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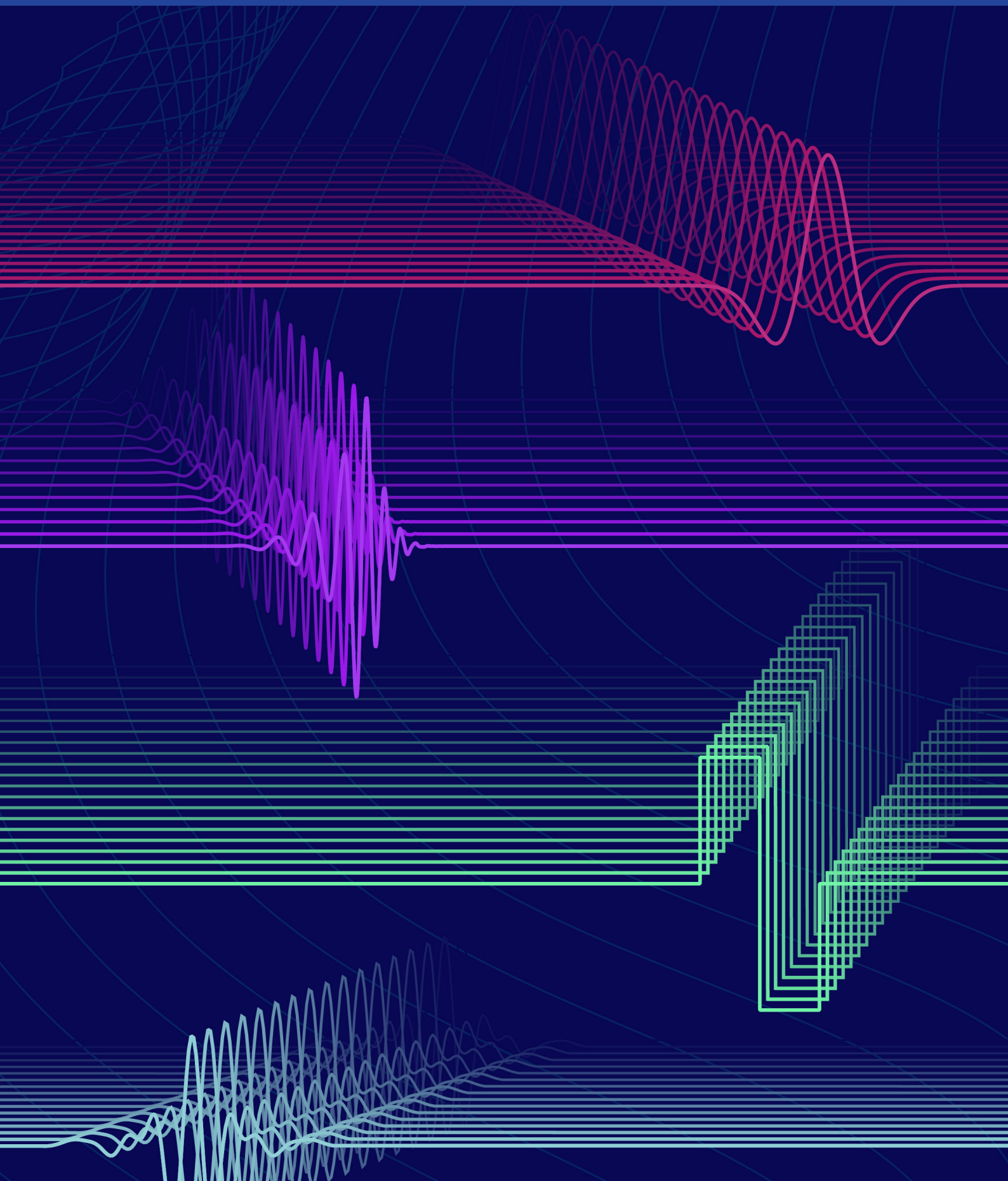
NEWSLETTER

OF THE INSTITUTE OF MATHEMATICS OF THE POLISH ACADEMY OF SCIENCES



BANACH CENTER UPCOMING EVENTS IN 2024

Title	Date	Place
Inspirations in Real Analysis II	14-19.04.2024	Będlewo
KinMAT2024 – Kinetic and Hydrodynamic Descriptions in collective Behavior	03-07.06.2024	Warszawa
Geometric and Variational Analysis. In Memory of Jan Malý	09-15.06.2024	Będlewo
13th Forum of Partial Differential Equations	23-29.06.2024	Będlewo
Conference on Constructive Approximation of Functions IV	24-28.06.2024	Warszawa
KinMAT Summer School 2024	01-06.07.2024	Będlewo
Conference on Fano and Uniruled Varieties	07-12.07.2024	Będlewo
Banach Spaces for Analysts. A conference in Honor of Professor Przemysław Wojtaszczyk	14-19.07.2024	Będlewo
On Geometric Complexity of Julia Sets V	21-26.07.2024	Będlewo
Summer School on Geometric Analysis and PDEs	28.07-02.08.2024	Będlewo
10th Polish Combinatorial Conference	15-21.09.2024	Będlewo
Numerical Analysis and Applications of SDEs	22-28.09.2024	Będlewo
On the Trail of Women in Mathematics: Cecylia Krieger-Dunaj and Her Successors	8-11.11.2024	Będlewo
SIMONS SEMESTER 2024		
Knots, Homologies, and Physics	01.03-30.06.2024	

For more information, please see: https://www.impan.pl/en/activities/banach-center/conferences?y=2024.

On the cover. From top to bottom: The Mexican Hat, Beylkin, Haar and Morlet wavelets. Prof. Przemysław Wojtaszczyk who was awarded the Stefan Banach Medal (see p.17) wrote a book entitled "A mathematical introduction to wavelets".

Photographs of Będlewo on pages 2 and 23. Credit: IM PAN.

Numbers in the Universe

August 7–11, 2023 IM PAN

Piotr Achinger, Artem Dudko, Adam Skalski and Masha Vlasenko

In August 2023, IM PAN co-organised a school and conference under the title "Numbers in the Universe" together with the International Centre for Mathematics in Ukraine (ICMU). The event aimed to present some of the latest breakthroughs in number theory and its applications to the broad mathematical public. The programme included lecture series by Vitaly Bergelson, Terence Tao and Maryna Viazovska, and five research talks.

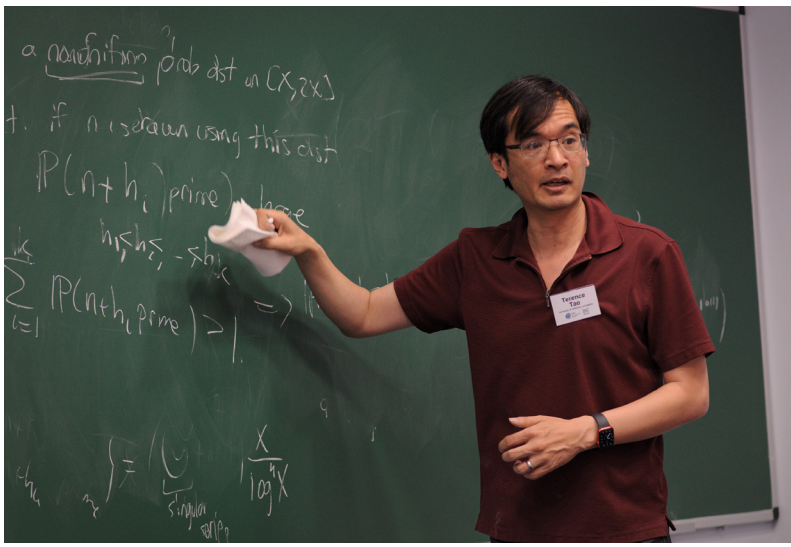
Viazovska dedicated four lectures to old and new ideas in sphere packing. Tao's minicourse gave an overview on the study of prime numbers focusing on the last two decades. Bergelson's lectures featured applications of ergodic theory to number theory and combinatorics. Research lectures were dedicated to hypergeometric functions (Fernando Rodriguez Villegas), probabilistic questions in number theory (Oleksandr Marynych), zeroes of the Riemann zeta function (Danylo Radchenko) and Sarnak's conjecture (Mariusz Lemańczyk and Joanna Kułaga-Przymus). Each ay ended with a problem session run by Jakub Byszewski, Artem Dudko and Oleksiy Klurman.

