# Newsletter
## of IMPAN

# 1948-2018

## INSTITUTE OF MATHEMATICS OF THE POLISH ACADEMY OF SCIENCES

# 70 YEARS OF IMPAN

A project to create a national institute of mathematics in Poland emerged in 1936. It was accepted in 1937 by the 3rd Polish Congress of Mathematicians. In 1948 the Institute was established as the State Mathematical Institute, incorporated into the Polish Academy of Sciences in 1952. The first director was Kazimierz Kuratowski. In 1972 the International Stefan Banach Mathematical Center was formed within the Institute. In 1996 IMPAN acquired, and then over the years developed, the Będlewo Conference Center. IMPAN is a top class research institute, fostering excellence in mathematical research, mobility and cooperation.

Directors of IM PAN (left): Kazimierz Kuratowski (1948-1967), Roman Sikorski (1967-1969), Jerzy Maria Łoś (1970), Czesław Olech (1970-1985), Bogdan Bojarski (1985-2002), Stanisław Janeczko (2002 - 2010), Feliks Przytycki (2010 -2018 ), Łukasz Stettner (2018-)

Presidents of the Scientific Council of IM PAN (right): Wacław Sierpiński (1952 -1967), Kazimierz Kuratowski (1968-1980), Karol Borsuk (Honorary President, 1980-1982), Zbigniew Ciesielski (1980-1989), Czesław Olech (1989-2007), Andrzej Schinzel (2007-)

IM PAN

**Director of IMPAN**

The Institute of Mathematics of the Polish Academy of Sciences has just reached its 70th anniversary. It is a distinction for me, but also a responsibility, to take the position of director starting from June 1st 2018. The Institute is highly recognized all over the world. We have been granted Polish top category A+. Our researchers have received a number of national and international grants (including 2 ERC Starting Grants). The Institute has been awarded a 5-year research and training program by the Simons Foundation. The International Stefan Banach Center, part of the Institute, has been organizing mathematical workshops and conferences for the last 46 years. We also have the Central Mathematical Library and the Publications Department, responsible for publishing 8 journals and 3 book series.

The Institute is also the proprietor of real estate: the main facility in Warsaw, the Mathematical Research and Conference Center at Będlewo, buildings in our branches in Sopot and Wrocław and an apartment in Cracow.

Therefore I consider the work of the new Board of Directors as both a mission and a challenge. It is with great pleasure that I present my young deputies:
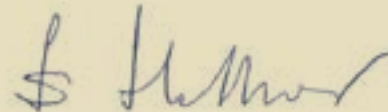
Tomasz Cieślak, responsible for the Będlewo Center, publication matters, the Mathematical Center of Science and Technology, and mobility (travels);

Piotr Nowak, responsible for hiring scientific staff and for scientific policy;

Adam Skalski, responsible for Banach Center activities and also for scientific policy;

and Renata Podgórska-Zając, responsible for administration in wide sense and daily governing problems.

I encourage you to read this Newsletter, which besides the presentation of the new Board of Directors recalls the history of IMPAN, describes the upcoming scientific events, and lists new grant recipients.ntific events at IMPAN, as well as new grants recipients.

# 70 years of IMPAN – an overview

## ADAM SKALSKI

The Institute of Mathematics of the Polish Academy of Sciences was called into existence, as the State Mathematical Institute, on the 20th November 1948. It was established by the act of the government, signed jointly by the Prime Minister and the Minister for Education. Four years later, in 1952, it was incorporated into the newly created Polish Academy of Sciences and was given the current name, usually abbreviated as IMPAN (Instytut Matematyczny Polskiej Akademii Nauk). The first director of the institute, and a person instrumental in its creation, was Kazimierz Kuratowski, who would hold this position for the next twenty years.

