Tuesday, April 28, 2020

Genesis of Science | Science and society | Author's columns | Research | Education | Pages of history | Trv online | Hyde Park online

Троицкий вариант

наука

trv-science.ru

Mathematics beyond the Arctic Circle

04/21/2020 / No. 302 / s. eleven /   Boris Kruglikov; Alexey Ognev /   Mathematics /   3323 views, 155 - today /   no comments

Panorama of Tromsø. Truls Tiller Photos

We continue to publish interviews with the participants of the conference "Integrable Systems and Automorphic Forms", which took place in the new Mathematical Center "Sirius" in Sochi in the last week of winter (see the report "Hunters for Special Functions, or" Sirius "on the Eve of the Virus" [1]). **Boris Kruglikov** *, professor at the University of Tromsø - the Arctic University of Norway, which is located 350 km north of the Arctic Circle, talks about his research and the specifics of studying the queen of all sciences in the homeland of Abel and Sophus Lie. Interviewed by* **Alexey Ognev** *.*

- **Boris Serafimovich, please tell us in what area do you specialize?**

- Keywords are: symmetry, curvature, invariant constructions in geometry, Cartan geometry, parabolic constructions connected with mathematical physics, geometry of differential equations.

- **Is there a problem that excites you now?**

- Yes. This is integrability via geometry. I collaborate with a team in England: Eugene Ferapontov, David Calderbank, Vladimir Novikov, Maciej Dunajski. There are colleagues in Russia: Maxim Pavlov, Leonid Bogdanov. Many years ago, Vladimir Zakharov published the book "What is Integrability?" [1] . In principle, the answer is still lacking, although there are a lot of examples and there are intermediate results. The idea is to formulate the answer, bring it to the level of an algorithm. For ordinary equations this is a very understandable thing, but not so for partial differential equations. We are working on it.

There are also problems that I like, but which do not cause an active response from other people nowadays. For example, the deformation of pseudogroup structures. In the 1960s, it was very popular, but now there are few experts in this field. We with Denis The and other colleagues use this to study the phenomenon of nonlinear symmetry breaking for various geometries.

- **What other topics in mathematics are studied at your university?**

- Our graduate students work in the field of supergeometry. In the language of physics, this means that in addition to boson particles, fermion particles are allowed. Classical mechanics is based on bosonic particles. The inclusion of fermionic leads to new equations. From the point of view of mathematics, this means the existence of additional nilpotents. The mathematics here is very interesting, but whether supersymmetry exists in the world of elementary particles is an open question. By the way, this summer we are planning to hold a conference on supersymmetry and supergravity in Tromsø.

- **What is the general situation with mathematics in Norway?**

- Unfortunately, mathematics is not very popular in Norway. There is little competition for undergraduate and graduate programs. Young people are more likely to go to management, medicine, biology. They want to see the result of their work right away. At school, mathematics is at a rather poor level. This crisis has dragged on since the 1970s. For example, in Finland the situation is much better: the country was on friendly terms with the Soviet Union and adopted a lot of good. Now they are breaking records for secondary education in Europe.

We have a small department of mathematics and statistics at our university: there are only 15 full-time employees, plus researchers, post-docs, and graduate students (temporary employees). One of my former graduate students remained at the university and now has become my boss - he is the head of our department and a leader of an active research group. The other two completed PhD and are now post-docs in the Czech Republic. Of course, in the Czech Republic the salary is much lower than in Norway, but no local options have been found for them, although they are quite good mathematicians. We now have three graduate students: two from Catalonia and one from Tanzania. This time we were unable to find a Norwegian for this doctoral call (although all my previous graduate and doctoral students are Norwegians).

As you know, Norway instituted the Abel Prize, one of the most prestigious mathematical awards in the world, but getting a research grant in Norway is highly difficult: only about 6% of applications in the fundamental sciences go through. However, recently the well-known billionaire Trond Mohn, the owner of a company producing pumps for oil tankers, created a very generous private grant called "Pure Mathematics in Norway". Ragni Piene, a well-known specialist in algebraic geometry from Oslo, approached him and convinced that investing in mathematics was good. And indeed, the importance and impact of program in mathematics of the Mohn Research Foundation is impossible to overestimate. I work in the program committee of this grant, which has significantly intensified the mathematical life in Norway.

- **What do you think about the development of mathematical schools in our country?**

- Recently, I like coming to Russia. It seems to me that there are great scientific prospects. Now there is a lot of rivalry between the HSE, Moscow State University, Steklovka and Skoltech for influence, state support and young scientists. It is very good. For example, in northern California, near San Francisco, the universities of Berkeley, Stanford, Davis and Santa Cruz are grouped, a lot of rivalry and cooperation. In Russia, of course, there should also be more variety.

PS Addition during the layout of the number.

- **Tell me, please, what is the current situation with quarantine in Norway?**

- Here pretty quickly everything was taken under control (at the beginning of March, Norway went immediately after Italy as a percentage of per capita for infection - this was facilitated by a large flow of tourists). But in a month of self-isolation, the situation returned to normal, and now they will gradually open kindergardens, schools, etc. We will be pioneers, others will learn from our achievements and mistakes.

Two factors played a role in improving the situation: (1) Nordic discipline of the population, (2) a large financial reserve that helps solving the problems of the population. Both factors, alas, are not applicable to Russia, where the situation is rather closer to Italy. However, Russia has good medicine, no matter what. "Curfew" and other measures are necessary for a "positive shock" of the population (this was also here, but to a lesser extent) - otherwise consciousness would not be awakened even by Herzen.

Boris Kruglikov
Interviewed by Alexey Ognev

1. **trv-science.ru/2020/04/07/sirius/**

[1] Zakharov VE (ed.) What is integrability? Springer-Verlag, 1992.

ABC If you find an error, please select a piece of text and press *Ctrl + Enter* .