The conference was in our view a spectacular success, and one of the biggest gatherings of mathematicians in the recent history of IM PAN. We had 109 participants on site in Warsaw, and 75 in Kyiv (including the speakers and organisers). The participants came from the Czech Republic, Egypt, Finland, France, Germany, India, Israel, Italy, the Netherlands, Norway, Poland, South Korea, Switzerland, the UK, Ukraine and the USA. About 75% of them were students and young researchers, in some cases even high school students, already with International Mathematical Olympiad experience.

The event marked the opening of the ICMU. The new Centre was established in 2022 by a group of mathematicians of Ukrainian origin, who believe that science and research will play a key role in rebuilding their home country after the war. The mission of the ICMU is to promote research in mathematical sciences in Ukraine, organize educational and outreach activities and facilitate interaction of Ukrainian mathematicians with their foreign colleagues.

Numbers in the Universe took place on the premises of the Kyiv School of Economics and IM PAN in Warsaw with a live connection between the two audiences. The parallel locations were necessary since martial law prevents adult Ukrainian men of age 18 to 60 from travelling outside the country, and the organisers hesitated to invite foreigners into a war zone. The Kyiv School of Economics was chosen due to its bomb shelter, which is suitable for lectures and equipped with whiteboards, backup power and internet.

On August 9th 2023, as part of the conference, there was a special session dedicated to the opening of the ICMU. At IM PAN we had the following official guests who addressed the audience: Paweł Szrot (State Secretary and Head of the Cabinet of the President of the Republic of Poland), Wojciech Murdzek (Secretary of State in the Ministry of Education and Science of Poland), Marek Konarzewski (President of the Polish Academy of Sciences) and Vasyl Melnychuk (Third Secretary of the Embassy of Ukraine in Poland). From Kyiv we heard speeches delivered by Mykhailo Podolyak (Advisor to the



Prof. Terence Tao at IM PAN. Photograph by Michał Kotowski.

Participants of the conference "Numbers in the Universe" in Kyiv. Credit: ICMU.

Head of the Office of the President of Ukraine), Ihor Taranov (Director of the Directorate of Science and Innovations at the Ministry of Education and Science of Ukraine), Anatoliy Zagorodnyi (President of the National Academy of Sciences of Ukraine) and Olga Polotska (Executive Director of the National Research Foundation of Ukraine) as well as a pre-recorded speech of Claire Giry (Director General of Research and Innovation at the Ministry of Higher Education and Research of France, which this year allocated a grant of 200,000 euros for the creation of the ICMU). The special session was interrupted by an air-raid siren after which the participants and special guests in Kyiv moved to the bomb shelter, from where Maryna Viazovska gave a presentation of the new Centre, continued further by six other members of the Co-ordination Committee of the ICMU. The meeting ended with a passionate discussion among mathematicians and educators on the role of the ICMU project for Ukraine and beyond.

Prof. Maryna Viazovska in Kyiv. Photograph by Iryna Yehorchenko.

All lectures were delivered live, and the quality of the audio-video connection was excellent, due to the recent renovation of the lecture hall at IM PAN. The interruption of the event twice by air raid sirens in Kyiv highlights the unique character of the conference; the mantra repeated throughout the event was the fact that even in the darkest war hours one has to advance education and research in order to ensure the prosperity of future generations.

On their long train ride from Warsaw to Kyiv, Maryna Viazovska, Masha Vlasenko, and some of the participants were interviewed by the science journalist Siobhan Roberts. We highly recommend reading her heartwarming article "In Ukraine, Mathematics Offers Strength in Numbers", published in the New York Times in September.

Links:

Conference webpage https://mathcentre.in.ua/en/events/numbers-in-the-universe

ICMU https://mathcentre.in.ua/en

Recordings of the lectures on ICMU Youtube channel: https://www.youtube.com/@the_ICMU

The New York Times article
https://www.nytimes.com/2023/09/12/science/ukraine-mathematics-yulia.html

Postdocs at IM PAN

Maciej Dołęga and Yonatan Gutman

In 2023 IM PAN had 22 postdocs, all employed as Assistant Professors. The most common contracts are for one, two or three years. We interviewed Liena Colarte Gómez, Jędrzej Garnek, Laura Baldelli and Hua Wang.

Please tell us about your education and research before coming to IM PAN. In particular, where did you get your PhD?

Liena Colarte Gómez: Although born in Cuba, I have spent most of my life in Barcelona, Spain. I completed my undergraduate education and obtained my PhD in mathematics from the University of Barcelona in 2021, followed by a one-year postdoc position at the same institution. My areas of expertise are commutative algebra and algebraic geometry. I am interested in the natural connections between these two branches. In particular, during that time, my research focused on studying algebraic objects and properties that describe and codify geometric information, such as minimal free resolutions of algebraic varieties.

Laura Baldelli: I did Bachelor and Master's degree in Perugia, my home city, in Italy. Then I got my PhD at Florence (Italy) but, due to the Covid-19 pandemic, I spent most of the time in Perugia, also because my PhD supervisor was at the University of Perugia.

Hua Wang: Before coming to IM PAN, I did my bachelor study in the University of Science and Technology of China, then finished my graduate study in France, first in ENS, then obtained my PhD in Paris 7. After that, I did a postdoc for one and half years in Besançon, France.

Jędrzej Garnek: I got my master's degree and PhD from Adam Mickiewicz University in Poznań, Poland. My thesis was defended in 2020 and concerned abelian varieties over p-adic fields.

How long have you been at IM PAN, who is your supervisor and what is the theme of your research?

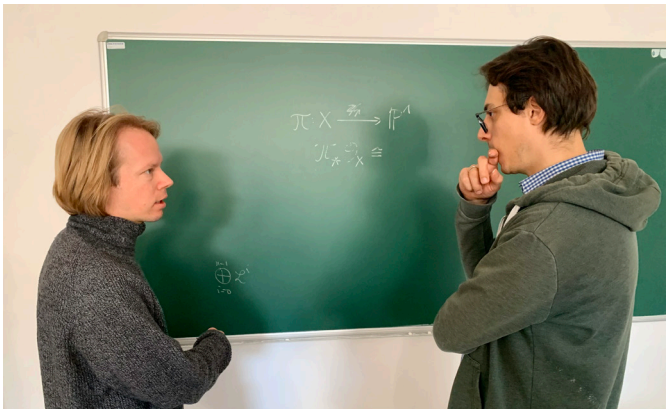
Laura Baldelli: I have been at IM PAN for one year and a half. I do research in analysis and PDEs under supervision of Prof. Mederski.

Hua Wang: I have been here for around a year, and I work on representations of quantum groups under supervision of Prof. Adam Skalski.

Liena Colarte Gómez: I started working at IM PAN in October 2022, with a two-year postdoc position obtained through the annual call for temporary research positions for young mathematicians. I carry out my research within the lines of my previous work and the theory of tensors and tensor decomposition under the supervision of Prof. Jarosław Buczyński. As part of the algebraic-geometric group at IM PAN, we investigate geometric aspects of rank decomposition as well as related questions.