Thus the formal existence of the Institute dates back to 1948. Its origins however can be traced to a much earlier time. In 1918, the year in which Poland regained independence after 123 years of its territory being divided between the neighbouring countries, a magazine called `Nauka Polska' (i.e. `Polish Science') published a famous article of a Warsaw topologist Zygmunt Janiszewski, entitled `On the needs of mathematics in Poland'. Janiszewski's article is striking in its relevance even now: he argues that a newly re-emerging state should actively support research, and mathematics in particular (motivating it partly by the fact that this is a branch of science which can be developed and promoted at a relatively low cost) and explains several forms which such a support should take. Among the key of those Janiszewski lists:

• providing income to the most talented individuals so that they can focus solely on their scientific training and research
• creating a `laboratory of mathematical research'
• establishing a publication house, which would publish both (specialized!) mathematical journals and mathematical monographs
• establishing and maintaining a central mathematical library
• promoting collaborative activities and collegiate atmosphere among mathematicians.

Many ideas of Janiszewski hugely influenced the development of mathematics in Poland in the period 1918-1939; in particular the Polish Mathematical Society was created in 1919 in Kraków and `Fundamenta Mathematicae' was established in 1920 as the first specialized mathematical journal in the world. In 1936 Kuratowski, at the behest of the Committee for Mathematics, an advisory body to the government, prepared a memorandum `On the state and needs of mathematics in Poland', explicitly recommending creating a state mathematical institute (in fact two such institutions were envisaged: a pure mathematics one in Warsaw, and an applied mathematics one in Lwów). The Second World War interrupted these plans, depriving Poland of approximately 50% of its active mathematicians, who either lost their lives or emigrated from the country. However already in early days of May 1945 Kuratowski together with Karol Borsuk and Bronisław Knaster prepared a new project for the `State Mathematical Institute'; this was to become reality in late 1948.

The original institute was divided into two Sections: the Theoretical Section, comprising the groups of Foundations of Mathematics, Topology, Functional Analysis, Theory of Real Functions, Differential Equations, Analytic Functions, Differential Geometry, and Mathematical Physics, and the Applied Section, comprising the groups of General Applications, Technical Group, Actuarial Group, the Mathematical Apparata, the Graphical Methods and the Statistical Control of the Production Quality. The division into Sections was abolished already in 1950, but the institute maintained a strong applied arm, led to a high extent by Hugon Steinhaus.

The new institute had branches in several cities, but its headquarters was located where it remains today, at Śniadeckich street, in the very centre of Warsaw. The building at Śniadeckich (then known as Kaliksta street) was constructed as a private school (the `Rontaler school') in 1902. Before the Second World War it changed hands several times. It was briefly hosting the prestigious Rey Gymnasium, run by the Lutheran community in Warsaw, and then on 1911 became the headquarters of the Warsaw Scientific Society. Here the society maintained a neurobiological laboratory led by Edward Flatau, the founding father of Polish modern neurology, and a radiological laboratory directed by Ludwik Wertenstein, a student of Marie Curie-Skłodowska, who herself was an honorary head of the latter research group. One of the physicists working at Śniadeckich 8 at the guidance of Wertenstein was Józef Rotblat, a later leader of the Pugwash movement, advocating the abolishment of the nuclear weapons, and a 1995 Peace Nobel Prize winner. The name of the street itself has scientific connotations: brothers Jan and Jędrzej Śniadeccy were Polish scientists, living in Vilnius at the turn of 18th and 19th century, interested in mathematics, astronomy, medicine, chemistry and philosophy.

The building itself was badly damaged during the war, but re-opened in 1950, already as headquarters of IMPAN. Two years later the Central Mathematical Library, formally created in 1947, was moved to Śniadeckich, where it remains until now. Originally formed by the surviving part of the collection of the Warsaw Scientific Society and a private collection of Samuel Dickstein, since its establishment it has served as a primary mathematical library for the Polish mathematical community. It is currently holding approximately 88 000 books and 90 000 journal volumes and opens its doors to all visitors. These can freely peruse the material collection and access the electronic resources, including practically all significant mathematical journals currently published in the world. Since 1998 the collection formally is a part of the National Library Resources.

