2018
page 2 >>

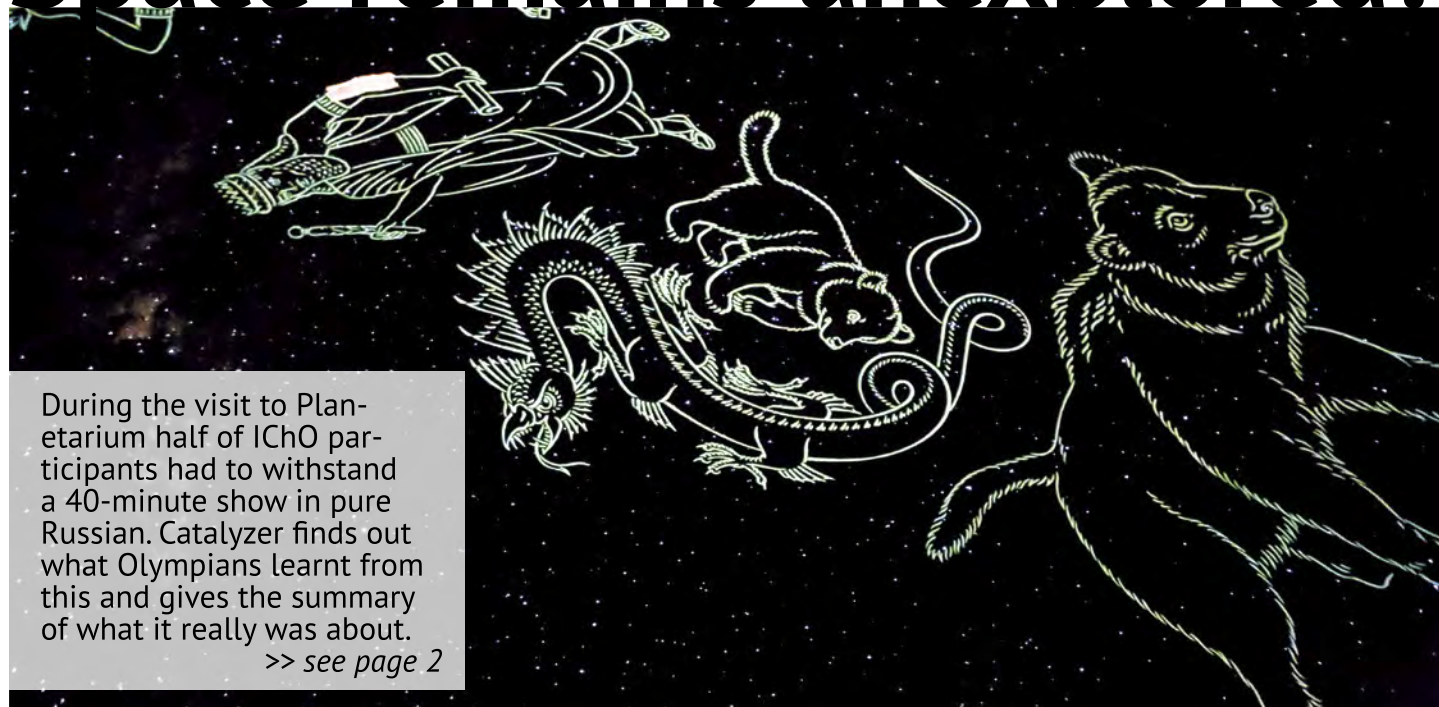


The DIY clouds
and other to-do's from
Planetarium
page 3 >>



Does a real
chemist wear
safety glasses?
page 4 >>

Space remains unexplored?



During the visit to Planetarium half of IChO participants had to withstand a 40-minute show in pure Russian. Catalyzer finds out what Olympians learnt from this and gives the summary of what it really was about.

>> see page 2

Today is gonna be the day | Catalyzer's tips

7.00-8.00 Breakfast	For breakfast, we recommend drinking a glass of milk. Milk contains amino acid tryptophan, which makes up for the deficit of serotonin an important brain neurotransmitter. Tryptophan has the antidepressant effect and eliminates anxiety.
9.15 Theoretical exam	Catalyzer continues to fill you in on national superstitions concerning luck at exams. Some Russian students believe you shouldn't wash your hair before the exam, or shave, or cut your nails, or take out the garbage, or step out of bed onto the right foot. On the contrary, what you have to do is: wear the same socks as at the first exam, have a short seat on your notes. If you want good luck for your friend, tell him «Break a leg!» which in Russian is something like "No fluff no feathers" / Ни пуха, ни пера! [Nip pooh-ha nip-pair-rah], to which the friend is supposed to respond «To hell!» / К черту [k-chir-too]
16.00 Lunch	Try cabbage rolls with milled potatoes, mushrooms, onions, carrots and buckwheat. In Russian they are called "ленивые голубцы" [lay-near-vow-yeah gull-loop-zee], which means "lazy" because you don't have to do much to cook them.
17.30 Transfer to MSU	Did you know Moscow's one of the world's greenest megapolises? There are 12 million trees which makes it about a tree per person. The most popular of them are poplar, linden and birch tree. The black-and-white birch tree is a symbol of Russia (see page 4).
19.00-22.00 Re-union party (boat trip), Dinner – BBQ or buffet aboard	TAKE WARM CLOTHES! Otherwise you'll get very cold, it's windy on the river. There are three things you need to know about the Moskva river. First: it's not called after the city, but vice versa. Second: if you sail along the Moskva river on and on you can finally get to the Black or even Mediterranean sea without getting out of the boat. Third: If you wave your hands from the boat at people on the bank, they'll think you're Moscow high-school graduates, they're known to be doing it every year in late July.

Space remains unexplored? >> from page 1

It was too late when the guides learnt there was an option of getting a headset with simultaneous translation into English. So the 40 minutes of the film in the Star Hall of Moscow Planetarium were seen by 100 foreigners in good clear Russian. Surprisingly most spectators appreciated it.

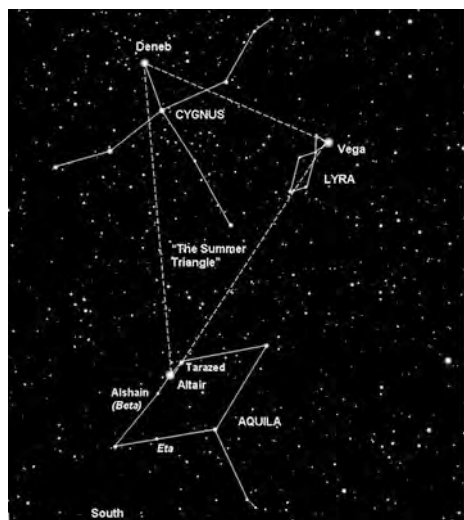


*"I do not understand Russian, but I generally grasped what was shown, – said **Boris Lukas Stolz** from Switzerland. – First there were stars, then the world's largest telescope Webb, and our Swiss CERN with the Large Hadron Collider."*

So what was really happening on the screen?

First we watched a movie "The Four Seasons: Summer." It showed how and where the sun rises and sets in Moscow in summer.

"On July 21st the noon solar altitude is 56 degrees, the sun's at a maximum distance from the equator. At 22:17, it will be hidden in the north-west, and we'll see the first few stars..."



Then the screen went black and we saw stars and constellations.

"In the south-west spring constellations are still visible, and near the horizon there's blue Spica of the Virgo. High on the south-east you can see three bright stars – Vega, Deneb and Altair. They form the Summer Triangle..."

At first the sky looked usual.

"We can't really see the stars because of the urban light and dust. So why don't we try to see the sky as our ancestors used to see it?"

At this moment some of the audience (obviously the Russian speakers) went "wow", because the sky suddenly turned jet-black and the stars went amazingly bright, which looked much cooler than anything anyone has ever seen up above.

"North Star is the only one of little location change, this is why we use it as a guide. But in fact it's not so stable. Here, between the Big and Little Dipper there's Thuban. About 5000 years ago it was polar and could be showing the direction to the North. Now look, here in



the Lyra constellation, there's Vega, the brightest star of the whole Northern celestial hemisphere. In 12 000 years it will become our North Star"

The screen also showed shooting stars (that in fact have nothing to do with stars because



*"I'm very interested in astronomy and space, I have a telescope at home – said **Anmol Arora** from India – and I wish I could understand at least something.... Still, the picture was very beautiful"*

they are disintegrating comet nuclei), and a dense star cluster in the core of our galaxy where there might be a supermassive black hole with a mass equal to 4 million



Suns. The second film in a male voice told how the understanding of the Universe has changed over time, from Galileo to Edwin Hubble, and how it is studied now. Then some little colored men talked about the astronomer's job. The idea was that astronomers no longer sit alone at observatories, but take part in international projects and work together with biologists, physicists, chemists and engineers.



*"I liked the part where they showed how to use different ranges of electromagnetic spectrum: infrared, visible light, ultraviolet and X-ray – to study various types of objects, it was beautiful," – said **Samuel Jacob Alsop** from Australia."*

"Astronomers of the world come together to find suitable places for telescopes. The advanced optical VLT – Very Large Telescope is located on Mount Paranal 2,600 meters high and consists of 4 huge telescopes. It gathers light 100 thousand times better than Galileo's telescope. Today astronomers have already observed the most distant galaxy and even obtained images of planets circling another star!"

The film mentioned the first space telescope Hubble and announced the next one named James Webb planned to be launched in 2018. James Webb orbit will be 1.5 million kilometers away from Earth (even the Moon is 384 thousand), its sun-shield is the size of a tennis court, its 18 mirrors allow to see objects 100 times less bright than Hubble, and the device for mid-infrared spectral range analysis is cooled down to -266°C / -446.8°F (even on Pluto it's warmer: -230°C / -382°F).

The young scientists were asked to contribute the open Galaxy Zoo catalogue. Then the Large Hadron Collider was shown, and finally they summed it all up:

Space exploration unites the humanity, let's explore it together!

*"The 3D-graphics were surprisingly cool, regarding that we didn't put on any glasses, – said **Philip Kozlina** from Croatia and added. – By the way I understood pretty much everything, just because Slavic languages are very similar, but I don't think it was this easy for the rest."*

Most of the humanity representatives didn't feel very united, mainly because they didn't even get what was said. Still they liked the Planetarium.

Well, at least now we know that a common language is crucial for space exploration.



A Country in Brief

Every day Catalyzer picks a random delegation and goes to meet the team.

Salvador

Although the Salvadoran team is a bit shy, these guys are friendly and emotional.



Team about Pamela: she passionately loves dancing. Likes spending free time with her family and enjoys playing volleyball with them. Plays football and is a good goalkeeper. Loves little kids, because they are lovely.