Jędrzej Garnek: At IM PAN I'm working on my grant SONATINA "The de Rham cohomology of p-group covers", awarded by the Polish National Science Center. The duration of the grant is October 2022 - September 2024. The grant concerns algebraic geometry. Roughly speaking, in the project I study algebraic curves over finite fields, their symmetries, and their cohomologies (certain invariants of the curves). My supervisor is Piotr Achinger, who also works on geometry in positive characteristic.

How did you hear about the position at IM PAN and why did you choose it?



Dr. Jędrzej Garnek (right) discussing with his supervisor Prof. Piotr Achinger. Photograph by Maciej Dołęga.

Laura Baldelli: At the end of my PhD I went to Będlewo for a conference. There I met Jacopo Schino, who had almost finished his PhD under the supervision of Prof. Mederski at IM PAN. It was him who told me about the open postdoc position and I decided to apply. It was an exceptionally good opportunity. I would have the possibility to collaborate with more people, there would not be teaching duties and the idea of working abroad was challenging.
Hua Wang: From many academic connections. IM PAN is great for doing research in my area.
Liena Colarte Gómez: After finishing my PhD, I decided to pursue an academic career in mathematics. Working abroad within new research groups involving new topics helps me to gain expertise and experience and boost my skills. This appealed to me rather than staying where I was. IM PAN is an excellent research institution that matches my career goals and offers me the opportunity to carry out my research.
Jędrzej Garnek: When applying for a grant I could choose any academic institution in Poland. There were several reasons to choose IM PAN. Firstly, not in many cities in Poland there are research groups in algebraic geometry in positive characteristic. Secondly, I already had an opportunity to visit IM PAN on an invitation from Piotr Achinger in 2019. Thus I knew that there are a lot of activities going on at the Institute. Moreover, IM PAN is the most international mathematical institution in Poland. There are a lot of people from all over the world either working at IM PAN or visiting it for some time. Finally, from the formal point of view, IM PAN is quite different from universities. Namely, it has a shorter "chain of command", which makes the bureaucracy much easier.

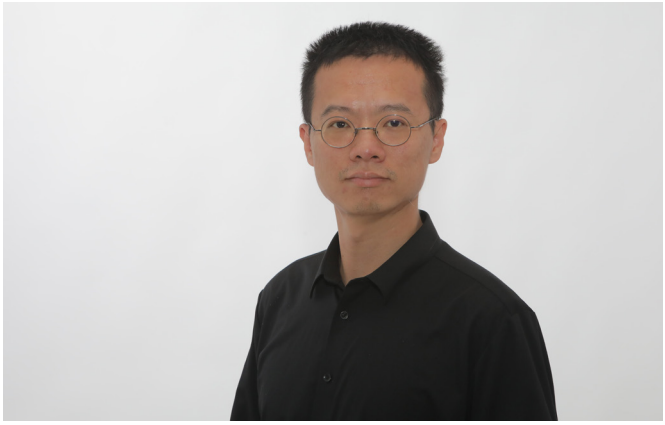

Dr. Laura Baldelli. Credit: private archive.

In which city do you live in Poland? How is it living in that city and how is life outside mathematics there?

Laura Baldelli: I live in Warsaw and I really like it. It is a flat city, so there is the possibility to use bikes or simply go walking without any difficulties. Public transport works really well. I always feel myself at home. The city gives you different options of having fun. Moreover, almost everyone is friendly and speaks English.
Hua Wang: I also live in Warsaw and it feels pretty nice. The city has many parks which I like very much. I also like the food. On the downside though, the weather, especially in winter, seems too gloomy for my taste, and the cost of living is rising quickly, and the rent is very expensive. I don't have much to say about "life outside mathematics". Last year, I went to the gym regularly, which is kind of nice. But in general, I think being able to speak Polish is definitely very beneficial to fully enjoy life in Warsaw.
Liena Colarte Gómez: I have lived and worked in Warsaw for roughly a year now. It is a fantastic city where a strong character and the "European city flavor" combine perfectly. It is a modern and comfy big city with all the commodities anyone could imagine, including comprehensive public transport options. The food and restaurants are fantastic, and I find it remarkable how Warsaw is immersed by a net of well-maintained green areas you can enjoy all year round.
Jędrzej Garnek: I live in Poznań. That is a medium-sized city (~500,000 inhabitants) between Warsaw and Berlin. Poznań is a really nice place to live in. With fewer inhabitants than in Warsaw, it is more peaceful and much easier to commute. On the other hand, the city is big enough to have a wide cultural offer and old enough to have its history and own local traditions. Poznań is also a university city and I'm still in touch with the mathematical community of Poznań, e.g. by taking an active part in their seminars.

How do you find the working conditions at IM PAN? In particular, is the postdoc salary satisfactory and are there any other benefits on top of the salary to which you are entitled?

Laura Baldelli: I find them particularly good, I did not have any kind of pressure. The offices are nice and all of them have kettles, very useful during winter. The salary is satisfactory with respect to life in Warsaw. I don't know about any other benefits.
Hua Wang: The conditions are excellent. The salary



Dr. Hua Wang. Credit: private archive.

is not really satisfactory, especially considering the inflation of the prices these recent years. Though, I enjoy multi-sport card very much.

Jędrzej Garnek: My salary is related to the grant that I've been awarded. Therefore it is better than the usual salary for an assistant professor at a Polish university. Apart from the standard work benefits, IM PAN helps me with accommodation from time to time when I'm staying in Warsaw overnight.

Do you speak Polish? If not, is this an obstacle while living in Poland? What challenges did you encounter with respect to starting to work at IM PAN and moving to Poland?

Liena Colarte Gómez: Moving to a foreign country with a different culture and language and leaving behind family, friends, and the ways you are used to is complicated and can prove difficult practically and emotionally. To that extent, IM PAN administration helps you to find housing, assists you with the Polish Administration, and offers you an introductory course to the Polish language. I am learning the Polish language, which I find beautiful and complex, but it will be a long journey. In my experience, Warsaw is English-friendly, so non-Polish speakers would not encounter many problems in daily life. I do not recall any particular challenge regarding starting to work at IM PAN.

Laura Baldelli: I do not speak Polish, but this was not an obstacle. Maybe only a few times it was a limit. I did not encounter any challenges with respect to starting to work at IM PAN. Everything was clear and without any problems. Everyday life challenges - the bureaucracy, the really cold weather and the food which is quite good but not enough for the Italian standard.

Hua Wang: I don't and it definitely is an obstacle, but how much of an obstacle of course depends on the lifestyle of each individual. The process of moving to Poland went smoothly for me in general, the only big challenge that I can think of is to find an apartment.

Jędrzej Garnek: Polish is my mother tongue. The biggest challenge for me is that I'm living in a different city - more than 300 km from my work. Therefore it is impossible for me to be at IM PAN everyday. Usually, I'm in the Institute one or two days a week. Also, on the one hand, the constant journeys are quite exhausting. On the other hand, travel by train gives an opportunity to work with concentration. Apparently, even some famous mathematicians liked to work on a train so much, they would travel without any particular reason.

Would you recommend IM PAN future candidates? What would be your advice for someone considering working at IM PAN?

Laura Baldelli: Yes, for sure!! IMPAN is an institute of research in mathematics so, if you want to increase your mathematical viewpoint, getting to know good mathematicians and nice colleagues, or to have a lot of time to dedicate for research without teaching duties, IM PAN is the right choice! Moreover, Poland will seduce you with its kindness, politeness, and clearness.

