

IMU-Net 93: January 2019

A Bimonthly Email Newsletter from the International Mathematical Union
Editor: Martin Raussen, Aalborg University, Denmark

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1. EDITORIAL: BREAKOUT GRADUATE FELLOWSHIPS

We have been asked to report on the IMU's relatively new Breakout Graduate Fellowships. These were an initiative of Ingrid Daubechies when she was President to support mathematics in developing countries. Mathematicians can play a vital role in the development of their countries, and Ingrid wanted to find a way that the IMU could foster the growth of a mathematically sophisticated workforce in these countries. This relies on having well trained mathematicians with research experience teaching in local universities. Training a research mathematician in the developed world is very expensive and increases the chance that he or she does not return to the developing world. On the other hand there are many places in the developing world that can provide a high quality education for PhD students at what is comparatively a very low cost. So Ingrid sought an endowment to provide fellowships for students from the developing world studying, perhaps elsewhere, in the developing world. It happened that the inaugural winners of the Breakthrough Prize in Mathematics, the mathematics prize very generously funded by Yuri Milner and Mark Zuckerberg, were simultaneously looking for a way to give a little back to mathematics and this seemed like a good match. Every winner of the Breakthrough Prize in Mathematics has contributed to the Breakout Graduate Fellowship Fund, which has now raised \$900,000. We very much hope that this tradition will continue, and indeed that the IMU and the Breakthrough Prize Foundation will find other ways to cooperate. It is not necessary to win a Breakthrough Prize to contribute! All contributions are greatly valued and can be sent to the Friends of the IMU: <http://friends-imu.org/donate/>.

The fellowships can cover both living and tuition expenses, up to \$10,000 a year for at most 4 years. The first competition was held in 2016 and awards were made to Do Thai Duong, who is studying complex analysis and geometry at Vietnam Academy of Science and Technology; Maria Alejandra Ramirez Luna, who is studying differential geometry at the Universidad del Valle, Colombia; and to Abebe Regessa Tufa an Ethiopian who studied analysis at the Botswana International University. In June 2018, Tufa became the first graduate from the fellowship

program, when he was awarded a PhD for his thesis 'Approximating Solutions of Fixed Point, Variational Inequality and Hammerstein Type Equation Problems'. He has now taken up an Assistant Professorship at Bahir Dar University back in Ethiopia.

There will be a second competition this year with up to 3 further fellowships available. Candidates cannot apply themselves, but must be nominated by a senior mathematician. More details of the competition are given under item 2 of this newsletter.

We urge mathematicians around the world to support this program, either by nominating worthy candidates or by contributing to the fellowship fund.

Terry Tao (UCLA)
Richard Taylor (Stanford University)

2. NEW CALL OF THE BREAKOUT GRADUATE FELLOWSHIP PROGRAM OF THE IMU COMMISSION FOR DEVELOPING COUNTRIES

Thanks to a generous donation by the winners of the Breakthrough Prizes in Mathematics (Ian Agol, Jean Bourgain, Simon Donaldson, Christopher Hacon, Maxim Kontsevich, Vincent Lafforgue, Jacob Lurie, James McKernan, Terence Tao and Richard Taylor), IMU - with the assistance of FIMU (www.friends-imu.org) and TWAS (<https://twas.org>) - is opening a new call of the *IMU Breakout Graduate Fellowship* program to support postgraduate studies in a developing country, leading to a PhD degree in the mathematical sciences. *The IMU Breakout Graduate Fellowships* offers a limited number of complete grants, with duration of up to four years, for excellent students from developing countries.

Professional mathematicians are invited to nominate highly motivated and mathematically talented students from developing countries who plan to complete a doctoral degree in a developing country, including their own home country. Nominees must have a consistently good academic record and must be seriously interested in pursuing a career of research and teaching in mathematics.