Another part of the mission outlined by Janiszewski is realized via the IMPAN's Publishing House. The Institute has participated in the editing and publishing

mathematical journals since its early days. Originally this was done in collaboration with the Polish Mathematical Society or the Polish Scientific Publishers, but in 1991 IMPAN established its own publishing house, which is currently responsible for 9 journals: Acta Arithmetica (number theory, published since 1935), Annales Polonici Mathematici (generalist, based in Kraków, since 1955), Applicationes Mathematicae (applied mathematics, since 1953), Banach Center Publications (Banach Center conference proceedings, since 1976), Bulletin Polish Acad. Sci. Math. (short articles, since 1953, IMPAN series since 2004), Colloquium Mathematicum (generalist, based in Wrocław, since 1947), Dissertationes Mathematicae (longer research articles, since 1952), Fundamenta Mathematicae (foundations of mathematics, since 1920) and Studia Mathematica (functional analysis, since 1929). For many years the institute has also collaborated, first with the Polish Scientific Publishers and since 2006 with Birkhäuser, on publishing the oldest series of mathematical monographs in Poland, `Monografie Matematyczne'. The other series of the monographs published with the assistance at IMPAN are called `IMPAN Lecture Notes' and `Księgozbiór Matematyczny' (i.e. `A Mathematical Collection').

The collegiate and collaborative atmosphere desired by Janiszewski has been a feature of the institute's activities from the beginning, via seminars, accepting visitors and organizing regular lectures and colloquia. As the nature of the international collaborations was changing throughout the years, 1972 brought a very significant point at IMPAN's history: the establishment of the International Banach Center. On January 13, 1972, an initial agreement was signed in Warsaw by the Academies of Sciences of Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and USSR, establishing the Banach Center. Later on, the Academies of Sciences of Vietnam (1979), Cuba (1984) and North Korea (1986) joined the Banach Center. In 1993 the original setup ran its course, and was replaced by an agreement between IMPAN and the European Mathematical Society, which forms a basis of the Banach Center's mission until today.

Since its inception the Banach Center was an integral part IMPAN, thought of as a conference arm of the institute. It is led by the board of directors of IMPAN, assisted by the International Scientific Council of the Banach Center, with the latter nowadays elected jointly by IMPAN and the European Mathematical Society. The aim of the Center has always been the promotion and stimulation of international cooperation in mathematics, in the first years of its existence especially concentrating on facilitating the links between the

researchers based in the East and in the West. New forms of activity have been continually added over the years, including condensed workshops and symposia, conferences, research groups, and longer concentrated programmes, such as thematic semesters. Special emphasis is put on the interaction of different fields of mathematics and interdisciplinary meetings.

In the first twenty years most of the Banach Center activities took place in a small 19th century palace located in Warsaw, at Mokotowska street, not far from the IMPAN's headquarters. In the 1990s the former proprietors of the palace at Mokotowska began legal steps aiming to regain the ownership of the building. When it became clear that IMPAN would not be able to continue using these premises, in 1996 via negotiations with the Polish Academy of Sciences another 19th century palace was acquired. This time it was located rather far from Warsaw, in Będlewo, a village in western Poland, near Poznań. The first scientific activities in Będlewo began in 1998. It is now the main location of Banach Center conferences and has become a probably best known Polish place among the world mathematicians. In the last few years the number of participants in the Banach Center activities has been steadily growing. Each year BC is organizing more than 50 meetings and hosts well over 2500 visiting mathematicians, majority of which come from outside of Poland.