Pamela on chemistry education in her country: "We have a well-structured way of studying science. For example we have a program that forms several streams. These streams include maths, chemistry, biology. We can choose subjects we like and study them in detail".



Team about Edwin: listens to rock and metal, plays football. Edwin is a talented dancer.

Edwin chooses the most typical Salvadoran of his team: "I suppose it's Rodrigo because he is pretty outgoing and friendly, spends a lot of time with his friends. Rodrigo is always relaxed. And he has dark hair".



Team about Rodrigo: as he is a typical Salvadoran, he plays football well. He is usually a half-back. Rodrigo is a very active guy.

Rodrigo about why he chose chemistry: "I've chosen deep study of chemistry in my school because I really enjoy the process, it engages and inspires me".

Rodrigo on chemical education in Salvador: "At first don't have chemistry as a separate subject

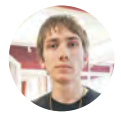
at school, we learn just the basics. Only at the age of 14 we can choose chemistry as one of the main subjects".



Team about Miguel: he loves organic chemistry and enjoys poker.

Miguel chooses his favorite substance: "My favorite organic substance is benzaldehyde because it smells nice. Somewhat like bitter almonds".

Daily Insights



Juraj Malincik, Slovakia

We saw the Solar system, then they took us inside and showed us films, but I fell asleep, so I didn't remember what the films was about. But it was a nice nap, I liked it.



Johel Arteaga, Venezuela

I remember a sad thing from the history of astronautics, it was about soviet dogs-astronauts Chaika and Lisichka. After 19 seconds of flight the rocket was damaged, it fell down and exploded and dogs died.



Jin Wook Rhyu, Korea

Doing experiments in Planetarium impressed me, especially the emergence of clouds. We've learnt how clouds help predict the weather a day before. We made clouds ourselves, that was really great.



David Kelly, Ireland

Today we've learnt a lot about stars and planets. For example we saw that the distance between Jupiter and Sun was 778 500 000 km.

Nejc Čeplac: "If I met God I'd ask him: Why us?"



Age turns 19 today.

From Maribor, Slovenia

Speaks English,

German,

a little Croatian

Education: finished high school and a bachelor program in English, preparing to enter the university

A perfect present: a huge laboratory of his own

— My name is the 7th common in Slovenia, but it sounds so weird elsewhere that I'm used to people calling me different combination of sounds — I even don't mind. You can call me Donald or Mickey or. What? Yeah, Richard is fine, sounds kingish. And Chandler is even

cooler! I only need to be sure you mean me. As to my real name it should sound like [neits].

— On my birthday we're writing the theoretical exam — which is so typical for my birthday. I'm used to something cool on that day, like year I was picking potatoes — oh no, that was 2 years ago, last year I was in Washington the day before the last IChO, 3 years ago I was working in a field, 4 years ago I spent the whole day in a ferry, so you see my birthday is like — see me having real fun? Welcome to my birthday! Haha.

— I'm planning to enter the university and see what the student life is like. I'm applying for the physical faculty this summer. For now I'm choosing physics because you need to know the basic atom structure, electrostatics and things. Still my final aim is chemistry, I love mixing up the substances.

— My favorite reaction is the one I haven't seen live,

it's a witty one: turning carbon oxygen double bond into carbon carbon double bond. I don't know what it looks like, but it seems so incredible to change a fairly strong bond into a double bond and progress a carbon chain like that!

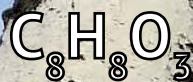
— If I were an element I would be... well, I'm going through the periodic table and the gold is so about me but it's trivial... Haha, ok, let's take astatine, at least it's the rarest element on Earth.)

— If I met God I'd ask him: Why us? I mean how come we humans are like this. That amazes me, because when you start thinking about the chain of factors that led to us being here, they are so random... it just blows up my mind!

Loving chemistry in Slovenian: Rad iman kemijo in sovražim vse ostalo!

It says: "I love chemistry and hate everything else". This is so not true but okay.)

Birch tree Chemical composition



is one of Russian national symbols. It's the first thing Russian emigrants start missing when abroad. It's associated with vast spaces and the humble nature of midland. All Russian poets wrote about the birch tree. Catalyzer offers to look at it from a chemist's point of view.

Betulin (from Latin "betula" – birch) – triterpene alcohol, that gives the birch trunk this recognizable white coloring and antiviral effect.

Birch sap | Transparent liquid that flows out if you make a cut on the bark of a birch tree. You can collect up to 7 liters of this syrup a day. In Russia birch sap is a popular drink, it also has a pharmacological effect: it improves metabolism and is used as a diuretic. You can bring this drink as a souvenir from Russia.

Composition: Saponins – nitrogen-free glycosides that contain aglycone (sapogenin), and carbohydrate portion
 $C_8H_8O_3$ – methyl salicylate; $C_6H_{12}O_6$ – fructose and glucose;
 $C_4H_6O_5$ – malic acid; Macro-and micronutrients: K, Na, Ca, Fe, Mn, Cu.

Broom | In Russia we tie up bunches of birch branches to make birch brooms, which are very good for massaging in sauna. It's hard to explain to those who haven't seen a Russian sauna. A birch broom kills pain and muscles aches after physical activity, cleanses the skin, accelerates the healing of wounds, improves the mood. This might be due to substances contained in the birch leaves:
 $C_6H_8O_6$ – ascorbic acid; $C_6H_5NO_2$ – nicotinic acid; $C_{40}H_{56}$ – carotene; $C_{21}H_{20}O_{12}$ – hydroperoxide; butyl ether of betuloretinic acid.

Birch bark | Birch bark is unusually resistant to decay. Due to that at ancient times it was widely used instead of paper. The so-called birch bark letters are the first evidence of writing in Russia (11 – 15th centuries).

Meet Russian Chemists



Alexander Nesmeyanov
(1899–1980)

First steps in chemistry

At the age of 12 took a recipe from Jules Verne's "Mysterious Island" and synthesized the smokeless gunpowder (pyrocotton).

Contribution to chemistry

In 1929 discovered the reaction of obtaining organomercurials by decomposing double diazonium salts and metal halides. This method was later extended onto the synthesis of organic derivatives of many heavy metals (Nesmeyanov's diazo method). One of the founders of organometallic chemistry. Established a link between metal position in the periodic system and its ability to form organic compounds. In 1960 discovered metallotropy.

Fact

Nesmeyanov was a vegetarian since the age of 12. Believed that creating food protein without killing animals is his main scientific challenge. Worked on artificial food for over 20 years.

Quote: "When eating meat we're forced to kill millions of bulls, sheep, pigs, geese, ducks, chickens, teaching thousands and thousands of people this bloodshed. And it's not very much in line with bringing up love, kindness and warmth in new generations"

What's the difference? Catalyzer asked, IChO answered:

A chemist



"His IQ is very high"
 "He washes with acetone"
 "He never sleeps"
 "He is in his lab all day"
 "He knows chemistry"
 "He smells of reactives"
 "Understands fumes"

"Where is his lab coat?"
 "His hands are colored with reagents"
 "He's left with only four fingers"
 "He drinks 55M hydroxide acid"
 "When he sneezes he says $Ac(CHOO)$ "
 "He always plays Alchemist when playing DotA"
 "He knows lab safety as his three fingers"

"He sees the world with different eyes (with four eyes to be exact (a real chemist doesn't wear safety glasses))"

An ordinary man



"Knows the meaning of weekend"
 "What he drinks is just 'water'"
 "His hands are free to take whatever he wants, his brain is too empty"
 "Not cool"
 "Orders H_2O too at the bar"
 "He can only tie his shoelace and write an average rap song"

"One of them is weird, the other is normal. The normal one is a chemist"



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Finally online

The first thing Olympians did when they got their mobile devices back page 2 >>



What are Victor Hugo and Albert Einstein

doing at IChO? see page 3 >>



Is chemistry a science or stamp collecting?

Discover chemophilately page 4 >>

Looks like highly-ordered lattice



They definitely needed some grey matter to save the world from methane disaster and decipher the structure of oligopeptides at the theoretical exam

>> see page 2

Today is gonna be the day | *Catalyzer's tips on a Russian-style day*

9.00-10.00 Breakfast	Follow the famous proverb: "Eat your breakfast, share your lunch with a friend and give your dinner to your enemy". So eat your breakfast like a king. Focus on proteins and carbohydrates, you're going to have a lot of physical activity today. The menu offers rice or buckwheat porridge and French beans.
10.30-12.30 14.30-16.30 Paintball & "Adventure" game	To play paintball a la Russe use the following vocabulary: Ура! [ooh-rah!] "hooray!" – the word doesn't have a meaning, but you should cry it out with all your might when you're going into the assault or want to frighten the enemy with a false maneuver; Мочи! [Moe-cheer!] "dip in liquid" – If you want your partner to shoot; Ешкин кот! [Your-skin caught!] – a kind of undefined cat Russians mention when they're not quite happy about what's going on. You can use it when a maneuver fails. Не топози! [knit-tar-muz-zee] «don't lag!» – If the partner is doing something too slowly. At the end of the game embrace your enemy, pat him on the shoulder and say: Браетелло! [bra-teller] – "bro".
13.00 Lunch	Try the Tartar azu, a traditional dish of one of Russian nations. Fried pieces of meat stewed with carrots, potatoes, onions and tomatoes.
16.30-18.00 Free time	Here are a few ways to spend your free time a la Russe. If you care for some privacy you can, as we say, «go for mushrooms» – «ищи мо грибы» [eat-tea paw gree-be]. After the rain under the trees you can find lots of them: boletus, aspen, etc. If you rather feel like socializing we suggest playing the popular «Mafia» game. It's much more interesting than the usual cards you love so much. «Mafia» requires attention, hazard and communication. It's believed that it came up at MSU campus. Ask your guide to teach you.
18.00 Dinner	If you want a Russian tea party you can use two ways of drinking tea: 1) With lumps of sugar. Sugar is not put into the cup, you bite a little piece of it before every sip and chew with a crunch; 2) «White Tea»: tea is drunk in a usual way, but you don't add neither tea nor sugar ;)
21.00 Disco party	In Russia, especially in the backblocks, there is a disco tradition: all dancers put their bags in a big heap, make a circle around it and dance without changing location. Thus personal belongings are watched and protected.



>> from page 1

18:49 The reunion with mentors was planned to happen on board of a cruiser that was waiting for the Olympians at the pier of the "Ukraine" hotel. Mentors were a little late and Olympians having boarded on the ship found themselves alone among the laid tables, with the feeling that all the challenges are left behind...