For a nomination to be eligible, the country of citizenship of the student, the country of residency and the country where the study will take place must be contained in the list of Developing Countries as defined by IMU for the period 2016-2019. <https://www.mathunion.org/cdc/about-cdc/definition-developing-countries>

The 2019 call will be open from February 11 to May 30, 2019. More information in <https://www.mathunion.org/cdc/scholarshipsgraduate-scholarships/imu-breakout-graduate-fellowship-program>

Olga Gil-Medrano (Secretary for Policy of the CDC)

3. CEIC: NOTES AND COMMENTS

As the IMU begins another four-year cycle between ICMs, it's an appropriate time to reflect on the issues being dealt with by the Committee on Electronic Information and Communication ([CEIC](#)). Although there are many topics within CEIC's mission, such as best practices for archiving and accessibility or how to take advantage of new capabilities of digital media, the most pressing concern for many mathematicians is open access. How can we ensure that all interested readers have full access to the mathematical literature, without in turn creating barriers to publishing?

Traditionally journals have used a subscription model, which is ideal from the perspective of authors, but leads to paywalls for readers as well as high costs to subscribing institutions when commercial publishers extract as much profit as they can. Even mathematicians at well-funded universities do not have access to every journal, and the situation is much worse for poorly funded universities or independent scholars (although Sci-Hub and similar forms of copyright violation relieve some of the pressure).

At the other extreme, open access based on article processing charges (APCs) is ideal for readers, but imposes costs for publishing. Authors are not expected to pay those costs personally, but rather through grants or institutional funding, with fee waivers available when suitable funding is not available. However, it is unclear how well such a system can realistically apply to mathematics, where first-rate research is often not funded.

A third option is an extremely low-cost system based primarily on volunteer labor, implicitly subsidized by the volunteers' employers. There is no doubt this can work well on a small scale, but it remains to be seen how well it can scale to the full size of the mathematical research community, or whether the implicit subsidization is really the most cost-effective approach.

It remains an open question what will work best, particular given how different mathematics is from scientific publishing more broadly. For example, mathematics papers are often ten times longer than biology papers, while the authors generally have far less research funding available.

One trend mathematicians should be aware of is "read and publish" agreements, in which institutions or consortia negotiate with publishers to replace subscription agreements with new agreements that make all articles published by the consortium open access, without APCs for individual articles. For example, the German consortium Project DEAL recently reached such an agreement with Wiley (see <https://www.the-scientist.com/news-opinion/german-institutions-and-wiley-reach-open-access-publishing-deal-65327>). Of course a large consortium may have an easier time negotiating, but individual universities have also reached read and publish agreements with some publishers (such as <https://www.insidehighered.com/quicktakes/2018/06/15/mit-trials-first-us-%E2%80%98read-and-publish%E2%80%99-agreement>). Mathematicians should work to ensure that these agreements meet our needs.

Another important issue is whether currently existing journals are locked into their publishers. Typically, the answer is yes from a legal perspective, at least regarding the journal's name and back issues, but the editorial board can always start a new, competing journal, which will inherit much or all of its predecessor's reputation. This gives the editorial board considerable leverage to negotiate with the publisher on behalf of the community, to ensure that they feel the

publisher's policies and prices are fair, and it gives them an exit strategy if they are unable to reach agreement with the publisher. The MathOA organization (<http://www.mathoa.org/>) can assist editorial boards that wish to transition to open access.

4. CWM: GENDER GAP PROJECT AND MAY 12TH, A CELEBRATION FOR WOMEN IN MATHEMATICS

The *Gender Gap Project*, an international and interdisciplinary project lead by IMU is entering in its third and final year.

We have in particular collected about 32 000 answers for the Global Survey of Scientists. The number of answers from the mathematical community is very satisfactory, with nearly 6 000 answers, thanks to the efforts of IMU and ICIAM which are 2 of the 11 partners of the project.

The proportion of answers by geographical zone is as follows: 4,57 % of the answers are from Africa, 20,22 % from Asia, 4,29 % from Eastern Europe, 17,56 % from Latino-America, 12,16 % from North America, 3,92 % from Oceania and 33,54 % from Western Europe. The proportion of these answers from men and women in the various zones is not the same: the proportion of answer by women is around 38% for Asia, 43% for Oceania, 47% for Europe and Latin America, 50% in North America and 59% in Africa, the average being 44%.

The third year will be devoted to analyzing the results from the Global Survey of Scientists and the Joint data-backed Study on Publication Patterns, and to formulate recommendations.

A conference presenting the results of the project, its conclusions and recommendations is going to take place at ICTP (Trieste) from 4 to 8 November 2019. More on <https://gender-gap-in-science.org/>.