The main part of the IMPAN's activities, and its raison-d-être, has always been, and will always remain, mathematical research. The institute is led by a director, selected in a competition decided by the President of the Polish Academy of Sciences. The director traditionally chooses two or three deputy directors for scientific matters and a deputy director for administrative matters. The list of the directors to date is as follows:

- Kazimierz Kuratowski (1948-1967)
- Roman Sikorski (1968-1969)
- Jerzy Maria Łoś (1970, temporary director)
- Czesław Olech (1970-1985)
- Bogdan Bojarski (1985-2002)
- Stanisław Janeczko (2002–2010)
- Feliks Przytycki (2010-2018).
- Łukasz Stettner (2018-)

A very important role has always been played by the Scientific Council of the Institute, partly elected from the IMPAN's staff, but also comprising so-called external members, chosen among the most distinguished mathematicians in Poland. The Chairmen of the Scientific Council have so far been the following mathematicians:

- Wacław Sierpiński (1949-1968)
- Kazimierz Kuratowski (1968-1980)

- Karol Borsuk (Honorary Chairman, 1980-1982)
- Zbigniew Ciesielski (1980-1989)
- Czesław Olech (1990-2007)
- Andrzej Schinzel (2007-)

Finally, listing the names of the leaders of IMPAN throughout the years one has to remember the Chairmen of the International Council of the Banach Center:

- Lubomir Iliev (Bulgaria) 1972-1976
- Ákos Császár (Hungary) 1977-1980
- Klaus Matthes (East Germany) 1981-1982
- Kazimierz Urbanik (Poland) 1983-1986
- Romulus Cristescu (Romania) 1987-1989
- Sergeï M. Nikol'skiï (USRR) 1990-1992
- Friedrich Hirzebruch (Germany) 1993-2001
- Rolf Jeltsch (Switzerland) - 2002-2005
- Ari Laptev (Sweden) - 2006-2013
- Marta Sanz-Sole (Spain) – 2013 – 2014
- Pavel Exner (Czech Republic) – 2014 -

Another important moment in the history of IMPAN, and more generally in the history of Polish mathematics, was the International Congress of Mathematicians in Warsaw. It was originally planned for 1982, but due to the martial law in Poland it actually took place in 1983. The head of the organization committee was Czesław Olech, then Director of IMPAN, many mathematicians connected to the institute gave lectures or were otherwise involved in the organization of the event. Researchers working at IMPAN gave several plenary and section talks at other ICMs as well; the (incomplete) list of such congress speakers includes Karol Borsuk, Jerzy Łoś, Aleksander Pełczyński, Czesław Olech, Andrzej Schinzel, Henryk Iwaniec, Tadeusz Iwaniec, Tadeusz Figiel, Zbigniew Ciesielski, Henryk Toruńczyk, Stanisław Lech Woronowicz and Jerzy Zabczyk. At the last ICM, in Rio de Janeiro in 2018, section lectures were delivered by Feliks Przytycki, the director of IMPAN in 2010-2018, and by Wojciech Kucharz, based at the Jagiellonian University, but spending the academic year 2017-2018 at IMPAN.

Since the early days of the institute an important role has been played by the applied mathematics. In particular the first Polish functioning computing machine, the so-called XYZ, was built at IMPAN in 1957/1958 by the Mathematical Apparata group under the direction of Leon Łukaszewicz. To strengthen this aspect of IMPAN's activities, a Center of Applications of Mathematics was established in 2003 by the then director of IMPAN, Stanisław Janeczko. The center is also known as the Mathematical Center for Science and Technology. It undertakes various activities related to Financial Mathematics, Biomathematics, Mathematical Physics,

Cryptology, Numerical Analysis and Statistics; its main annual event is a National Conference on Applications of Mathematics, held in Zakopane every autumn (the first meeting in the series took place already in 1972). Andrzej Królak, a mathematician from IMPAN, leads the VIRGO-POLGRAW team, a group of Polish scientists participating in the programme of discovery and study of the gravitational waves.

As mentioned earlier, from its beginning IMPAN was active not only in Warsaw, but also in other places. Currently the biggest external branch exists in Wrocław, three further active branches function in Gdańsk, Kraków and Toruń, and there are also smaller groups in Katowice and Poznań.