Although just seven hours ago

The first task of the theoretical tour was called "The clathrate gun". Participants were supposed to evaluate the impact of possible decomposition of methane hydrates located at the bottom of the global ocean. The release of huge amounts of methane and its auto-ignition when contacting the atmospheric oxygen was associated with the increasing temperature of the global ocean due to the greenhouse effect...

19:03 Mentors were a little late, the cruiser crew turned on the painfully familiar Boney M, and after listening to it for a few moments Olympians suddenly realized that all the tests are over and the reserves of methane hydrates at the bottom of the Moscow River must not be too big... A few moments later a multinational crowd of Olympians was dancing and enjoying life to the 1980s disco. The circle was dragging inward a Hindu, an Israeli, a German, and the crowd went wild every time. The future of chemistry was just getting down...



Six hours ago

Task number five was commented by MSU professor **Vadim Eremin**. A beautiful problem on a fundamentally new material graphene was about evaluating its properties, that are still difficult to measure. "The material is very promising, only we don't yet know what exactly it's promising and to who", – said Vadim jokingly.

The task supposed to extrapolate the graphite properties on those of graphene. It was easy to see Russian roots in the problem: since the invention of graphene brought a Nobel Prize to Russian-born physicists **Andrey Geim** and **Konstantin Novoselov** in 2010.

19:20 The ship departed and it was at this point when buses with mentors finally arrived. The students dashed to the left side of the ship, frightened that the river would carry them away from their beloved mentors for-

ever... At the last moment the captain took a complicated maneuver and dropped a saving ladder ashore. Mentors boarded to embrace their pupils, and the celebration on the ship broke out with the renewed vigor.



Whereas five hours ago

The last out of eight tasks was commented by one of its authors, MSU Professor Alexander Gladilin. It concerned archaeobacteria, a unique ancient microorganism that can produce energy by performing the reaction of methylamine with water.

Students were supposed to write the equation for this reaction and decipher the structure of the amino acid residues contained in the enzyme which catalyzes this reaction.

"Most guys are well aware of the 20 amino acids that are part of the protein, Professor Gladilin said. – But they tend to forget that in reality there are twenty two of these acids. It was precisely one of them, the twenty-second acid (pyrrolysine) that was featured in the problem".

19:45 The House of Government is seen through the open doors of the cruiser. Czech Republic is the first delegation to cross the protective chain banning access to the open deck, they are followed by the Kirghiz and the French who thus discover a simple truth: here, in Russia, if something is prohibited it's still possible. Five minutes later the whole Olympiad crowd gathers on the cruiser bow taking photos of the Novodevichy Convent, so the ship even begins lurching a bit toward the methane hydrates.

Four hours ago

"All the problems are constructed in a way that separate parts of them are relatively independent, – Professor Gladilin explained. If you don't do the job completely, you can still solve some of its parts. For each task (out of eight) you can score from 6 to 8 points. The maximum for the theoretical exam is 60 points (it was 40 points for the practical part)"

"Many problems were created by the previous winners of the competition", Vadim Eremin added. The first problem was proposed by the twice golden medalist (2001 and 2002) Chemistry PhD Igor Sedov. IChO gold medalist of 2003, now a PhD in physics and mathematics Alexander Belov was working over the third task. The idea of the eighth task belongs to the IChO winner of 1998, now a PhD Bulat Garifullin...

22:00 Behind me the medalists of the 45th IChO are dancing enthusiastically. None of them yet knows who will receive the gold or the silver. None of them knows who will make a breakthrough in medicine, or in the energy sector. Meanwhile they are just smart and (mostly) cheerful guys from 77 countries. Just simple guys who in the morning have saved the world from methane disaster and deciphered the structure of oligopeptides.

The first thing they did when turned their Devices on



Miguel Ramos, El Salvador

I send an e-mail to my parents to say that I'm fine and that I have finished my exams.



Oskar David Henriksson, Sweden

In fact I didn't use my phone at all, I just answered my e-mails from my computer. There were so many mails from my friends!



Bekhzodbek Boltaev, Uzbekistan

First of all I turned my phone on... And then answered text messages.



Evgeny Gulyak, Russia

I put my phone into the pocket. I didn't miss it at all.



Lautaro Vogt, Argentina

I called my cat and said "Meow"! I miss him so much!

Mentors' insights



Uno Mäeorg, Estonia

"I have been to Moscow several times before, but now it's got a new look. These skyscrapers looks very well, Russia develops with these new buildings and companies"



Kenneth Charles Hoffman, Canada

"I didn't realize how important the religion was for the Russian people. I can't express how I was surprised about this quantity of churches!"



Andrew Dicks, Canada

"Last time I was in Moscow we weren't using public transport. But today we used the train, and it was fantastic! It was fast and clean!"



Sunday Asher Adedeji, Nigeria

"Russia is very advanced now compared to my country. There are lot of fascinating buildings, the streets are so clean!"



Per Henning Lindgren, Sweden

"People are so kind and nice there, they're organized and everything's perfect! And you Russians know what you want"

A Country in Brief

Azerbaijan

Every day Catalyzer picks a random delegation and goes to meet the team.



Team about Sona Adam Guluzade:

the only girl in the team. She is very pretty and charming but a bit disobedient: every time we go for a walk, she suddenly disappears... Sona likes physical chemistry and organic chemistry for the fact that many things come up logically and she doesn't have to do much reading.

Sona on chemistry education in her country:

School lasts for eleven years, but after the ninth it's not compulsory. As for chemistry, we start it at the age of 14. In our lyceum we have three chemistry classes a week while ordinary schools usually have two. At school we don't have any lab classes.

Sona on her country's contribution to chemistry:

I should mention Vagif Abbasov who has some researches about inhibitors. His works are really appreciated all over the world.



Team about Javid Rafiq Ahmadow:

He likes sunflower seeds too much. Javid is very cheerful and jokes a lot. Has very strong sense of humor.

Javid imagines himself a great scientist: I would probably invent the substance which could make people disappear. You know, there are always unwanted people... So I suppose a substance like this could help to get rid of those people. I would probably name it "Javidinium".



Team about Murad Polad Rahimov:



He easily gets angry. Murad doesn't like kidding and joking. He likes football, his favorite football player is Vagif Cavadov. Enjoys listening to national music Mugam.

Murad chooses his favorite substance: Benzoic acid because of the name and its unique chemical properties.

Murad on chemistry: In fact I am interested in science in general. I also like maths and biology very much!



Team about Balagardash Cabrayil Bashirov:

he is good at explaining, both something he knows and what he doesn't know.

Balagardash chooses the most typical Azerbaijani of his team: When I look at Murad I see the typical Azerbaijani. He loves our country and respects our traditions. He is very patriotic. He also has black hair, black eyes, black eyebrows which is also very typical of our nation.

Victor Hugo and Albert Einstein alive

Victor Hugo and Albert Einstein came to visit IChO. No one expected that. Catalyzer talked to the guys about their famous names.



Victor Hugo Angulo-Cazarez from Mexico got his name due to his father, who's also Victor Hugo. As it turns out Victor Hugo is a very widespread name in Central and Latin America. Friends call him just Victor or VH. Victor admits the greatness of his famous namesake but he wouldn't want to be his relative. "I am what I am", Victor said.



"When my father was studying he came across the great physicist and became very interested in his works", **Alberto Einstein Flores Turpo** from Peru told us, "This is the reason why I have such name". Like his father, Alberto admires Einstein, especially the way he raised the physics to a new level and made a real breakthrough in his sphere.



photos by Nataly Ionova

Chemical structures on stamps

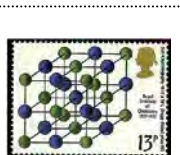
Part 1

All science is either physics or stamp collecting.
Ernest Rutherford

Chemistry is definitely a science. We study nature by constructing models of atoms, molecules, colloid particles, complex systems, materials. Moreover, we not only study what was given to us but also create a new reality by synthesizing new substances and materials that never existed in nature. So it's not like a stamp collecting. Still chemistry is somehow related to stamps.

There's a peculiar part of philately called chemophilately, the pursuit of stamps related to chemistry – they turn out to exist in abundance!

Inorganic substances are usually presented in chemophilately by crystal structures of ionic compounds, typically – NaCl:



or minerals:



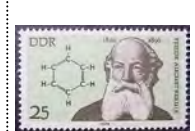
and various molecular structures – mainly of simple molecules:



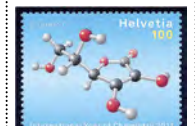
discovering fullerenes – the new elementary form of carbon. The molecule of the most stable fullerene – C_{60} – is shown on the stamp. The stamp is heat-sensitive: when exposed to small heating it turns pale.



Another unusual structure is that of an inorganic cluster ion $Re_2Cl_8^{2-}$ with the metal-metal bond. Presented on a Soviet stamp devoted to the Institute of General and Inorganic Chemistry (Moscow) where this ion was first synthesized.



Structures of organic compounds on stamps are much more numerous and diverse. They present hydrocarbons (benzene is most popular)



as well as naturally occurring compounds,

and proteins.

Vadim Eremin,
Chemistry Professor,
MSU

To be continued.



Meet Russian Chemists



Nikolay Semenov
(1896-1986)

On the question of chemistry and stamps: as the only (!) Russian Nobel Prize awardee in chemistry, Semenov is depicted on a Russian stamp from a special set commemorating Nobel Prize Winners.

First steps in chemistry

As a schoolboy, he decided to test whether salt can be synthesized from active sodium and toxic chlorine. At his home laboratory he burned sodium in chlorine, took the sediment, salted bread with it and ate it! Later got physical education.

Contribution to chemistry

His main works are devoted to chemical kinetics. He developed the theory of branched chain reactions (for which was awarded a Nobel Prize in Chemistry in 1956), the theory of thermal explosion and the combustion of gaseous mixtures. Discovered the ion-type heterogeneous catalysis and developed the theory of heterogeneous catalysis (1955). Founder of the Institute of Chemical Physics (Moscow).

Fact

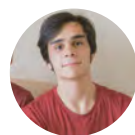
Semenov was 9 times awarded with the Order of Lenin, the highest prize of Soviet Union (which is almost the absolute record).

Quote: "If I had known chemistry I wouldn't have got a Nobel prize"

Happy Birthday!



ICHO is celebrating birthday of **Felix Edar** from Austria, who's 18 today. For the occasion, «Catalyzer» asked his team to wish him something and give imaginary presents.



Martin Reiterer:

«I wish the competition will go well for him. And my present for him will be... a trip to the Moon».



Paul Lorenz Türtscher:

«Don't be sad about the restaurant! If I could present him anything I wanted, it would be a ticket to the Final of World Football Cup».