Hua Wang: Yes. Start looking for apartments early on, and if possible, get familiar with some simple Polish.

Liena Colarte Gómez: IM PAN is an excellent international research institution with strong research groups in various branches of Mathematics. IM PAN periodically hosts interesting research events such as conferences, workshops, courses, and thematic semesters. I highly recommend it to any young mathematician pursuing a research career since it offers an ideal environment to grow and carry out research.

Jędrzej Garnek: I already recommended working at IM PAN to several other young mathematicians and am willing to do it again. Here's my advice to other people considering work at IM PAN. Working in a research institute means a lot of freedom. Use it wisely! Be at the institute regularly (even if this means one day a week - like me). Try to engage in various activities (lectures, seminars, ...) at the Institute. Meet a lot of people. Warsaw is beautiful and very lively, so enjoy your stay and explore the city!

The IM PAN Colloquium

Mateusz Wasilewski and Aneta Wróblewska-Kamińska

The IM PAN Colloquium is a new weekly seminar aimed at a general mathematical audience, taking place at the Warsaw branch. Carefully crafted presentations by world-class experts inform us about current mathematical trends. The interdisciplinary nature of this event will hopefully foster interactions not only within the Institute but also with researchers from other institutions.

There is a long tradition of organizing colloquia at IM PAN. From 2001 until 2019 many interesting talks were delivered during the joint Colloquium of the Banach Center and the Polish Mathematical Society. Unfortunately that event was happening somewhat irregularly. In 2012 a new meeting was launched, namely the Young Researchers Colloquium, organized by PhD students and postdocs. It grew out of the series of colloquia for PhD students which dates back to at least 2001. During the COVID-19 pandemic it continued as an online seminar but finally came to a halt in 2021. The new IM PAN Colloquium is meant to fill this gap.

So far we have had four talks in October. The first one was delivered by Prof. Dawid Kielak from the University of Oxford, who talked about fibring,

Prof. Šárka Nečasová at IM PAN Colloquium. Photograph by Aneta Wróblewska-Kamińska.

Participants of the IM PAN Colloquium. Photograph by Aneta Wróblewska-Kamińska.

an important tool in low dimensional topology, and its relation to group theory. After that we had an opportunity to listen to Prof. Maciej Dołęga from IM PAN Kraków. His presentation focused on the links between various areas of mathematics related to enumerative combinatorics. Our next guest was Prof. Grigor Sargsyan from IM PAN Gdańsk, who discussed applications of logic, more specifically forcing axioms and determinacy axioms, to naturally posed problems in different fields of research, such as analysis. The last speaker in October was Prof. Šárka Nečasová from the Czech Academy of Sciences. Her talk was devoted to partial differential equations describing motion of fluids, in particular the Navier-Stokes equation.

We hope to continue having speakers representing a wide spectrum of mathematical disciplines. This diversity will be crucial if we want the IM PAN Colloquium to be an important seminar for the whole mathematical community in Poland. The IM PAN Colloquium is organized by Piotr Achinger, Mateusz Wasilewski and Aneta Wróblewska-Kamińska. More information, including the titles and abstracts of future talks, can be found on the website: impan.pl/kolokwium.

The Kraków branch of IM PAN

Michał Kapustka

The Kraków branch of IM PAN boasts a rich history dating back to the inception of IM PAN itself. Initially, the department operated from a makeshift space on św. Jana street, an apartment generously provided to IM PAN by its owners. During this period, the Kraków branch flourished under the patronage of esteemed mathematicians, including Prof. Stanisław Gołąb, Prof. Andrzej Pliś, and Prof. Włodzimierz Mlak. However, in the 1990s, when the owner of the apartment returned to Kraków, IM PAN had to relocate the branch. Consequently, an apartment nearby on Św. Tomasza street was purchased, subsequently becoming the permanent venue for the Kraków branch of IM PAN. This strategic location places our branch at the heart of historic Kraków old town, in close proximity to the main square, the „Planty" park, and within walking distance from the main train station. Moreover, the train station offers a direct 17-minute connection to the airport.

Under the stewardship of Prof. Janas, the Kraków branch of IM PAN transitioned into the Kraków hub for functional analysis. Over time, with the addition of new staff, various other research fields found a place within the branch. Notably, upon Prof. Janas' retirement, algebraic geometry and discrete mathematics emerged as the predominant areas of research at the branch, and I assumed the role of branch head.

Thanks to the kindness of several IM PAN directors, over the past few years, the Kraków branch of IM PAN has undergone extensive renovations. The process encompassed a range of upgrades, from window replacements and electrical improvements to heating enhancements. Finally, the interior underwent a complete refurbishing, including a comprehensive overhaul of the furnishings, and the addition of a new kitchen and social space. One may note with satisfaction that the renovation has transformed our branch into a state-of-the-art research facility. The apartment has a total area of around 150m^2. It now boasts three spacious offices with a total of eight workstations, with room for some small expansion. We also have an additional lecture room accommodating approximately 20 individuals, as well as a guest room for hosting both internal and external guests. If you are affiliated with IM PAN and interested in collaborative research, or have a work-related trip to Kraków, you are always welcome to visit our branch and use our room upon availability.

The Kraków branch of IM PAN. Photograph by Michał Kapustka.

In Kraków, the number of employees may fluctuate annually, contingent upon the research grants of our three long-term staff members and the preferences of new hires at IM PAN. Presently, the Kraków branch employs seven individuals, the majority of whom are affiliated with one of three interconnected research areas, each overseen by a long-term staff member:

–Algebraic and Enumerative Combinatorics (Maciej Dołęga) - specifically the study of discrete models such as Young diagrams and discrete surfaces with applications to probability, representation theory, and enumerative geometry.

–Algebraic Geometry (Michał Kapustka) - specifically classical algebraic geometry, Calabi-Yau and Hyperkähler geometry, derived categories.

–Combinatorial Algebraic Geometry (Michał Lasoń) - specifically the study of matroids, graphs, and polytopes.

This year, Maciej Dołęga's research group notably expanded, thanks to his Sonata Bis team-building grant. All our research groups maintain close collaborations with other academic units in Kraków, primarily at the Jagiellonian University, but also at the AGH University of Science and Technology and the Pedagogical University. Additionally, we engage in regular research visits at universities abroad, including institutions in Bologna, Boston, Konstanz, Milan, Oslo, Paris, Tokyo, and Toulouse.

At the Kraków branch of IM PAN, we currently host or plan to host three recurring seminars:

–The Algebraic Geometry seminar IM PAN at Kraków (co-organized by Grzegorz Kapustka from the Jagiellonian University and Michał Kapustka) is a research-oriented event featuring regular talks by external experts, intertwined with a reading seminar format involving local speakers. In addition to IM PAN participants, we regularly welcome attendees from the Jagiellonian University and the Pedagogical University.