The setup of mathematical groups working in the institute has been changing during the years; at the moment IMPAN is organized in the following research teams:

- Department of Algebra and Algebraic Geometry
- Department of Differential Equations
- Department of Foundations of Mathematics
- Department of Functional Analysis
- Department of Biomathematics
- Department of Mathematical Physics and Differential Geometry
- Department of Mathematical Statistics
- Department of Number Theory
- Department of Probability Theory and Mathematics of Finance
- Department of Topology
- Department of Dynamical Systems
- Laboratory of Numerical Analysis
- Laboratory of Noncommutative Geometry

The continuity with the original division is clear, as are some changes which took place during the last 70 years. Since 1998 the institute gained an independent legal status (with the Polish Academy of Sciences playing the role of an umbrella organization). Currently IMPAN is a truly international organization, with approximately 30 permanent researchers, 25 long-term researchers and around 50 mathematicians employed on short-term (1-2 years) contracts. Among IMPAN's staff one finds scientists from Poland, Brazil, China, France, Iran, Israel, Japan, Russia, Ukraine, United Kingdom, United States. Their activity is supported by a strong administration team, including secretaries, the financial and IT sections, librarians, and general support staff. The institute runs also a Graduate School, with approximately 20 PhD students. It is a member of ERCOM, the network of European Research Centres on Mathematics, and participates in several European network grants. IMPAN employees won the first ever two individual mathematical European Research

Council grants in Poland: in 2016 Piotr Nowak was awarded an ERC Starting Grant `Rigidity of groups and higher index theory', and in 2018 Piotr Achinger was awarded an ERC Starting Grant `Homotopy Theory of Algebraic Varieties and Wild Ramification'. The institute itself awards several annual prizes, including the Kuratowski Prize (jointly with the Polish Mathematical Society, since 1981) for a best Polish mathematician under 30, the IMPAN Prize for mathematical achievements (since 2009) for mathematicians under 45 and Barbara and Jaroslav Zemánek prize (since 2018) for achievements in functional analysis, with a special focus on the theory of operators.

Since 2015 the institute is running a `Simons Semesters in Banach Center' programme, funded by the Simons Foundation and supported by the Polish Ministry of Science and Higher Education. Every year two or three thematic semesters are organized, with international leaders spending 1-3 months in Warsaw and many younger mathematicians taking part in conferences, workshops and lecture series. Moreover since 2010 the Central Mathematical Library has participated in a large national project called `Digital Repository of Scientific Institutes', focused on the digitalization of resources available to over twenty Polish research institutions, and is now coordinating its continuation, `Open Resources in the Digital Repository of Scientific Institutes'.

The ideas of Janiszewski, already 100 years old, put into life 70 years ago by Polish mathematical heroes such as Kuratowski and Sierpiński, who created the institute, still live with us at IMPAN today.

Finally as a sample of depth and variety of mathematical achievements of every decade of the existence of the institute I list the following papers and monographs: these should be of course viewed purely as a personal choice and not representing in any way an `objective' selection.

Andrzej Schinzel and Wacław Sierpiński, Sur certaines hypothèses concernant les nombres premiers. Acta Arith. 4 (1958), 185–208.

Kazimierz Kuratowski and Czesław Ryll-Nardzewski, A general theorem on selectors. Bull. Acad. Polon. Sci. Sér. Sci. Math. Astronom. Phys. 13 (1965) 397–403.

Karol Borsuk, Theory of retracts. Monografie Matematyczne, Tom 44 Państwowe Wydawnictwo Naukowe, Warsaw, 1967 251 pp.

Joram Lindenstrauss and Aleksander Pełczyński, Absolutely summing operators in Lp-spaces and their applications. Studia Math. 29 (1968) 275–326.

Tadeusz Figiel, Joram Lindenstrauss and Vitaliy Milman, The dimension of almost spherical sections of convex bodies. Acta Math. 139 (1977), no. 1-2, 53–94.

Henryk Toruńczyk, Characterizing Hilbert space topology. Fund. Math. 111 (1981), no. 3, 247–262.