Felix Frank:

«I wish him not spend so much time thinking about the exam, and just be happy on his birthday, because he can't celebrate his birthday well».



150 Years
Science For A Better Life



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Lena Brandt
Anastasia Grigorieva

Lena Yudina
Zoya Vysotskaya



“I was afraid they’d have a terrible Irish accent”
Guides about their IChO experience
page 2 >>



No Stephen King among the charming Americans
But the charming Stephen Ting is there for you
page 3 >>



Talking to himself on chemistry issues
That’s what Lev Chugaev used to do
page 4 >>

Go, my friend, go!



Paintball organizers didn’t speak very rich and flexible English, so the Olympians had to orientate afield basing on the brief instructions of “Go” and “My friend”. Despite this and the adverse weather they seemingly coped.

>> page 2

Today is gonna be the day | *Catalyzer’s tips on a Russian-style day*

8.00-8.30 Breakfast	Catalyzer has always acquainted you with Russian cuisine. Today let’s see how other countries influenced it. For instance the sausages came here from Germany, so the Germans can easily recognize the russified version of Bratwürstchen, while Americans might see it as a hot dog deprived of the bun.
9.00-14.00 Transfer and recreation in “Kwa-Qua Park”	To get a black belt in Kwa-Qua-parking (the name comes from Russian version of the frog’s “ribbit-ribbit”), you need to pass at least four tests: the «Wild River» downhill, the enclosed «Black hole» chute, the «Cyclone» sheer aquadrome and, finally, Russia’s unique water supermountain «Tsunami». After that, you can relax in the beach area and get your bruised body massaged in the jacuzzi.
15.00 Lunch	What else came to Russian menu from other countries: Apple strudel from Austria; Polish sauce for fish from Poland; «Viennese» meatballs from Austria; Eclair cake (éclair) from France. See at lunch.
14.00-18.00 Free time	If you have an opportunity to get to Moscow, be sure not to miss the metro. It’s believed to be the world’s most beautiful underground. Go down and see for yourself! What else you should try to see in Moscow: Ostankino Tower – the fifth highest building in the world (540 m), the Arbat pedestrian street , Moscow’s oldest tree (600 years old) in Kolomenskoye park, the largest Ferris wheel in Eastern Europe (73 meters) at the VDNKH, Russia’s largest temple of Christ the Savior . Those who remain in the hotel, we invite you to Catalyzer Lounge: we’ll teach you the popular games of «Mafia» and «Dixit».
20.00 Dinner	What else came to Russian menu from other countries: Greek salad from Greece; Croissants from France; Buffalo chicken wings from the USA. See at dinner.

Go, my friend, go!

The only people who felt like making friends were obviously the organizers. Others looked resolute and merciless. 20 teams were formed for a life-and-death fight.

First the teams got the camouflage with colored sleeve markers and the helmets. "Here are the bulletproof shields for girls! – **Anton Sinitsky** was shouting. – Every single girl should wear a protective vest... And every married girl too!" Then the guns were handed out ("Hold them straight, don't turn them over!") and the troops were let out onto the battlefield. American **David Liang** went out wearing a white coat. "I just want to preserve the memory of IChO, so I'll take these stains home."

No one could distinctly explain how the teams were formed: whether the delegations were united randomly or they have chosen each other on purpose. Did USA, UK, Estonia unite to

form a NATO paintball army? How come Peru and Slovenia joined Pakistan, Turkmenia and Uzbekistan?.. Some military alliances were absolutely incredible, and Catalyzer's correspondents were watching the battle realizing that IChO must be the only place in the world where Singapore-Malaysia-Lithuania-Norway-Kyrgyzstan, or Sweden-Ukraine-Saudi Arabia can make war shoulder-to-shoulder.

The team of Greece and Cyprus had the amazing winning spirit:

- Do you have a military strategy?
- Er... No.
- Is any of you good at shooting?
- Not really.
- So what are you guys gonna do?
- Well... improvise.
- Do you think you'll win?
- No idea.

But there was a different team that could be recognized by loud team yelling. They had a strong leader, a political belief and a plan:

"We're a communist team if you look at our red sleeve markers", – said Argentinian **Nicolas Del Grosso** on behalf of the whole team of Mexico, Costa Rica,

Argentina and China. Not everyone seemed to be sharing this political view, but Nicolas as a strong military leader was unexceptional: – "We're going to spread all over the field and shoot everyone! We'll take the high places, and... – suddenly he started sounding suspiciously like a guide and the team began giggling: – There are a lot of high places here, because Moscow, you know, is standing upon seven hills, cause seven is a lucky number, like Constantinople, so we're taking these hills and then go doooooown, that's our plan!"

The first battle started about noon and since that it was impossible to understand anything. The whole world began running about, shooting, shouting and hiding in ambush. Some were showing exceptional fighting techniques, but we couldn't identify them because helmets and face shields were forbidden to take off.

We only could recognize those who got shot and left the field. When **Mona Koder** from Sweden decided to take a maneuver on all fours and crawled into nettel thicket (which obviously is something uncommon for a Scandinavian country, although very familiar for every Russian kid) she ran out screaming and worrying why she'd got blisters on her arms. Russian observers calmed her down: it's safe and even good for health.

To the end of the game a big group of "deadmen" crowded to support the alive. The most active **Salman Allahmadi** from Saudi Arabia was running back and forth all along the fence and commanding.

Women were the only people to have maintained the human form. The three girls sitting together belonged to different countries – and different teams.

"We're playing for the red team, – **Paula Borovik** and **Priscila Vensaus** from Argentina said, – while **Marah** is with the green-orange one". "And I'm not going to shoot them even for fun! – claimed the beautiful but soldierlike Israeli **Marah Zubi**. – Because they are my friends and I love them!"



Guide in light



Ksenia Morugina, Team of Greece

Languages: Greek (modern and ancient), Lingua Latina, ancient Slavic

Education: Moscow State University,

Faculty of Philology

"I like studying foreign cultures because it's the best way to know your own culture, if you're able to compare. And it refers to language skills too. Philology is a complex science: we learn art, literature, languages and so on".

About guide's job: "I don't feel it's my work. It's like having active rest: we practice our language, have excursions every day, and my group has helped me discover chemistry. Amazing pastime!"

About the team: "**Georgios Karagkiaouris** and **Ioannis Stavroulakis** are always hungry, because of that they are always going somewhere

We pay due attention to IChO participants and mentors, but there are people who always stay out of sight. They are our guiding light, they help and protect and solve problems and know everything and they're just nice people who got here quite by chance. At last Catalyzer talks to IChO guides.

and getting lost. In the Planetarium they got lost because they needed to buy water, and I was in real despair. **Petros Fountas** is a good backgammon player. **Georgios Kotzampasis** is the youngest one, but he is a god at chemistry!"

Team about Ksenia: She is very nice and helpful and she speaks very good Greek! We can easily understand her.



Ksenia Tserkovskaya, Team of Ireland

Languages: English, Hebrew, Arabic, Aramaic.

Education: Department of Jewish studies, Institute of Asian and African Countries.

Here because: senior guide Rodion Panin invited to guide a team because she knows Hebrew, but there were so many people who spoke it, that Ksenia was given the Irish team.

About the team: "They are just great. The amazing thing is that they all somehow learn Russian. And they all have the same problem: they can't pronounce Russian "bl", it sounds like "oy". **David** started reading Russian letters very quickly. He must have seen them before he came here. **Pearse**, when he hears me speaking Russian, turns to me and says: "Het!". **Zach** amazes me. He's a drummer in his own music band back home, he seems very lively and talkative on Facebook, but has said a word here! I have no idea why, maybe he was



A Country in Brief

Every day Catalyzer picks a random delegation and goes to meet the team.

The USA

The team works together cohesively because guys have a lot in common. One thing is that they all consider each other... charming. One of their favorite songs is "American Pie". "I can still remember, how that music used to make me smile," – the American team sings every now and then in a perfect unison.



Team about David Lu Liang: David plays soccer and talks very fast. He always wears very nice sunglasses, they make him look very charming.

He definitely has a sense of humor and he is nice to talk to.

David on his attitude to chemistry: I like chemistry so much because I understand it and it's really interesting. At first I was a bit frustrated about studying it, but I was lucky to meet a very talented teacher, he involved me in chemistry, and now



I see how great it is!

Team about Runpeng Liu:

A charming and personable young man. Actually he studies a lot but when he has spare time he likes playing Frisbee. He really likes "Crime and Punishment" by Dostoevsky. He is very good at finding material that might come up at the exam. "When I was preparing for the IChO I predicted several problems!"

Runpeng chooses his favorite substance: Uranium-235 because I like its color, it looks like a yellow cake.

Runpeng chooses the most typical American of his team: America has so many cultures... but I'd say it's Stephen. He is a leader. Stephen is well-socialized, he is always looking for different experiences. He's good at motivating us as a team, which is one of the most typical American traits.



Team about Stephen Ting: he is so nice and happy, and cheerful. And Stephen is definitely good as a teacher. There are few people in the world that can explain better than he does.

Stephen on chemistry education in the USA: chemical education in our country is quite... broken. In fact, chemistry is not popular at all. Sometimes it seems to be something Americans don't want to do but they are forced to. We start studying chemistry quite late, at the age of 16. We all agree that one of the main problems is memorizing, because you don't actually need that, even if you remember everything, you can't succeed until you really understand it. Chemistry is not about memorizing things, it's about thinking. So there is definitely a huge gap between what chemistry actually is and how it's taught at the USA. Unfortunately, many people take chemistry only because they need to pass an exam to



a medical program or something like that. It's not popular as a passion...

Team about Saaket Agrawal: we think he is a typical Indian American in many ways: he is loud; he



is good at organic chemistry – and really creative. His chemistry knowledge is strong. And we think he is the strongest member of our team. Besides, he enjoys playing word-games.

Saaket invents a new substance: It would smell nice, because I always enjoy inhaling the vapors of everything I make :)

nervous. **Alast** is the real scientist. He's very curious. He rarely talks, but he knows ancient Greek and I remember he was eager to see Lenin in the Mausoleum. He likes leaving us. So there's a side of him that seems mysterious and fascinating".

About chemistry: "It's definitely not my cup of tea. I studied in a humanitarian class at school. We had a nice chemistry teacher, very lively and kind, but I just didn't feel like going with it".

Understanding each other: "I was afraid I wouldn't understand their accent, but it turned out the Republic of Ireland speaks usual English, unlike Northern Ireland. Still, sometimes two of my guys start speaking Irish, then neither I nor the other two understand a word. Besides I don't understand them when they speak about chemistry, I just fall out".