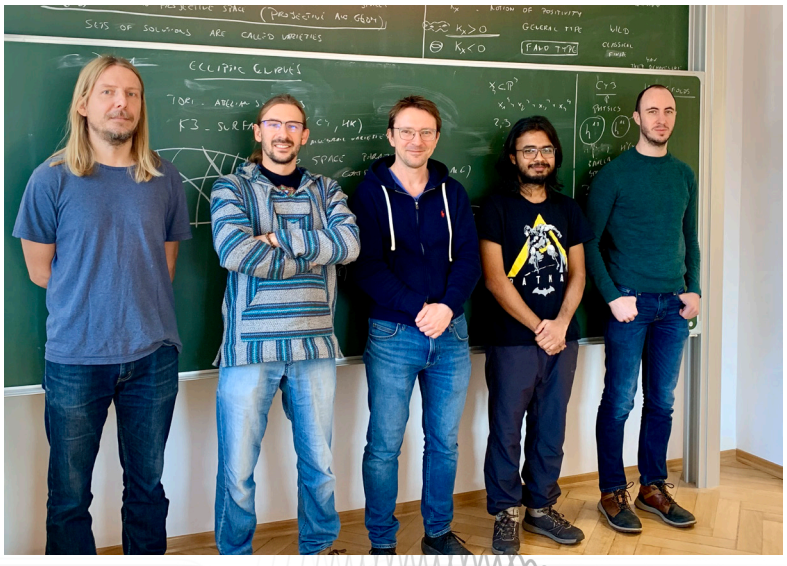
–The Colloquium of the Kraków Branch of IM PAN (co-organized by Maciej Dołęga and Michał Kapustka) is primarily tailored for our branch's employees, who present talks intended for a general audience, aiming to elucidate their research to one another. This fosters an understanding of each other's work and often leads to the discovery of connections between research projects. The colloquium talks are followed by a communal lunch, providing an opportunity for social interaction.

–The Kraków Combinatorics Seminar (co-organized by Maciej Dołęga and Michał Lasoń) is meant to bring together researchers in combinatorics from the Kraków area, including scholars from the AGH University of Science and the Technology and the Jagiellonian University.

Furthermore, occasionally, our branch hosts meetings with talented high school students who have the opportunity to take their initial steps in advanced mathematics through the Jagiellonian University tutoring program.

Additionally, after the COVID era and the abundant emergence of online events, we have decided to use our lecture room for co-organizing or sometimes just broadcasting online research events. In this way, we organized local groups that took part in various conferences, among others: "Summer school of the University of Warsaw on stability conditions", "Japanese European symposium in symplectic geometry and moduli", "MATCH-PIMS conference „Hodge theory, and Mirror Symmetry, and Physics of Calabi-Yau Moduli".

In 2018, the Kraków branch of IM PAN hosted a mini workshop titled "Motives of Calabi-Yau Manifolds'" which brought together over 10 promising young researchers from various parts of Europe. Subsequently, the commencement of renovations rendered it impractical to hold such events at our branch. Now that the renovation has been successfully completed, we are eager to resume hosting workshops in our branch. Meanwhile, our staff actively collaborates with other research centers in Kraków, co-organizing a diverse range of research events meant specifically to build new opportunities for the development of the local research community. This includes several recent successful events such as the large international conferences "Recent Advances in Classical Algebraic Geometry" and "Summer School in Algebraic Combinatorics", both held at the Jagiellonian University. Other events such as the workshop "Explicit Algebraic Geometry" and "Summer School on Algebraic, Asymptotic, and Enumerative Combinatorics" were hosted in Będlewo but, in addition to prominent guests, featured mainly participants from research institutions in Kraków.



A group working at the Kraków branch of IM PAN. Photograph by Edyta Momot.

Simons Semester on Dynamical Systems: Topological, smooth, and holomorphic dynamics, ergodic theory, fractals

Feliks Przytycki

The event took place from March to June 2023 in Warsaw and Będlewo, and it was organized by the Banach Center in cooperation with the mini-semester 'Modern Holomorphic Dynamics and Related Fields'. The latter was hosted at the Faculty of Mathematics, Mechanics, and Computer Sciences of the University of Warsaw (MIMUW) within the Thematic Research Programme action, part of the Excellence Initiative – Research University Programme (IDUB), and a similar program at the Nicolaus Copernicus University in Toruń. For further information, please visit https://www.impan.pl/en/activities/banach-center/conferences/23-simons-v.

This semester was a continuation of the Simons Semester "Dynamical Systems" held in the Banach Center in Fall 2015. The current semester included several schools, workshops, and conferences, featuring minicourses in Warsaw led by world leaders: Fabrizio Bianchi (Lille), André de Carvalho (São Paulo), Genadi Levin (Jerusalem), Núria Fagella (Barcelona), Juan Rivera-Letelier (Rochester), Giulio Tiozzo (Toronto), Christian Bonatti (Bourgogne), Philip Boyland (Florida), Jérôme Buzzi (Paris-Saclay), Katrin Gelfert (Rio de Janeiro), Mark Pollicott (Warwick), Polina Vytnova (Surrey), Bálazs Bárány (Budapest), Károly Simon (Budapest), Jonguk Yang (Zürich), Jon Chaika (Utah), Alexandre Eremenko (Purdue), Mariusz Urbański (Denton), Felipe García-Ramos (San Luis Potosí, México/Jagiellonian University).

The following events took place in Warsaw:

– School & workshop "Complex Dynamics and related fields. From introductory minicourses to advanced topics", 12-25 March, Warsaw (IM PAN & MIMUW),

– School & workshop "Smooth and topological dynamics", 10-22 April, Warsaw (IMPAN & MIM UW),

– School & workshop "Dynamics and fractals", 7-13 May, Warsaw (IMPAN & MIM UW),

– School & workshop "Ergodic theory and parabolic dynamics", 22 May-3 June, Warsaw (IMPAN & MIM UW).

Additionally, several events that were organized within the Simons Semester or associated to it took place in other parts of Poland:

– Conference "Complex dynamics: connections to other fields", 27-31 March, Chęciny,

– School & conference "Beyond Uniform Hyperbolicity", 23 April-5 May, Będlewo (the 10-th in a series of conferences organized in various countries since 2001. Organizers included: Maria José Pacifico, Amie Wilkinson, Danijela Damjanović, Jairo Bochi, Christian Bonatti, Sylvain Crovisier, Dominik Kwietniak),

– Workshop "Thermodynamic Formalism: Non-additive Aspects and Related Topics", 14-19 May, Będlewo,

– Conference "Nilpotent structures in topological dynamics, ergodic theory and combinatorics", 4-10 June, Będlewo.

Altogether, there were approximately 350 participants in the semester onsite (and a number online), including leaders (several ICM invited speakers) and junior researchers (PhD students and postdocs) from at least 40 countries. Local organizers included Piotr Gałązka (Warsaw University of Technology), Artem Dudko, Yonatan Gutman, Łukasz Pawelec, Feliks Przytycki, Michał Rams, Adam Śpiewak (all at IM PAN), Krzysztof Barański, and Anna Zdunik (University of Warsaw).

Participants of the conference "Nilpotent structures in topological dynamics, ergodic theory and combinatorics". Photograph by Sławomir Malecha.

Simons Semester „Structures: set theory, model theory, logic, and computer science”

Maciej Malicki

The Simons Semester titled “Structures: set theory, model theory, logic, and computer science” was organized by Piotr Kowalski (the University of Wrocław), Aleksandra Kwiatkowska (the University of Wrocław and the University of Münster), Maciej Malicki (IM PAN), Marcin Sabok (McGill University), and Grigor Sargsyan (IM PAN) in the fall of 2023. Our aim was to convene experts working across various aspects of mathematical logic. This field encompasses diverse domains, including mathematicians engaged in general and descriptive set theory, model theory, as well as computer scientists.Currently, there are numerous fruitful interactions between logic and other branches of mathematics, such as model theory with diophantine geometry and number theory or descriptive set theory with dynamics. Indeed, a number of experts from outside the field took part in the semester.

The semester comprised four thematic parts, each focusing on a specific subfield of logic:

–A workshop on current trends in descriptive set theory and dynamics held at IM PAN in Warsaw from August 14th to August 18th.

–A workshop on model theory held at IM PAN in Wrocław from September 15th to September 18th.

–A series of tutorials on inner model theory and forcing axioms held at IM PAN in Sopot in November.