Bogdan Bojarski and Tadeusz Iwaniec, Analytical foundations of the theory of quasiconformal mappings in Rn. Ann. Acad. Sci. Fenn. Ser. A I Math. 8 (1983), no. 2, 257–324.

Stanisław Lech Woronowicz, Compact matrix pseudogroups. Comm. Math. Phys. 111 (1987), no. 4, 613–665.

Feliks Przytycki, Mariusz Urbański and Anna Zdunik, Harmonic, Gibbs and Hausdorff measures on repellers for holomorphic maps. I. Ann. of Math. (2) 130 (1989), no. 1, 1–40.

Giuseppe Da Prato and Jerzy Zabczyk, Stochastic equations in infinite dimensions. Encyclopedia of Mathematics and its Applications, 44. Cambridge University Press, Cambridge, 1992. xviii+454 pp.

Zbigniew Jelonek, On the effective Nullstellensatz. Invent. Math. 162 (2005), no. 1, 1–17.

Valentin Féray and Piotr Śniady, Asymptotics of characters of symmetric groups related to Stanley character formula. Ann. of Math. (2) 173 (2011), no. 2, 887–906.
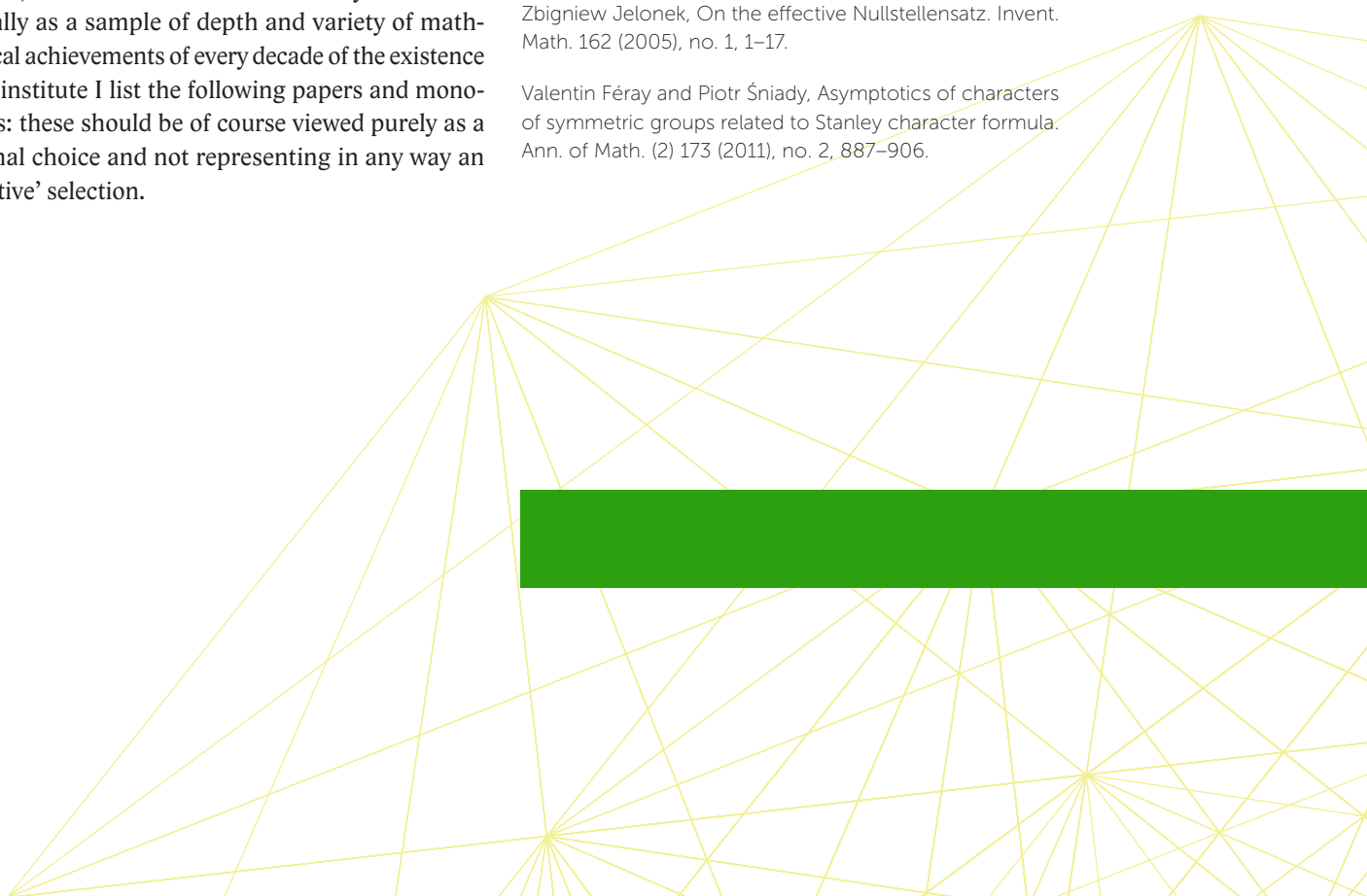
# DIRECTORY BOARD