What was useful: "They teach me colloquials.

For instance they may say "half six" which means "6:30", I didn't know it could be put this way. And new words. Sometimes I point at something and ask – guys, what do you call that? They say: it's dill. I've got a lot of language practice with them and I'm thankful for that. When I come back I'll go and pass IELTS exam, I feel now I can".



Siranuysh (Anuysh) Badalyan,

Team of Armenia

Education: Chemistry faculty, Yerevan University, master's degree in MSU.

Job: works in a Semiconductors Laboratory, deals with nanocrystalline semiconductors, synthesis and properties. **Languages:** Armenian (native), Russian, English

About the team: "My guys are smart and active and very different. On the first day they suddenly started playing "Pantomyme" and "Contact" and still play all the time. **Vahe** is 17 and he's going to enter faculty of

biochemistry in Yerevan. He's very responsible, though for some reason it takes him about an hour to get ready for breakfast, so I have to wake him up at 6 a.m. **Hrachya** is serious and reserved, but surprisingly cheerful when in a company. He always takes photos like a Chinese tourist. **Vardges** is rather a biologist, than a chemist, he has won an International biological olympiad last year. He's going to enter biochemistry in New York this year.

Olgert's short name is Ogo and our bus loves mocking at it. Ogo always makes pictures in weird positions. In Tsvetnoy boulevard he climbed up a clown sculpture and we took photo of him sitting on the clown's nose"

About chemistry: It's my job, but I can't talk to kids about it, it's the rules of the Olympiad. And it's good, they'd better have rest"

What was useful: What's new for me is working with big groups, previously I only did it with 3 to 5 students, here I have 4 of my kids, 28 from other delegations and 7 guides! It's a good experience.



Chemical structures on stamps

Part 2

Many organic compounds contain stereo centers and must be drawn with regards to correct stereochemistry. A good example is a 2005 Austrian souvenir stamp sheet that contains a stamp honoring Carl Djerassi (1) – an Austrian-born American chemist. The sheet features his portrait and enantiomeric steroid molecules with correct stereochemistry. The sheet was the first of its kind: the face in the background was composed of microscopic chemical formulae, enantiomers of the steroid.

The history of the present-day chemical nomenclature is counted since 1892 when an International conference in Geneva took place. The Swiss stamp (2) marks the centenary of this event (will you try and give a systematic name to the molecule shown in the stamp?).

Philately is not just a hobby. It's a rapid and efficient way to disseminate information, increase curiosity and attract attention to a specific subject like chemistry. In this respect, chemical mistakes deserve special attention. In philately mistakes aren't rare either in the stamp design,

or in printing. The reason for the former is simple: designers are not chemists, neither are the postal service officials, and sometimes they do not check the stamps carefully. Printing errors are always welcomed by stamp collectors because such errors make stamps exclusive and, hence, more expensive. For example, the inverted overprint on a stamp can increase its value by several thousands times. Chemistry mistakes are interesting from educational point of view – it's always fun to discover a mistake and discuss its origin. Try and find mistakes on the stamps (3), (4), (5), some are obvious, others are not.

And the final comment: no stamps have yet been devoted to chemistry Olympiads. Mathematics and physics were luckier in this respect – see (6) and (7). We tried to issue a Russian stamp devoted to IChO-2013 but failed due to bureaucratic barriers. Looking forward to see it in the near future!

Vadim Eremin,
Chemistry Professor, MSU

Exercise.

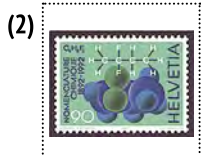
What molecules are shown on stamps (1), (5)?

What are they used for?

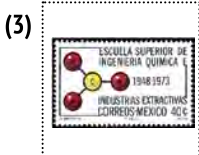
Answers in the next issue.



Austria, 2005



Switzerland, 1992



Mexico, 1973



Monaco, 1986



USA, 2008



Korea, IMO-2000



Iran, IPhO-2007

Meet Russian Chemists



Lev Chugaev
(1873-1922)

Contribution to chemistry

In 1899 developed the "xanthogenic" method of converting alcohols into hydrocarbons (Chugaev's reaction). In 1902-1907 suggested a quantitative method of defining mobile hydrogen atoms in organic compounds (Chugaev-Tserevitinov method). He has made a great contribution to the chemistry of complex compounds: in 1906 he established that the most stable of them contain 5- or 6-membered rings in their inner sphere (Chugaev's rule).

Was the first to synthesize pentamine compounds of tetravalent platinum (Chugaev's salt) and the carbene organometallic complex (1915). Discovered analytical reactions detecting nickel (Chugaev's reagent) and osmium.

Interests

Throughout his adult life Chugaev was engaged in science 24/7, considering all other activities useless and revealing the complete failure to adapt to normal life.

Fact

Visitors coming to meet Chugaev used to wait at the door for a while because they heard him talking to someone. In fact Chugaev had a habit of talking to himself, discussing the issues of chemistry.

Quote: "The theory is easy to build, you now try to do at least something experimentally!"

Happy Birthday!



Oskar David Henriksson is 19 today! Catalyzer wishes him the **Fe** nerve, the **W** persistence, the **He** independence and an **Au** IChO medal.

Ads

MASCOT DAY

Does your team have a mascot? Take it with you and come to the hotel lobby at 4 p.m. today altogether: we'll be making a photo collection! A bientôt, your French delegation.



MOSCOW IS A PUZZLE

If you wonder how our participants spend their free time look at the picture. The masterpiece was made by the teams of New Zealand, Israel, Spain, Finland, Belarus, El Salvador, Turkey, Pakistan, Serbia, Azerbaijan, Romania and Kyrgyzstan. With such strong line-up the work took no more than a gap between breakfast and lunch, although the puzzle consists of 1000 pieces (brought by Rodion Panin, Azerbaijan team guide).



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Ivan Afanasyev
Lena Brandt
Anastasia Grigorieva

Lena Yudina
Zoya Vysotskaya



Japan is challenged
by systematizing
chemistry
for students
page 2 >>

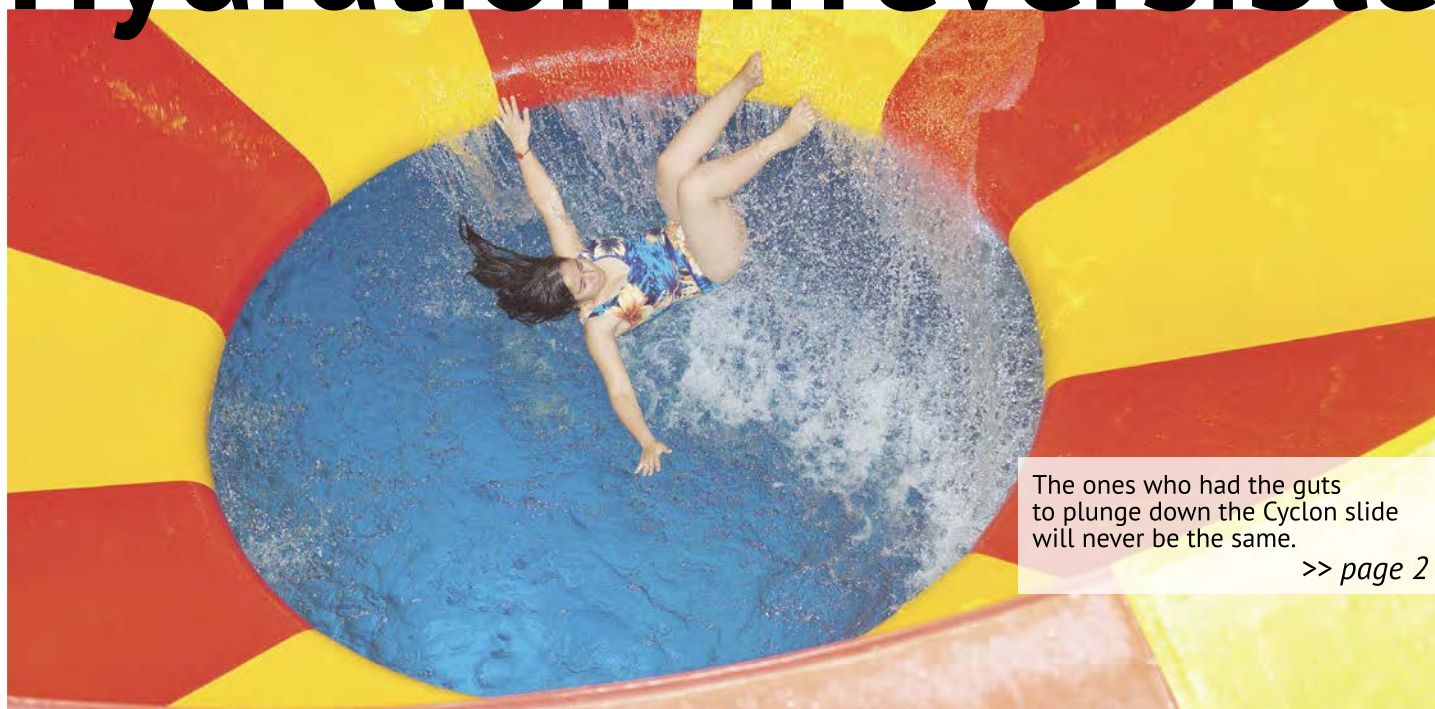


IChO ex-winner
on what
the future holds
page 3 >>



**What's money
made of**
A 100-ruble bill un-
der examination
page 4 >>

Hydration irreversible



The ones who had the guts
to plunge down the Cyclon slide
will never be the same.

>> page 2

photo by Alexey Kungurov

Today is gonna be the last day

8.00-8.30 Breakfast	Russian word for breakfast is "zavtrak" and it's coming from the word "zavtra" – tomorrow.
9.00-12.00 Free time	Those who stay at the hotel are invited to the main lobby at 10 a.m. to learn to play Dixit and Mafia.
12.00 Lunch	We call lunch "обед" [awe-bed] which has the same root as food / "еда". Be careful, leave some room for the evening buffet.
13.00 Transfer to MSU, 15.00 Closing ceremony	This might be your last chance to see Moscow from Vorobyovy hills, the best city lookout.
18.30 Transfer to the Farewell Banquet, 19.00 Farewell Banquet	A Russian proverb says: "You meet people by clothes, but you see them off by their mind". On the first day of IChO we were greeting you with your national clothes. We're seeing you off with regards to your intelligence.

Catalyzer's Totalizer!

