

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; $C_{21}H_{20}O_{12}$ – hy-perezide; 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"

1.5 mln km, -266° C
Figures on James Webb-2018
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The DIY clouds
and other to-do's from Planetarium
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Does a real chemist wear safety glasses?
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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.
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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 hydroxic 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 H₂O 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"

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.



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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..."



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:

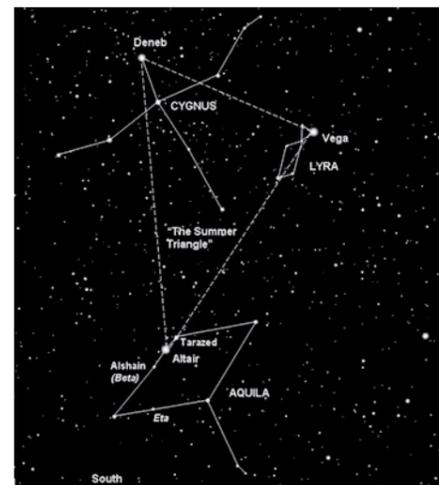
Space exploration unites the humanity, let's explore it together!



*"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.



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

A Country in Brief

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

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 :)