–A session on Fraïssé theory held on December 3rd at IM PAN in Warsaw.

Throughout the workshops and sessions, leaders of the Simons Semester delivered series of lectures, featuring:

–Omer Ben Neria (Hebrew University)
–Adam Bartoš (Czech Academy of Sciences)
–Matthew Foreman (UC, Irvine)
–Yonatan Gutman (IM PAN)
–Tobias Kaiser (Universität Passau)
–Wiesław Kubiś (Czech Academy of Sciences)
–Anand Pillay (University of Notre Dame)
–Nick Ramsey (University of Notre Dame)
–Ralf Schindler (University of Muenster)
–John Steel (UC, Berkeley)
–Todor Tsankov (Lyon 1)
–Anush Tserunyan (McGill University)
–Jouko Väänänen (University of Helsinki)
–Boban Velickovic (Université de Paris)
–Matteo Viale (University of Torino)
–Jindřich Zapletal (University of Florida)

Additionally, four other conferences on related topics were co-organized by the University of Warsaw and the Banach Center as part of the IDUB Thematic Semester “Structures”:

–A conference on descriptive set theory and dynamics held at the University of Warsaw from August 21st to August 25th.

–A conference on model theory held at the University of Wrocław from September 19th to September 23rd.

–A conference on generic structures held at Będlewo from October 23rd to October 27th.

–A conference on perspectives in set theory held at IM PAN in Wa rsaw from November 13th to November 17th.

One of the organizers’ goals for the semester was to make it as inclusive as possible for junior participants. Several PhD students and young researchers were invited to give talks during the workshops. Overall, these events attracted between 40 to 90 participants.

Marie Skłodowska-Curie Staff Exchange Operator Algebras That One Can See

Piotr M. Hajac

Graph C*-algebras are analytical objects blessed with tangible structures and a classification theory derived from their combinatorial origins. Through the analysis of directed graphs, including higher-rank graphs or quantum graphs, one can visualize and explore them in intuitive ways lacking elsewhere. They serve as strikingly efficient models for key open problems in noncommutative geometry and topology, as well as in C*-dynamical systems. Additionally, they provide a focal point for the much-needed extension of the celebrated Elliott classification program to non-simple C*-algebras.

The main objective of the project is to achieve a critical mass for a successful attack on these problems by combining the strength of numerous research groups inside and outside the EU and using graph algebras as a unifying vehicle for hitherto unconnected areas of mathematics. The synergy of these innovative connections should allow us to develop and apply brand new methods unavailable otherwise. Furthermore, researchers using graph C*-algebras for applications in adjacent fields are likely to provide groundbreaking insights enabling the, to make an impact far beyond graph algebras themselves. In particular, we expect to develop an interdisciplinary dimension involving quantum computing.

We aim to achieve our objective through networking and the transfer of knowledge. The project is primarily supported by an EU "Staff Exchange" grant supplemented by three Polish Government matching grants "Projekty Międzynarodowe Współfinansowane". Additionally, as part of the project activities, the Banach Center hosted a Simons Semester on "Operator Algebras That One Can See" in the summer of 2023, and the University of Warsaw currently runs a yearly Thematic Research Programme "Quantum Symmetries". Among the twenty-six partners from the EU and North America participating in the network, there are globally leading scientific centers. Among the approximately seventy researchers involved in the project, there

are renowned experts and experienced mentors for young researchers. Combining them with student members of the network yields a top-tier human-resource infrastructure. An important objective is to take advantage of that potential by creating new career opportunities. Another tremendous asset of the network is the unique opportunity it offers to form new and lasting connections for successful transcontinental scientific collaboration.

The combined leadership of the network consists of the Project Coordinator, Piotr M. Hajac; twenty-six Node Coordinators; and seven Work Package Leaders. The Project Coordinator represents the project in all contacts with the Research Executive Agency and with the administration of the involved institutions, bearing the responsibility of the day-to-day management of the project. He also chairs the management board. The Node Coordinators serve as liaisons to the local administrations of their respective nodes, ensuring the practical realization of staff exchanges as well as financial reporting. The Work Package Leaders are responsible for monitoring the scientific progress of their work packages and, jointly with the Project Coordinator, for the scientific progress of the entirety of the project.

Prof. Piotr M. Hajac. Credit: private archive.

The long-term Program of Support for Ukrainian Research Teams

Artem Dudko

The long-term program of support for Ukrainian research teams at the Polish Academy of Sciences was announced in December of 2022. It is carried out in collaboration with the U.S. National Academy of Sciences as well as with the help of external partners. In total, 174 Ukrainian research teams submitted their projects in different branches of science to the program coordinators. Among them, 18 projects won the competition and are now funded within the long-term program.

Each team consists of up to 5 researchers having a Ukrainian citizenship or an affiliation at a Ukrainian scientific institution. The winning teams will receive up to $200,000 USD per year for up to three years, covering salaries and research related expenses. Their members will have both a Polish and a Ukrainian affiliation.

The only winner within mathematics is affiliated with IM PAN. This team consists of Prof. Artem Dudko (the principal investigator, IM PAN Warsaw), Prof. Oleksandr Danylenko and DSc. Mykola Nessonov (B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine Kharkiv, Ukraine), and PhD students Mykyta Vieprik and Nhok Thai Shon Ngo (V. N. Karazin Kharkiv National University, Ukraine).

Prof. Artem Dudko. Photograph: Michał Kotowski.

Their project is devoted to studying group actions, invariant ergodic measures, characters on groups, and unitary representations for several classes of groups. These objects have many important and fruitful connections. For instance, given a measure-preserving action of a group G on a Borel probability space (X,μ) one can associate to it a character given by $\chi(g)=\mu(\{x:gx=x\})$, $g\in G$, and several types of representations: Koopman, groupoid, and quasi-regular.

The project officially started in September 2023. It opens new challenging research directions for the Institute of Mathematics of the Polish Academy of Sciences, the National Academy of Sciences of Ukraine, and the Kharkiv National University in the fields of ergodic theory, operator algebras and group representations. The project facilitates further cooperation between the Kharkiv team members and their Polish colleagues.

POLSKA AKADEMIA NAUK

Renovation of IM PAN

Edyta Momot

In April 2023, a comprehensive renovation of the first floor of the IM PAN headquarters at Śniadeckich Street in Warsaw was completed. This floor serves as the showcase of the Institute. The restoration of floorboards, restroom renovations and a modernized overall appearance have increased the comfort of work. New floor boards were installed in the corridor, while old floor boards in the seminar rooms were refurbished. The restored portraits of eminent mathematicians have returned to the walls. Additionally, a new social room and a mailroom were added. The Banach Centre also relocated to the first floor.

Centralizing administrative staff on the first floor allows scientists to conveniently handle all matters in one place. Prioritizing the comfort of our employees and the image of our Institute, the renovation of the first floor marks the beginning of the modernization process for the IM PAN building at Śniadeckich Street, its branches, and the Conference Center in Będlewo.

The first floor of the IM PAN headquarters after renovation. Credit: IM PAN.

In September 2023, minor renovations were carried out in the Reception area. These included changes to lighting, replacement of furniture, and repainting of walls. Room 321 on the third floor was equipped with a high-quality audiovisual system, including new cameras and microphones, along with air conditioning and repainted walls. These steps enable lectures and conferences to be conducted comfortably for an audience of up to one hundred people. Opposite to Room 321, two modern public group workrooms with glass doors (303 and 308) were built, each equipped with blackboards and armchairs, creating a welcoming space for collaborative work and scientific discussions.

A new public group workroom at IM PAN. Credit: IM PAN.