We're about to know the Olympiad results. At that squeaky burn time we asked 38 people about who they expect to win:

China 25
Russia 16
Korea 12
Chinese Taipei 6
Japan, USA 2
Czech Republic, Poland,
Hungary, Australia, UK,
India, Vietnam, Iran 1

Individual bets

1. Nikita Shlapakov, Russia (2)
2. Gergo Sale, Hungary (1)
3. Chen Chun-Yi, Chinese Taipei (1)
4. Kairat Ashim, Kazakhstan (1)

Experimental exam:

1. Russia 2. India 3. China

Theoretical exam:

1. China 2. Japan 3. Russia

Waiting for the results.



photo by Alexey Kungurov

"Please put on your bathing suits to enter the waterpark! Exception is made for the delegation of Kuwait, they may enter in clothing, which is their bathing suit". This kind of instructions the IChO teams were getting when approaching the famous Moscow "Kwa-Kwa Park". Its staff hasn't yet seen such exotic and elegant bathing suits. **Fatima**

Azhibek Sabirov, Kyrgyzstan
Though I've visited a water park in Tashkent, and the slides are higher there, Kwa-kwa Park in Moscow is also cool. We've tried all slides and the most thrilling was the "Cyclon" and the "Black hole" where I could see almost nothing!

and **Zohra** from Kuwait were fully clothed, including traditional headgear. However, those were real swimsuits, they didn't prevent the girls from happily chuting down the waterslides.

Meanwhile, the Olympians were forming the interest groups. Most boys started playing horses in shallow water: they sat on each other's shoulders and tried to pull the rivals off the horses. The

struggle went on with hits and misses until **Josephine Prativi** came up. Catalyzer vividly remembers the Swiss girl playing football the other day, — well, she proved to be even a better horse-rider. As soon as she came to play the guys started falling down into the water.

Chenmind Tang, Australia

The scariest slide was of course the "Cyclon", but it was great fun! We tried it once and then we couldn't stop sliding down again and again!

Others were diving, swimming, splashing, trying "Wild Rivers", "Tsunami" and the scariest "Cyclone". Surprisingly,

among the daredevils trying this last one Catalyzer detected Sona Guluzadze from Azerbaijan, who was diving into a black hole without losing her cute smile and met by encouraging whistles at the bottom. There was an unusual swimmer who (instead of actually swimming and things) was

slouching in a beach chair reading a sci-fi book named "Space and paleontology". This was Russian **Artem Boychuk**.

Three hours later a good crowd of Olympians gathered in the shallow waters of the pool and was just standing

there discussing something. If it wasn't for their swimming trunks you could have thought them to be a large group of scientists discussing the problems of modern chemistry. And maybe that's exactly the way it was...

Ziqing Liew, Malaysia

There was one slide that was really terrifying, because it was my first one. I fell down into a deep pool and was a bit scared to drown because I am not very good at swimming.

Violeta Stojalnikova, Lithuania

We spent all our time in jacuzzi and it was the best part of the whole water park, because after yesterday we were so tired and it was just a great recreation.

Koichiro Masada, Japan

Today I swam for the first time over the last five years, so I am both very excited and tired! I really liked the "Black hole". It was so dark inside!

What's chemistry coming to?

Catalyzer regularly talks to mentors about how they see the present and the future of chemistry, chemical education and the role of their country in the world scientific progress.



Akira Nagasara

Nabuhiro Kihara
Japan

Trends and challenges of modern chemistry:

We basically see two direction of chemistry development. One is moving towards biochemistry: we're currently working on reconstructing complex biochemical processes like artificial photosynthetic systems. The other trend is synthesizing more and more complicated substances.

Chemistry education: The science is developing at a fast pace. Our main scientific challenge is educational: preserving what we've learnt so far and systematizing it so that it could be studied in the most efficient way. We have to decide what's the backbone of chemistry and what can be left aside as additional details. With new discoveries every day it's not as easy as it seems.

Eastern and Western approach to education:

It seems that European countries are more about discussing the concepts, particularly in the USA. In Japan we're more about getting knowledge, it's important, at least at the secondary school. Although higher education is gradually

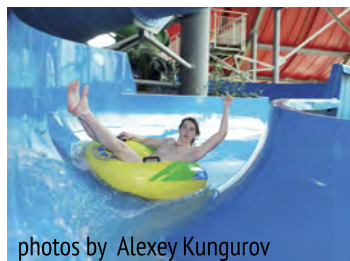
changing towards this western style.

The new generation of chemists: Today's young people have a lot of ways to obtain knowledge, like Internet, and it's so different from what it used to be, we need to help them find their way through it.

What makes a good chemist: Sadly, there is a lot of failure and defeat in chemistry. A chemist should not give up, but proceed.

The most famous Japanese chemist:

There have recently been 7 Japanese chemists who were awarded Nobel Prizes. There was Kenichi Fukui who got it in 1981 with his USA and UK colleagues for their theories, developed independently, concerning the course of chemical reactions. There was Akira Suzuki, who was awarded for palladium-catalyzed cross couplings in organic synthesis. There was Osamu Shimomura with the discovery and development of the green fluorescent protein. Together they make up the Japanese chemistry. We can't really name one.



photos by Alexey Kungurov



A Country in Brief

Every day Catalyzer picks a random delegation and goes to meet the team.

Macedonian team is taking part in the IChO for the first time. These guys are really bright! Their motto is: "Chemistry's everything!"



Team about Filip Ilievski: he is a mad scientist. Loves joking. He plays many instruments... mainly imaginary; Filip's dream is to be a football coach. His favorite coach is José Mourinho.

Filip on his country's contribution to chemistry: Macedonia is a small country, we're not too much involved in the industry. Still our chemistry is still developing, we're a large center of aluminium production.



Team about Marija Tepegiozova: she is an excellent mathematician.

She is funny, she can always cheer us up. Marija is a wingman of our team. She is very caring and reliable. Likes rock and classical music.

Marija chooses her favorite substance: well, girls like diamonds and since nothing girlish is alien to me I choose diamonds!

Marija on her attitude to chemistry: I passionately love chemistry! It's my life. It explains just how the world around



you functions. It answers many questions that you have been asking yourself all your life. It really intrigues me.

Sometimes he is loud. Macedonians are people who can learn languages very fast, and that's about Gorjan, too.



Team about Gligor Ducheve: Gligor is irreplaceable, he knows how to cook, how to iron, how to use all these gadgets. He is the only guy in our team who

knows how to do a tie! And – in five different ways!

Gligor invents infinite power source: If I could I'd make gas, oil and energy unlimited. That would be very smart and useful!

Gligor chooses the most typical Macedonian of his team: I think it's Gorjan. He is very friendly and cheerful.



Team about Gorjan Stojkov: the youngest member of the team. Very conscious. With him we're never bored, Gorjan always tells good jokes.

Gorjan about chemistry education in Macedonia: chemistry is not very developed in our country. We don't have such long tradition of studying science as you do in Russia. We are relatively young as a country. We start studying chemistry at the age of 13 and keep studying until we are 19. Quite a long while...

Is there life after IChO?

To find out how the IChO experience can be useful in real life Catalyzer sometimes talks to medal winners of previous years.



Anton Sinitskiy

Guide of the US delegation. Won a gold medal at IChO in 1996 and a silver one in 1997. A graduate of the Chemistry Department of MSU, PhD in Economic Sciences, researcher in the University of Chicago.

It's been a while since you won the IChO, now you're back. How've you been through these 17 years?

– Amazing things happened. I graduated from the Chemistry Department of MSU and entered Master's program in Economics...

Economics?

– I've always taken interest in various levels of matter organization. In chemistry there's a transition from quantum mechanics that describes electrons to the macrolevel dealing with chemical properties of substances. Back then I was interested in the similar transition from technology to social phenomena, which economics is basically all about. So I defended a thesis in economics but soon got disappointed in

this field. You see, the quality of statistical data is often very poor, and you can't use them to validate complicated theories. Chemistry in this regard is far more exact as a science. So I decided to come back to chemistry.

What did you do to come back?

– I applied to seven U.S. universities. And you know what really was of help? The fact that I'd won IChO! I can't say they all know it in the US, but 3 universities sent me invitations. And this is how I ended up in the University of Chicago.

Was it then that you understood what the matter really is?

– Let's just say we're working on it. We're developing a very new direction in the Center for Multiscale Theory and Simulation. A week ago I was giving a talk at MSU about our research and faced a problem: some of the terms can not be translated into Russian, they have not yet developed equivalents! What we do is take the initial geometry of a certain biomolecule, describe the coordinates of all its atoms basing on the laws of classical physics, and then with the help of a supercomputer we do the forward integration of these equations. Thus we get a model of a system that allows us to predict its behavior. This is done at different levels ("Multiscale"): from single atoms to the assemblies of biomolecules in living cells.

Did IChO experience help you in life?

– A lot. The first time I felt it when entering the Economics department. I passed the exam in economic theory better than all entrants with M.S. degrees in economics, because we all had to do our best in 5 hours, to perform at maximum, and I knew how to do this due to the Olympiad. Besides, you know, in modern science (at least in the USA) the supervisor's job is more of doing business: you have to fundraise, work with the human resource, it's permanent multitasking and a lot of independent problem-solving. Again, it's a lot like IChO. So I'd say to all participants: remember this experience, stay in touch with each other. What can help you with this is the Facebook group called "International Science Olympiad" (ISO). I started it to help international competitions participants of different years stay in touch. It already has 3300+ members and you're welcome to join!

<https://www.facebook.com/groups/InternationalScienceOlympiads/>



Chemical composition

Here's the 100-ruble note, the most common cash in Russia.

Russian paper notes bear the images of big Russian cities and thus are all symbols of Russia. For example, a 50-ruble bill depicts Saint-Petersburg, 500 rubles show Arkhangelsk, 1000 rubles have Yaroslavl on them, a 5000 note shows Khabarovsk. The nominal value is not related to the size of the city, so 100 rubles represent Moscow, particularly the Bolshoy theater as one of its famous sights.

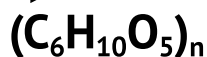
As you might know, the actual chemical composition of national money is always a state secret. Still there are some curious things to know about the chemistry of Russian money.



Today Russian notes can stand 4000 folds (and the new 2010 thousand bills as much as about 10,000) and are not afraid of up to 19 chemicals, including alcohol, **acetone**, turpentine and chlorine.

$(\text{C}_6\text{H}_{10}\text{O}_5)_n$ To make the paper stronger it's made of several layers (up to 24 in some Russian paper bills!) that are glued up together with the help of **starch** or melamine-formaldehyde resin.

