

# Faculty of Mathematics National Research University Higher School of Economics

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Established in 2008, the Faculty of Mathematics at the National Research University Higher School of Economics (FM HSE) has gained considerable international reputation in mathematics and mathematical education. Not only our faculty members but also our students and graduates are starting to become recognised internationally.

In July 2016, the FM HSE moved to a new building in a quiet street not far from Moscow city centre. The new location has three times as much area as the previous one and we finally have room for off-curriculum activities for students.

## Research and Teaching

The National Research University Higher School of Economics (HSE)<sup>1</sup> is a national leader in economic and social sciences. This was the original intention of the founders back in 1992. However, the university's ambitions extended much further; HSE transformed into a classical (comprehensive) university and has, in fact, outgrown its name. In 2007, the HSE administration suggested that the Independent University of Moscow<sup>2</sup> [2] (a non-government, open educational organisation aimed at training professional mathematicians) should help create a world-level department of mathematics. And so it happened, with students majoring in fundamental mathematics entering the HSE in 2008. As of now, we are called the Faculty of Mathematics (despite our smaller size, we have the same status as the Faculty of Humanities and the Faculty of Social Sciences). The FM HSE now includes two international research units and three joint departments with the Russian Academy of Science. Alongside about 380 students, we have about 150 professors and research fel-



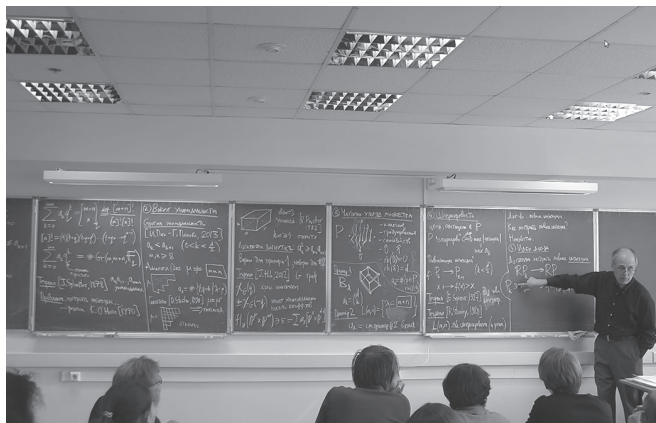
The new building of the FM HSE.

lows and we offer educational programmes at all levels (BSc, MSc and PhD). The concentration of talented and highly motivated students is arguably the highest among all Russian programmes in fundamental mathematics. More than a half of our undergraduates are winners of prestigious contests for high school students, including the International Mathematical Olympiad.

In its teaching practices, the Faculty of Mathematics attributes weight to individual interactions between professors and students. There are two mechanisms to keep this interaction active: the so-called “mathematical practicum” (students individually discuss their solutions of special assignments with faculty members and teaching assistants) and coursework (preparation of term papers) during every year of study. The first two years of the 4-year Bachelor of Science programme consist mostly of core courses, whilst the last two years are spent according to individual learning trajectories. Our students are engaged in actual research projects and some of them produce publishable results.

<sup>1</sup> <https://www.hse.ru/en/>

<sup>2</sup> <http://ium.mccme.ru/english/index.html>



Sergei Fomin giving a lecture at HSE.

Except for the initial composition of the faculty, all faculty members have been hired from around the world; active researchers from many different countries compete for positions at the HSE. Fourteen faculty members have been invited speakers at International Congresses of Mathematicians, including three plenary speakers. At ICM 2014 (Seoul, Korea), there were only four invited session speakers from Russia and three of them are affiliated with the FM HSE or associated laboratories: Alexander Kuznetsov (Algebraic and Complex Geometry session), Grigori Olshanski (Combinatorics session) and Misha Verbitsky (Algebraic and Complex Geometry session).