Several renovation works were undertaken at the Conference Center in Będlewo, such as:
-renovation of the historic fountain,
-refurbishing the floors in the palace,
-installation of air conditioning in the Knights' Hall and the "BB" conference hall.
Additionally, to enhance the surroundings, benches and pots by the fountain and in the garden, along with umbrellas, garlands, deckchairs and lanterns, were purchased.

Banach Prize Awarded to Piotr Nowak

Adam Skalski

Piotr Nowak from IM PAN was awarded in 2023 the Banach Prize for his groundbreaking results concerning Kazhdan Property (T), a fundamental notion appearing in representation theory of discrete groups. The Banach Prize, the main award of the Polish Mathematical Society, is one of the most prestigious mathematical distinctions in Poland, awarded annually since 1946.

Piotr Nowak was born on the 9th of October 1978. He studied mathematics at the University of Warsaw, and in 2008 defended at the Vanderbilt University a PhD thesis written under the supervision of Prof. Guoliang Yu. Since 2011 he has worked at IM PAN in Warsaw. He received numerous prizes and grant awards, in particular he won the Prime Minister award for the habilitation thesis in 2017, the Award of the Minister of Education and Science for scientific achievements in 2023, and the ERC Starting Grant (as the first mathematician in Poland) in 2016.

During 2018-2022 Piotr Nowak published eight research papers, in journals such as Annals of Mathematics, Crelle, Mathematische Annalen and the Journal of Functional Analysis. For several years he has studied Kazhdan Property (T), a property of groups introduced in the 1960s in the theory of representations of discrete groups. It has deep geometric and topological consequences and lies in the heart of modern geometric group theory. The groundbreaking results of Nowak obtained in the last years include the proof (obtained with Marek Kaluba, Dawid Kielak and Narutaka Ozawa) of the Kazhdan Property (T) for the group of outer automorphisms of the free group with at least 5 generators. This solved a fundamental open problem stated already in the 1990s by several prominent mathematicians such as Martin Bridson, Emmanuel Breuillard, Alexander Lubotzky and Karen Vogtmann. The originality and importance of the result were confirmed by the fact it was published in the most prestigious mathematical journal in the world, Annals of Mathematics.

The proof is based on a brilliant combination of theoretical methods reducing the infinite-dimensional question to a finite-dimensional one, and computer assisted semi-definite programming. It also involves a highly non-trivial induction process based on geometric arguments, which allows the authors to reduce the case of an arbitrary number of generators to that of five generators. The theorem obtained not only has deep theoretical importance, but also certain practical implications, for example explaining a surprisingly high convergence rate of certain algorithms used for the efficient design of computer networks. The techniques developed in the work of Nowak in recent years, combining the higher cohomology theories with computer assisted computations, form a key inspiration for future developments of the field, and have been met with enormous interest in the community.

Prof. Piotr Nowak. Credit: private archive.

Banach Medal Awarded to Przemysław Wojtaszczyk

Marcin Bownik

On October 14th 2023 Przemysław Wojtaszczyk was awarded the Stefan Banach Medal by the Polish Academy of Sciences for lifetime contributions in functional analysis, the theory of Banach spaces, and approximation theory. Professor Wojtaszczyk has been affiliated with IM PAN for his entire academic career. He received his PhD in 1973 under the supervision of Professor Aleksander Pełczyński, who was a towering figure in Banach space theory and a leader of the Warsaw school of functional analysis, which continued the famous school of functional analysis founded by Stefan Banach. Coincidentally, Professor Pełczyński was also one of the earliest recipients of the Banach Medal in 1996.

Professor Wojtaszczyk made several contributions in the forefront of important developments involving Banach spaces, i.e., complete normed spaces. This can be grouped into the following three general topics.

1) General theory of Banach spaces, Schauder bases, and unconditional bases. An example is the 1982 result of Wojtaszczyk that the Franklin system, which is a precursor of wavelets, is an unconditional basis of the Hardy space. In addition an influential 1991 book of Wojtaszczyk "Banach spaces for analysts" showed the importance of Banach space methods for other branches of analysis such as harmonic analysis, functions of a complex variable, orthonormal series, approximation theory and probability theory.

2) H^p spaces, splines, wavelets, and polynomial bases. The second topic includes the study of specific types of bases in Banach and quasi-Banach spaces such as wavelets and their precursors in the form of splines and polynomial bases. Wojtaszczyk wrote a beautiful book "A mathematical introduction to wavelets" (1997) dealing with the theory of orthogonal wavelets and their use in analyzing functions and functions spaces both in one and several variables.

3) Nonlinear approximation theory, greedy bases. Starting in the early 2000s, Wojtaszczyk's mathematical interests shifted to studying approximation properties of expansions in Banach spaces and greedy bases. Indeed finding estimates for the rate of approximation of a function by means of nonlinear algorithms with respect to biorthogonal systems and, in particular, the greedy approximation algorithm using bases, has attracted much attention for the last twenty years. This was also a topic of the talk given by the Laurate as part of the Prize ceremony - the precise title was "Greedy methods and democracy in approximation theory and functional analysis".

The common dominator for all these contibutions are Banach spaces. They are named after Stefan Banach who initiated the systematic study of these spaces in the 1920's, and proved several fundamental results that are nowadays core topics in any graduate level analysis course. They will also be a central topic of the upcoming conference "Banach spaces for analysts. A conference in honor of Professor Przemysław Wojtaszczyk", which will be held at the Banach Center in Będlewo on July 14-19, 2024.

President of the Polish Academy of Sciences Prof. Marek Konarzewski (left), Laurate Prof. Przemysław Wojtaszczyk (center), Director of IM PAN Prof. Karol Palka (right). Photograph by Marcin Gregorczyk.

IM PAN Prize for Outstanding Scientific Achievements in Mathematics Awarded to Mariusz Mirek

Krzysztof Bogdan

The Institute of Mathematics of the Polish Academy of Sciences Prize for Outstanding Scientific Achievements in Mathematics has been awarded yearly since 2009 to a Polish mathematician under the age of 45. The Jury is appointed by the Director of IM PAN after consultation with the Scientific Council of IM PAN and the Prize is one of the most important awards given to mathematicians in Poland. In 2023, the Prize was awarded to Prof. Mariusz Mirek from the University of Wrocław and Rutgers University for outstanding results in harmonic analysis and ergodic theory.

The scientific activity of the Laureate focuses on interactions of harmonic analysis, ergodic theory, number theory, combinatorics, probability theory, and geometry. A significant part of his results pertains to discrete harmonic analysis, a fast-developing field at the intersection of Fourier analysis, analytical number theory, additive combinatorics, and ergodic theory. Of paramount importance are the contributions of Mariusz Mirek to the so-called unconventional ergodic theorems motivated by the Furstenberg–Bergelson–Leibman hypothesis, in particular to the issue of almost everywhere convergence of ergodic averages along polynomial curves.

Another part of the research of Mariusz Mirek is devoted to dimension-free (high-dimensional) estimates for variants of the Hardy-Littlewood maximal operator in continuous and discrete settings. The maximal functions are a classical subject in harmonic analysis motivated by partial differential equations and analytic functions theory. Mariusz Mirek has obtained a series of original results contributing significantly to our understanding of Hardy-Littlewood means over dilations of symmetric convex bodies in high-dimensional Euclidean spaces and integer lattices.