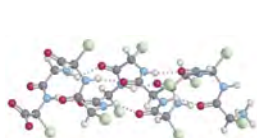
Making Money



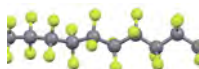
One of the closely guarded state secrets is the composition of money paper. Each country has their own recipe. While the EU money is made of cellulose and the U.S. make it of a mixture of wood and plastic, in Russia we add **cotton** and ship hemp.

Nd:YAG

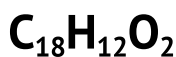
The latest innovation of Goznak (national banknote and security printer) applied in Russian banknotes is micro-perforation, which means punching small holes in the paper so that it stays smooth. It's done with **laser** and allows to define the authenticity of the bill even in very little light.



Cotton and linen fiber has little acid and therefore fades slowly. The cloth is soaked in **gelatin** for greater strength. The average life of such notes is two years.



In modern rubles the name of the Central Bank of Russia is done in microprinting with the help of **polymer fiber**. The formula is kept in secret, and the method was considered the most reliable until money forgers learnt to copy it by the end of 2000s.



Money bills of almost all countries (except the U.S.) are multicolored (on average 10 colors). Among the special types of ink there are magnetic ink, fluorescent ink containing organic **luminophores**, phosphorescent paint and the type of ink absorbing or reflecting infrared radiation.

Meet Russian Chemists



Vladimir Ipatiev
(1867-1952)

First steps in chemistry

On the sixth year of school Vladimir read about chemical phenomena in a textbook of physics and was shocked: "It was like I looked at the world with the eyes open for the first time, I felt the desire to learn and understand it better".

Contribution to chemistry

Military chemist, the founder of the whole chemical industry of the Soviet Russia. Considered to be the author of the multi-component catalysis method as well as the heterogeneous organic catalysis under high pressure (1900).

Discovered the reaction of synthesizing cyclopropanes (1901, Ipatiev reaction). Discovered the way of getting butadiene from ethyl alcohol (1909), was the first to carry out ethylene polymerization (1913). Since 1930 lived and worked in the United States, where he has made a great contribution to the development of the oil industry. Became one of the founders of petrochemical industry.

Fact

In 1937 Ipatiev was chosen "Man of the Year" in the United States. In 1942 his colleague R.Vilshetter said: "Over the entire history of chemistry there has never been a greater man than Ipatiev".

Quote: "I'd like to see every chemist who works under my direction having two problems, one for the company, the other for his own "chemical soul".



Countries saying goodbye the evening before the Closing ceremony



150 Years
Science For A Better Life



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IChO 2013 absolute winner
about the national secret of winning Olympiads
page 2 >>



Life after IChO
Career plans
page 3 >>



It's been fun!
Thanks from the Catalyzer team
page 4 >>

Running the flags up



192 medal winners traditionally hoisted their national flags at the 45th IChO Closing ceremony
>> page 2



Artikbay Ishankulov, M.D., Head Mentor of Uzbekistan delegation

«We're here for the first time. I really didn't expect such a success: one golden medal and two silver ones! My lyceum student Bekhozbek Boltaev was awarded the gold one.

I'm really happy for him, he's from a simple family, his mother is a nurse, his father is a worker. He's a totally self-made, very ambitious, at the same time very open to dialogue. By the way he's won silver in the 47th Mendeleev Olympiad this year. It was really hard to prepare for this Olympiad, it's much more complicated than our republican contests. Besides, we failed to translate the pre-tasks from English. But Bekhozbek coped. I'm so proud of him”.



Vadim Eremin, MSU professor
Why Chinese delegation is such a success

– I used to think Chinese students are just well-trained and hard-working, but tend to fail the non-standard jobs. However, at this Olympiad there was a task on inorganic chemistry that just can't be trained for. It was designed as in traditional Russian competitions and was about a simple chemical experiment with a very surprising result. The guys had the necessary information to obtain this result. It has been the most difficult one, because even the trained guys really did not have enough time for it. But the Chinese guys coped with it. So after this contest I have no answer...

ICHO takeaways



Guillermo Jauregui, Uruguay

I was amazed by Moscow, its size, the Red Square and the Faberge eggs. I'm taking home the experience of being exposed to so many cultures. The way people dress was particularly curious, when Japanese guys were wearing kimonos for breakfast, Kyrgyzstan had their special hats on. We tried some peculiar food like Danish candies. I loved blini and Russian candies.



Fernando Igoa, Uruguay

Theoretical exam wasn't difficult... it was impossible! But we had heard rumors about Russian tests in 2007, the hardest in the whole IChO history, so it met our expectations. We've made friends with a lot of guys from Latin America and Saudi Arabia (hi Norah)! And Planetarium was a great siesta!



Roberto León, Costa Rica

I am taking home souvenirs from at least 20 countries. A specialty from Russia is a bottle of kvass.



Olgerd Dallakyan, Armenia

A little guitar from Mexico, several fridge magnets, I also have a small flag from Kuwait and Switzerland. I myself was giving some souvenirs too, like bracelets in the colors of Armenian flag. My facebook account is now richer. IChO was a great opportunity to become more outgoing and sociable.



Dovydas Draksas, Lithuania

I met a lot of interesting people from Latvia, Sweden, Denmark and Finland. I've learnt a lot about other nations. I could hardly imagine that Asian people are so cheerful and friendly, and the Scandinavians are so talkative. I also discovered that the Spaniards are really fantastic football players!



Nikita Onizhuk, Ukraine

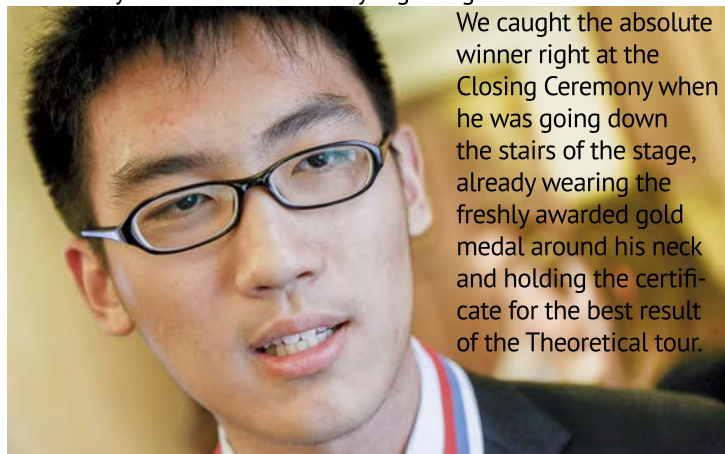
I'm taking home all issues of Catalyzer! We became great friends with Armenia, Russia, Macedonia, and Belarus. We played cards and Mafia together. We tried to teach our foreign friends some Russian phrases such as "ешкин кот". Besides we exchanged coins, now I have a large international collection of money! I improved my focusing skills, I'd never think I could be so well-disciplined!



Passionate love for chemistry and strict national selection

form the winning strategy for China.

Although the scores of the medal winners have not been announced or published, Catalyzer's reliable source has disclosed the name of the person who got the maximum 85.09 points at the IChO this year. It was Chinese Yuyang Dong.



We caught the absolute winner right at the Closing Ceremony when he was going down the stairs of the stage, already wearing the freshly awarded gold medal around his neck and holding the certificate for the best result of the Theoretical tour.

In English your name sounds a little like "you young". So how young are you, as a person and as a chemist?

– I'm 18, but I'm turning 19 very soon. As to chemistry, I started it at my 9th grade, so I've been doing it for 4 years so far.

Where are you from and what do you do now?

I'm studying in a USA university, Chemical engineering department. I'm from Tianjin, it's a relatively small city near Beijing.

"A relatively small" Chinese city is exactly how many people?

About two million.

Pretty small, indeed :) Did you expect yourself to win?

– Not really. Well, I mean, as to the gold medals, we were intending to get all four of them, It's a fail that we've got only three, the fourth one is silver... We're all sure it's due to some small mistakes... But the individual maximum score – no, I honestly didn't.

How did your country manage to get all these awards? Is it because Chinese people learn to be ambitious and persistent from early childhood?

– It's hard to tell being inside the culture, so I can only say for myself: I was

taking part in the Olympiad not out of ambition, but just because I passionately love chemistry. But as to China, I'd say we have a very strict selection on a national level, just because of the high competition and the amount of people. Only the very best pass.

Which task was the most challenging?

Experimental exam was generally harder for me, although many say the opposite. I can't say it was about some certain tough task, it was mainly about the time. When doing the synthesis I didn't get all the necessary experimental data on time, and then there was this exhausting choice of whether to finish one issue or try all of them.

What are your professional plans?

After I finish the undergraduate studies, I'll first get my PhD, I prefer organic chemistry, it fascinates me. Then I'll go to work for a university or a factory... Maybe have my own factory some day... I'd like the results of my research to be applied in environmental problems or energy sector.

What are you taking home from IChO?

New friendships with the guys from Israel and Argentina etc. And the impressions of Moscow, I'm amazed, I didn't expect it to be this cool.



Career ladder

Olympians are welcome to apply for jobs as practical researchers with Bayer and Dow Chemical who presented their programs and career opportunities to future scientists on Monday. The Dow Chemical company is constantly looking for bright chemists to develop the sustainable energy solutions. Bayer is saving humans lives by producing pharmaceuticals and is also in need of talents. Both companies are officially sponsoring IChO 2013.

Over 100 students took part in the meeting and regarding the amount of questions got curious about the businesses. **Artem Boychyuk** won-

dered how to join the companies, **Sona Adam Guluzade** asked about scholarships and internships, **Filip Zoran Ilievski** came to light with a questions about the number of Nobel Prize winners from Dow and Bayer. There was also a question about a typical day of an employee, which was followed by an expected one about salaries.

Young scientists appeared to be worried about combining their researches with the main job and career building. Catalyzer develops the topic.



Martin Reiterer, Austria

Next year I will study chemistry in Zurich, and then I hope I'll work in the Chemistry Department for a while. If I study well, I'll obtain the PhD. I'd like to work for physical chemistry, because there is a lot of mathematics, which I'm fond of. The Olympiad is a great investment into my future, because I've met a lot of my future colleagues from different countries, maybe our professional paths will cross someday.



Oskar David Henriksson, Sweden

I'd like to dedicate my life to researches and specialize in organic chemistry, it's beautiful! If I ever win a Nobel Prize, I think, that it would be pretty cool to take it for researches in alternative energy or making a cure of cancer. The Olympiad is the best way to get in touch with great researchers from all over the world, I'm sure it'll be of use. I hope at some point of my life I can get the same experience in the USA. Maybe I will study or provide some researches there, but I also want to work in my native Sweden.

Instagram under examination

To be honest, the 45th IChO hasn't been largely represented online. Let's improve it next year, and for now several photos we found on Instagram on the last day of the Olympiad.