### Partners

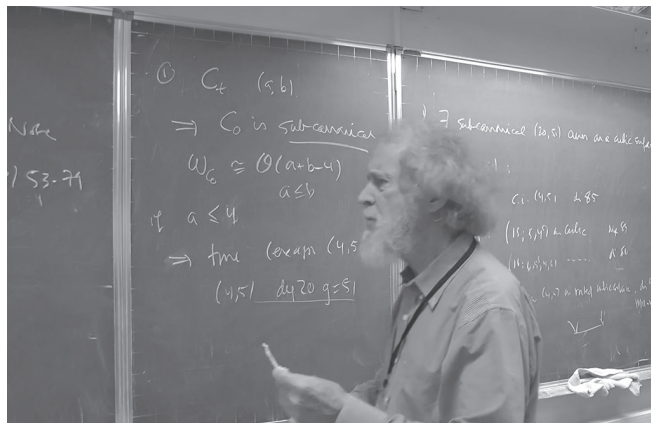
The FM HSE collaborates with leading research institutes of the Russian Academy of Sciences (RAS) through joint departments. These provide an interface between researchers of the RAS and students of the HSE (for project and thesis supervision, special topic courses and seminars). We have joint departments with the Steklov Mathematical Institute (headed by Victor Vassiliev), the Kharkevich Institute for Information Transmission Problems (headed by Alexander Krasnoselskii) and the Lebedev Physics Institute (headed by Andrei Marshakov).

Two research units, the so-called international laboratories, are associated with the Faculty of Mathematics. International laboratories unite researchers from the HSE with international researchers holding principal affiliations at different universities in different countries. Our best students also work in the laboratories as research assistants. The Laboratory of Algebraic Geometry and its Applications<sup>3</sup> was created in 2010 as a centre of excellence, funded by a mega-grant from the Russian Federation Government. It is headed by Fedor Bogomolov (Courant Institute) and it continues its operation as an international laboratory funded by the university. The Laboratory of Representation Theory and Mathematical Physics<sup>4</sup>, headed by Andrei Okounkov (University of Columbia, Fields Medal winner in 2006), was created in

<sup>3</sup> <https://ag.hse.ru/en/>

<sup>4</sup> <https://mf.hse.ru/en/>

<sup>5</sup> <https://math.hse.ru/en/experts>



Robin Hartshorne giving a lecture at HSE.

2015. Both laboratories invite visitors and organise seminars, conferences and summer schools.

Among international partners of the FM HSE are the Universities of Kyoto, Tokyo, Leiden, Nantes and Luxemburg, as well as the “Grande Écoles” in Paris. We have regular student and faculty exchanges with these universities and a number of additional cooperative agreements are being negotiated.

### International Advisory Board

The International Advisory Board<sup>5</sup> of the FM HSE consists of leading external experts in mathematics and the ex-officio membership of the Dean. The board evaluates the overall performance of the faculty and provides recommendations for the HSE administration. Until 2015, the external members of the board included Stanislav Smirnov (Head), Sergei Fomin, Pierre Deligne, Tetsuji Miwa and Andrei Okounkov. In 2015, Okounkov became a faculty member and Nikita Nekrasov took his place on the board.

In 2012, the FM HSE filed the first report to the International Advisory Board. The members of the board studied the report, visited the HSE and had long talks with the students, the professors and the administration. This resulted in the report of the board to the HSE administration. The main conclusions of the board were:

- The Bachelor’s programme is on a par with the world’s best Bachelor’s programmes.
- Research at the FM HSE is on a level with the top 100 mathematics departments in the world.
- The postgraduate programmes (MSc and PhD) are subject to further improvement that would allow them to reach the level of the Bachelor’s programme.

As a by-product of the advisory board visits, HSE students have a remarkable opportunity not only to attend lectures by Fields Medallists but also to directly communicate with them. In April 2016, the second faculty report was sent to the International Advisory Board.

### Cooperation with the IUM

Being an offspring of the Independent University of Moscow (IUM), the Faculty of Mathematics retains a

tight connection with it. Several projects initiated by the IUM are continuing jointly with the HSE, the *Moscow Mathematical Journal* and the *Math in Moscow* programme (MiM) among them.

The *Moscow Mathematical Journal*<sup>6</sup> (MMJ) was founded in 2000; as of 2014, it was the leading Russian journal in terms of Scopus SJR (the highest rank achievable amongst all Russian journals and not just mathematical ones). The MMJ is published in English and has an international editorial board. The journal is distributed by the American Mathematical Society.

The Math in Moscow programme<sup>7</sup> is aimed at international students getting in touch with the best traditions of the Moscow mathematical school. MiM is a fee-paying programme. Its participants mostly come from North American universities. Recently, there have also been a number of students from China. Credit points of the

MiM are transferable. The US National Science Foundation, as well as the Natural Sciences and Engineering Research Council of Canada, offer several stipends each year to cover participation by US and Canadian students in the MiM.



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<sup>6</sup> <http://www.ams.org/distribution/mmj/>

<sup>7</sup> <https://math.hse.ru/en/MiM-en>