May 12 th, a Celebration for Women in Mathematics will be organized for the first time in 2019.

Doctor Ashraf Daneshkhah from the Women's Committee of the Iranian Mathematical Society, presented to the participants of (WM)², the World Meeting for Women in Mathematics organized by CWM on 31 July in Rio, a proposal that Maryam Mirzakhani's birthday – May 12th – be recognized and supported as a day to celebrate women in mathematics. The date would be celebrated every year inside the mathematical community, encouraging women from all over the world to advance their achievements in the field. This was approved by a vast majority of (WM)² participants.

The coordination group of the **May 12th** initiative includes representatives from the European Women in Mathematics, the Association for Women in Mathematics, the African Women in Mathematics Association, Indian Women and Mathematics, Colectivo de Mujeres Matemáticas de Chile and the Women's Committee of the Iranian Mathematical Society.

5. ICM 2018

In the recent [Newsletter 15](#) of the international congress, you find links to the story of the nine days of mathematics at the [ICM 2018](#), fully reported in photos, videos, and news stories. Congress proceedings and digital files are now available for sale.

6. MATHS DAY FOR DEVELOPMENT

A [Maths Day for Development](#) will be held on March 15 this year at UNESCO (Paris, France) under the auspices of CIMPA, the French CNRS, and the French National Commission for UNESCO. The event aims at raising awareness about the importance of mathematics regarding development issues, in particular of high-level mathematical teaching and research.

7. HELP THE VENEZUELA MATHEMATICAL COMMUNITY

For over 30 years, the Venezuelan Mathematical Association ([AMV](#)) has promoted the teaching of mathematics and mathematical research in Venezuela, and has been the link between the Venezuelan community of mathematicians, the International Mathematical Union (IMU) and the Unión Matemática de América Latina y el Caribe ([UMALCA](#)). The AMV has been profoundly affected in recent years by the extremely difficult situation of the country, which has resulted in the near paralysis of its activities and a significant migration of mathematicians from Venezuela to other countries. As a result, the AMV has been unable to pay its fees to IMU and to UMALCA for several years.

During the General Assembly of the IMU that took place in Sao Paulo prior to the International Congress of Mathematicians (ICM 2018) in Rio de Janeiro, it was expected that Venezuela would be expelled from the IMU. This did not occur thanks to the solidarity of many delegations present, and Venezuela was granted a grace period until December 2019. At the initiative of the President of the ICM 2018, Brazil generously offered to cover a third of AMV's debt, and other mathematical societies also expressed their disposition to collaborate.

We are asking for your help to pay our EUR 8,000 six-year debt to IMU, as well as an additional amount owed to UMALCA and to support the activities of the AMV in Venezuela. We are addressing our request to Venezuelan mathematicians, as well as to friends of mathematics from anywhere in the world. Your support is critical for the continuity of AMV's academic and research activities in Venezuela during this extended period of extreme economic stress. Current and future generations of Venezuelan mathematicians will be extremely grateful.

Your contribution can be realized through the following link: <https://gogetfunding.com/amv/>

Pedro Berrizbeitia (President of the AMV)

8. JEAN BOURGAIN (1954 – 2018)

Jean Bourgain passed away on December 22, 2018, after a long and valiant struggle with cancer. Bourgain was a giant in the field of Mathematics. His vision, technical power and broad accomplishments were outstanding.

Bourgain had to his credit so many striking results that it is difficult to select his most important contributions. Some of his breakthroughs were the proof of invariance of the Gibbs measure for certain infinite dimensional Hamiltonian systems, the proof of global existence for critical nonlinear Schrodinger equations, the proof of the Erdős-Volkmann ring conjecture, the development with Kontorovich of striking applications of the “circle method” to Apollonian packings and the Zaremba conjecture, the proof of the L^2 decoupling conjecture with Demeter and the proof of the Vinogradov mean value theorem, with Demeter and Guth. Besides having obtained central results in many aspects of mathematical analysis, Bourgain also made major advances in theoretical computer science, group theory, number theory, convex geometry and the geometry of Banach spaces.