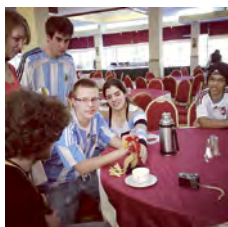
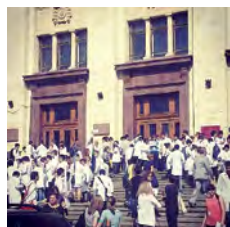
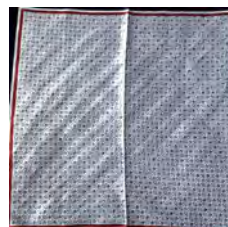


Photo by Argentinian guide **Ekaterrina Kozhemyazkina** depicting the moment her team met the French Mascot. An important contact in chemical professional community.



Turkish guide **Evgenia Ostashkina** has taken photo of the anthill of chemists before the experimental tour. Feeling nervous?



Chinese guide **Eli Tihomirova** shared a photo with her Chinese team with a scarf bearing the periodic table. As usual.



This picture by Armenian **Siranyush Badalyan** was discussed in terms of "Is there any other Moscow apart from Russian?" Well, you might be surprised, there is a number of Moscow-cities all over the world.



Stamps

Answers, as promised in issues 7-8

Mistakes: Mexican stamp has a CH_3 instead of CH_4 . Monaco stamp has an even cooler mistake: a quadrivalent hydrogen. It should be CH_4 of course.

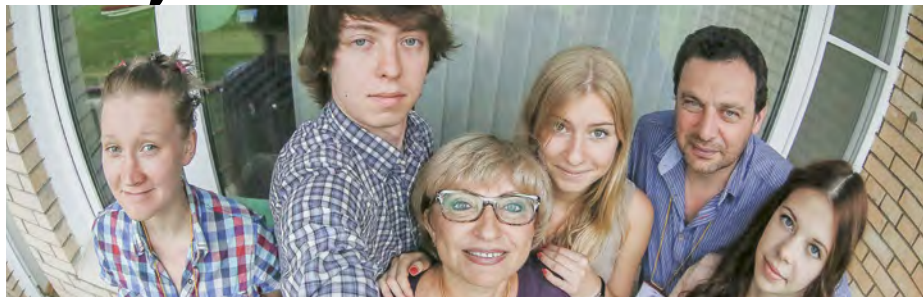
On the USA stamp it can't be seen in this size,

but the phosphate group is attached to carbohydrates by the wrong oxygen.

Substances: Switzerland: ascorbic acid. Austria: steroids (the stamp pictures a man who has invented oral contraceptives).

Catalyzer 2013

Thank you for being with us, it's been fun!



Lyudmila Levina, Project Director.
Candidate of pedagogical sciences, Chief editor of "Chemistry in school" magazine

"...this cute feeling that among the guys sitting next to me at lunches and dinners there definitely are future Nobel Prize winners..."



Vladimir Golovner, editor in chief.
Chemistry teacher, Honored teacher of Russia

"Every time I took a comment and then checked the badge, it was either Boris Stolz or Lautaro Vogt or Josephine Pratiwi or Filip Kozlina – again and again! They appeared in



Lena Brandt, content director.
Works for SPN Ogilvy Public Relations

Catalyzer a dozen times, as if they were magnetizing all our team. I finally came up with a theory that all people have different chemical reactivity and it can be measured!"



Ivan Afanasyev, art director.
Independent photographer and designer



Lena Yudina, reporter.
Moscow State Linguistic University student

"Guys, thank you for your patience regarding my 'what have you discovered today'. I know it was hard and I appreciate it!"



Zoya Vysotskaya, reporter.
Russian Presidential Academy of National Economy and Public Administration student

Meet Russian Chemists



Dmitry Mendeleev
(1834-1907)

First steps in chemistry

Mendeleev recalled that as a child he was fascinated by glass blowers. Later on he would surprise his colleagues with being able to make his own glass equipment.

Contribution to chemistry

Mendeleev is definitely the most famous Russian chemist. In 1869 he discovered one of the fundamental laws of nature – the periodic law. With the help of it he predicted eleven elements, five out of these predictions came true.

In 1860 Mendeleev discovered the critical temperature. In 1874 derived the general equation for the state of an ideal gas (Mendeleev-Clapeyron equation). Stated the hydration solution theory, created the smokeless gunpowder. Published the textbook on "The Fundamentals of Chemistry" that several generations of Russian chemists were taught by.

Interests

Took interest in economics. Mendeleev was one of the authors for the Customs Tariff of Russia (1891). He was one of the first in Russia to carry out a flight in a hot air balloon (1887) to observe a solar eclipse. Drafted an icebreaker to wrestle through the ice of the North Pole (1902). Developed the principles of using mineral fertilizers to increase soil fertility. Founded the first Metrology Institute in Russia.

Quote: "You can't look for anything, either mushrooms or any correlation, without approaching and trying".

Vadim Eremin, coordinator
Professor of Chemistry Department,
Moscow State University

Anastasia Grigorieva,
translation editor



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№11
July 24, 2013



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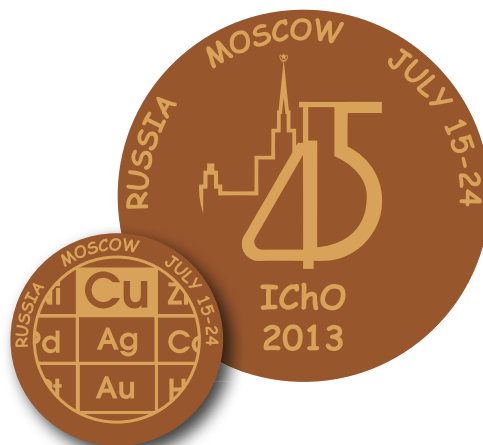
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Greeting the winners



The 45th IChO is over. Medal winners announced

Medal design by Anastasia Nikolaeva. Special for IChO 2013, Moscow, Russia.





GOLD

Yuyang Dong (China)

Weiwei Sun (China)

Chun-Yi Chen (Chinese Taipei)

JOON YOUNG HONG (Korea)

Zhihao Cui (China)

Gergo Salyi (Hungary)

Chi-won Hwang (Korea)

Štefanko Dominik (Slovakia)

Sergei Kuzovchikov (Belarus)

Nikita Shlapakov (Russia)

Chih-Chun Pai (Chinese Taipei)

Anlong Chua (Singapore)

Kairat Ashim (Kazakhstan)

Michał Magott (Poland)

Phan Quang Dung (Vietnam)

Dong-Han Shin (Korea)

GADAM MYRATGELDIYEV (Turkmenistan)

Yuxin Cao (Singapore)

Yongjie Lin (Singapore)

Oleksandr Vyhivskyi (Ukraine)

David Lu Liang (United States)

Eszter Szekely (Hungary)

Surya Sai Ritwik Nimmagadda (India)

Parth Shah (India)

Jiratheep Pruchyathamkorn (Thailand)

Runpeng Liu (United States)

Andriy Stelmakh (Ukraine)

Azim Amanzholov (Kazakhstan)

Ching-Ting Tsai (Chinese Taipei)

Mykyta Onizhuk (Ukraine)

Tomasz Damian Kudłacz (Poland)

Bekhzodbek Boltaev (Uzbekistan)

Evgeny Gulyak (Russia)

Serafim Buiucli (Moldova)



SILVER

Felix Eder (Austria)

Stephen I-Ming Ting (United States)

Peiyao Wu (China)

Piotr Krzysztof Wróbel (Poland)

Balagardash Cabrayil Bashirov (Azerbaijan)

Le Duc Viet (Vietnam)

Roman Beránek (Czech Republic)

Tas Yusoontorn (Thailand)

Jin Wook Rhyu (Korea)

Maximilian Keitel (Germany)

Artem Boichuk (Russia)

Morian Sonnet (Germany)

Saaket Agrawal (United States)

Mustafa Başaran (Turkey)

Peter Bolgar (Hungary)

Xiaotian Li (Norway)

Feng Zhou (New Zealand)

I-Hsiang Li (Chinese Taipei)

Mahdiyar Amani Tehrani (Iran)

Adam Přáda (Czech Republic)

Avishek Das (India)

MARIA ANDREEA FILIP (Romania)

Alexander Matthew Turner (Australia)

Samuel Jacob Alsop (Australia)

TOSHIYA FUKUNAGA (Japan)

Nejc Čepлак (Slovenia)

Ryan Bagus Fitradi (Indonesia)

Watchara Ouysinprasert (Thailand)

KOICHI OKAMOTO (Japan)

Martin Reiterer (Austria)

Kamil Maršálek (Czech Republic)

Hirbod Heidari (Iran)

Ivan Kurniawan (Indonesia)

Aliaksandra Dzemidovich (Belarus)

DUMITRU CALUGARU (Romania)

Putu Ivan Budi Gunawan (Indonesia)

Ashkan Khavaran (Iran)



SILVER

Ho Quang Khai (Vietnam)

KOICHIRO MASADA (Japan)

Frederik Munkholm Soendergaard-Pedersen (Denmark)

TAKAHIRO HANEBUCHI (Japan)

Dovydas Draskas (Lithuania)

Ivan Jakovac (Croatia)

Antanas Radzevicius (Lithuania)

Andrei Shved (Belarus)

Nguyen Quoc Anh (Vietnam)

Mikalai Artsiusheuski (Belarus)

Sirajuk Khongviwatsathien (Thailand)

Kwong Ching Philip Leung (United Kingdom)

Valdo Tatitscheff (France)

James Pinder (United Kingdom)

ADRIAN MURGOCI (Romania)

Vytautas Peciukenas (Lithuania)

Czipo Bence (Hungary)

Stanko Štefan (Slovakia)

Isidora Banjac (Serbia)

Michael Iagofarov (Russia)

Anmol Arora (India)

Malinčík Juraj (Slovakia)

Marko Nešić (Serbia)

Can Philipp Kocer (Germany)

Mikus Puriņš (Latvia)

Arya Aminorroaya (Iran)

Paulina Mieldzioć (Poland)

Honorable mention

Annelies Landuyt (Belgium)

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Samuel Nils Johannes Backman (Sweden)

Sabrina Ge (Canada)

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Jean Michalland (France)

Vardges Tserunyan (Armenia)

Vasil Hristov Vasilev (Bulgaria)

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Guy Lewy (United Kingdom)

Chenming Tang (Australia)

Khrystofoor Khokhlov (Ukraine)

Ervīns Cauņa (Latvia)

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150 Years
Science For A Better Life



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