Noteworthy, early foundations of this theory were laid down by J. Marcinkiewicz and A. Zygmund. It was then developed by E. Stein, J. Bourgain, and their students and collaborators, who also set the future course of harmonic analysis. The Laureate comes from the Wrocław school of harmonic analysis, founded by S. Hartman and A. Hulanicki and then developed by M. Bożejko, E. Damek, J. Dziubański, W. Hebisz, A. Nowak, K. Stempak, R. Szwarc, J. Zienkiewicz and others. Mariusz Mirek is one of the leading researchers in the world in this field. In particular, his results in collaborative works with J. Bourgain, A. Ionescu, E. Stein, T. Tao, B. Trojan, B. Wróbel, and others, were published in top mathematical journals, including Advances in Mathematics, American Journal of Mathematics, Annals of Mathematics, Geometric and Functional Analysis and Inventiones Mathematicae.

Prof. Mariusz Mirek. Credit: private archive.

Barbara and Jaroslav Zemánek Prize Awarded to Léonard Cadilhac

Yuri Tomilov

The Barbara and Jaroslav Zemánek Prize in functional analysis, with emphasis on operator theory, has been awarded in 2023 to Léonard Cadilhac (Sorbonne Université, Paris) for his fundamental contributions to non-commutative analysis centered around ergodic theory, harmonic analysis, and free probability. The jury emphasized Cadilhac's outstanding results on non-commutative Khintchine inequalities, maximal functions, and Calderon–Zygmund theory, as well as his recent deep generalization of Lindenstrauss' ergodic theorem for amenable group actions to non-commutative probability spaces.

Cadilhac received his PhD in 2019 from Université de Caen under the supervision of Eric Ricard. He held postdoctoral positions at IM PAN from 2019 to 2020 and at Université Paris-Sud, Orsay, from 2020 to 2021.

The Barbara and Jaroslav Zemánek Prize was founded in 2018 by the Institute of Mathematics of the Polish Academy of Sciences to encourage research in functional analysis, operator theory and related topics. The Prize is awarded to mathematicians under thirty-five years of age who have made important contributions to the field.

The Prize Jury for 2023 consisted of F. Gesztesy (Baylor University), R. Latała (University of Warsaw), V. Müller (Institute of Mathematics of the Czech Academy of Sciences), N. Nikolski (University of Bordeaux), G. Pisier (Texas A&M), A. Skalski (IM PAN) and Y. Tomilov (IM PAN).

The award ceremony, featuring the introductory lecture titled "Weak Type Inequalities in Non-Commutative Analysis" by Eric Ricard (Université de Caen) and the Laurate's lecture on "Non-Commutative Maximal Functions and Ergodic Theory"' was held at IM PAN, Warsaw, on November 20th, 2023.

For more detailed information about the Prize, please visit the webpage: https://www.impan.pl/en/events/awards/b-and-j-zemanek-prize.

Prof. Leonard Cadhilac. Credit: private archive.

Kuratowski Prize Awarded to Agnieszka Hejna

Piotr Achinger

Dr. Agnieszka Hejna was awarded the 2023 Kazimierz Kuratowski Prize for scientific achievements in the field of mathematics. The jury awarded the prize for a series of results generalizing classical theorems of harmonic analysis to the context of Dunkl theory, including the estimation of heat kernels and vector-valued Riesz transforms.

The Dunkl transform enriches the usual Fourier transform with a certain discrete geometric data. Indeed, in the classical Fourier theory the standard differential operators $f \mapsto \partial_x f$ are basic objects that are converted into multiplication by the Fourier transform. In Dunkl theory a transform is built such that the operator which is transformed into ordinary multiplication is a perturbation of the classical operator $f \mapsto \partial_x f$ by additional factors $D_w f$ that are difference operators of the form: $D_w(f)(t) = f(w+t) - f(t)$. Different choices of the finite set of the associated vectors w lead to interesting discrete geometric data carried in Dunkl theory.

Dr. Hejna completed her PhD in 2021 at the University of Wrocław under the supervision of Jacek Dziubański. She currently works as a Hill Assistant Professor at Rutgers University.

The Kuratowski Prize is awarded annually, jointly by IMPAN and the Polish Mathematical Society, to mathematicians under the age of 30 of Polish origin or affiliated with a Polish academic institution.

More about this year's prize and Dr. Hejna's research can be found in the article :
https://naukawpolsce.pl/aktualnosci/news%2C96679%2Cmatematyka-dr-agnieszka-hejna-laureatka-nagrody-im-k-kuratowskiego.html
(in Polish)

Dr. Agnieszka Hejna. Credit: private archive.

List of New Grants at IM PAN in 2023

Mariola Iżycka and Paweł Zdanowski

NCN Grants:

Dimension-free estimates in harmonic analysis and beyond it. https://radon.nauka.gov.pl/dane/profil/645a116a8707f049c95422bf
(SONATA BIS)
dr hab. Błażej Wróbel
2023 – 2028

Algebras generating characteristic classes. https://radon.nauka.gov.pl/dane/profil/651bd-45325cdc15573f568b6
(SONATINA)
dr Jakub Robert Koncki
2023 – 2025

MEiN Grants:

Recent advances in number theory and its applications. https://www.impan.pl/en/events/news/2023/konferencja_number-in-the-universe-2023
(Doskonała Nauka II – Wsparcie konferencji naukowych)
dr hab. Masha Vlasenko
2023 – 2023

PAN Grants:

Ergodic group actions, characters on groups and unitary representations https://www.impan.pl/en/events/news/2023/artem-dudko-laureatem-grantu
(Long-term program to support Ukrainian research teams at the Polish Academy of Sciences, carried out in collaboration with the U.S. National Academy of Sciences with the support of external partners.
dr hab. Artem Dudko
2023 – 2025

European Grants:

Image-Guided computational and experimental Analysis of fractured Patients (GAP) https://www.gapmscaproject.com/copia-di-ntnu
(Marie Skłodowska-Curie Actions, Doctoral Networks 2022)
Coordinator of the overall project: Politecnico di Milano
Principal Investigator at IM PAN: dr hab. Paweł Dłotko
2023 – 2027

Ministerstwo Edukacji i Nauki

European Commission

PAN
POLSKA AKADEMIA NAUK

NARODOWE CENTRUM NAUKI

New Faculty in 2023

Jakub Paulus and Piotr Nowak

The following new employees were hired at IM PAN in 2023:

1. dr Douglas Blue
   Foundations of Mathematics (2 years)
2. prof. dr hab. Marcin Bownik
   Functional Analysis (1 year)
3. dr Leonardo Caldeira Pires Ferrari
   Topology (2 years)
4. dr Alberto Cavallo
   Topology (1 year)
5. mgr Karol Duda
   Topology (1 year)
6. dr Neeraj Deshmukh
   Algebra and Algebraic Geometry (2 years)
7. dr Veronika Ertl-Bleimhofer
   Algebra and Algebraic Geometry (2 years)
8. dr Sylvain Gaulhiac
   Algebra and Algebraic Geometry (2 years)
9. dr Abhishek Ghosh
   Functional Analysis (2 years)
10. dr Hans Höngesberg
    Algebra and Algebraic Geometry (2 years)
11. dr Jakub Koncki
    Algebra and Algebraic Geometry (2 years)
12. dr Antonio López-Neumann
    Topology (2 years)
13. dr Rouzbeh Mohseni
    Mathematical Physics and Differential Geometry (2 years)
14. dr Victor Nador
    Algebra and Algebraic Geometry (2 years)
15. dr Anna Szumowicz
    Algebra and Algebraic Geometry (2 years)
16. dr Adam Śpiewak
    Dynamical Systems (2 years)
17. dr Christopher Turner
    Foundations of Mathematics (1 year)
18. dr Kentaro Yamamoto
    Foundations of Mathematics (1 year)
19. dr Bogusław Zegarliński
    Probability Theory (1 year)
20. dr Błażej Żmija
    Number Theory (2 years)

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