Bourgain was a widely celebrated mathematician, having received many awards, including the Fields Medal in 1994, the Salem Prize, the Élie Cartan Prize, the Ostrowski Prize, the Shaw Prize, the Craaford Prize, the Feltrinelli Prize, the Steele Prize for lifetime achievement and the Breakthrough Prize in Mathematics. In 2015, his country, Belgium, bestowed upon him the title of Baron.

Jean Bourgain served as professor at the Free University of Belgium, the University of Illinois, the Hebrew University, Caltech, the Institut des Hautes Etudes Scientifiques (IHES) and from 1994 on at the Institute for Advanced Study (IAS) where he was the IBM Von Neumann Professor.

Jean Bourgain’s grace and courage during his long illness were deeply appreciated. His devotion to mathematics was on clear display during this terribly difficult time, in which he continued making fundamental new contributions to mathematics.

Jean Bourgain’s contributions to mathematics will be remembered forever. Those who knew him will also remember his warmth, generosity, and graciousness.

Carlos Kenig (Univ. Chicago, IMU-president)

9. SIR MICHAEL ATIYAH (1929 – 2019)

Sir Michael Atiyah died in Edinburgh, aged 89, on January 11th 2019. He was one of the giants of mathematics whose work influenced an enormous range of subjects. His most notable achievement, with Isadore Singer, is the Index Theorem which occupied him for over 20 years, generating results in topology, geometry and number theory using the analysis of elliptic

differential operators. Then, in mid-life, he learned that theoretical physicists also needed the theorem and this opened the door to an interaction between the two disciplines which he pursued energetically till the end of his life. It led him not only to mathematical results on the Yang-Mills equations that the physicists needed but also to encouraging the importation of concepts from quantum field theory into pure mathematics.

Born of a Lebanese father and a Scottish mother, his early years were spent in English schools in the Middle East. He then followed the natural course for a budding mathematician in that environment by going to Cambridge where he ended up writing his thesis under William Hodge and becoming a Fellow at Trinity College where he started to pursue his research. But, attending the ICM in Amsterdam in 1954, his eyes were opened to the exciting work that was going on in the outside world and the opportunity then arose to spend a year at the Institute for Advanced Study in Princeton where he met his future collaborators and close friends Raoul Bott, Fritz Hirzebruch and Singer. The benefits of international collaboration which he valued so highly were made concrete when in 1957 Hirzebruch established in Bonn the annual Arbeitstagung where Michael was always the first speaker. In those years he and Hirzebruch developed topological K-theory, which subsequently became the natural vehicle for the index theorem.

A visit by Singer to Oxford in 1962 (where Atiyah had recently moved) began the actual work on the Index Theorem, which ultimately led to a Fields Medal in 1966 and, with Singer, the Abel Prize in 2004. Another visit in 1977 brought mathematical questions concerning gauge theory. Using quite sophisticated algebraic geometry and the novel work of Roger Penrose this yielded a precise answer to the physicists' questions: the so-called ADHM construction of instantons. The fact that mathematicians and physicists had common ground in a completely new context made a huge impression on Michael and he was energetic in the following years in facilitating this cooperation.

With a naturally effervescent personality he possessed, in Singer's words, "speed, depth, power and energy". His strong voice could be heard across many a departmental common room explaining some crucial point. Collaborations were all-important, bouncing ideas around, two or three people in front of the blackboard, exploring ideas, erasing them, sudden insights. This also held for his students -- he needed continuous feedback and challenges. He had a natural talent for lecturing: leaving the lecture theatre you always had the feeling you had understood things, though trying to reproduce them later was a different matter. Beauty in mathematics was a feature he took seriously. It was in evidence in so many of his ideas and proofs and in his later years he actually instigated a neurological experiment to detect its presence.

Sir Michael received numerous awards and honours. He worked for the mathematical community in many ways. In particular, he was instrumental in founding the Isaac Newton Institute (where he insisted that it should be for the Mathematical *Sciences*) and the European Mathematical Society. He was also President of the Royal Society of London where he found himself in a situation where he could voice long-held views about science in general. He contributed to the IMU itself in many ways, including two terms on the Executive Committee. He will be greatly missed by all.

Nigel Hitchin (Oxford, UK)

10. SUBSCRIBING TO IMU-NET

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