## ŁUKASZ STETTNER

*Graduated in theoretical mathematics from Maria Curie Skłodowska University in Lublin in 1978, Phd, Institute of Mathematics Polish Acad. Sci., Warsaw under supervision of prof. Jerzy Zabczyk, habilitation, Institute of Mathematics Polish Acad. Sci. 1989, „Ergodic Problems in Stochastic Control"*

### SPECIAL FIELDS:
stochastic control and its applications in particular in mathematics of finance.

### THREE SELECTED PAPERS:
- - G. B. Di Masi, Ł. Stettner, Risk sensitive control of discrete time Markov processes with infinite horizon, SIAM J. Control Optimiz., 38 (2000), 61-78,
- - M. Rasonyi, Ł. Stettner, On utility maximization in discrete - time market models, Annals of Applied Prob., 15 (2005), 1367-1395,
- - J. Palczewski, Ł. Stettner, Impulse control maximising average cost per unit time: a non-uniformly ergodic case, SIAM J. Control Optim., 2017, Vol. 55, No. 2, pp. 936-960,

### MONOGRAPHS:
- - W. Runggaldier, Ł. Stettner, Approximations of Discrete Time Partially Observed Control Problems, Applied Mathematics Monographs CNR, Giardini Editori, Pisa 1994,
- - J. Jakubowski, A. Palczewski, M. Rutkowski, Ł. Stettner, Matematyka Finansowa, Instrumenty pochodne, WNT 2003 (in Polish)
- No. of PhD students: 14

### EDITORIAL WORK:
Editor of Applicationes Mathematicae (since 1998), Associate Editor of SIAM J. Control Optimiz. (2002-2007), Editorial Board of International Journal of Stochastic Analysis (since 2009), Advisory Editor of Applicable Analysis (since 2014).

### INVITED PLENARY LECTURES:
23rd IFIP TC7 System Modelling and Optimization, Cracow 2007, "Problems of mathematical finance by stochastic control methods",

2013 Lasota Lecture, University of Silesia, "Ergodicity of filtering processes: the history of a mistake and attempts to correct it"
Long stays abroad: 1984-85 visiting lecturer (9 months), Dept. of Mathematics and
Dept. of Statistics of The Ohio State University in Columbus, 1986-86 visiting professor for research (7 months), Lefschetz, Center for Dynamical Systems (Applied Mathematics), Brown University in Providence, 1990-91 visiting associate professor (5 months), Department of Mathematics University of Kansas in Lawrence

### SCIENTIFIC POSITIONS:
1981-1989 assistant professor, IMPAN in Warsaw, 1990-2001 associate professor, IMPAN in Warsaw, 2001- full professor, IMPAN in Warsaw, 1990-95 deputy director of the IMPAN for general affairs, 2000-2018 scientific director of the IMPAN, 2018- director of the IMPAN

### WORK FOR INTERNATIONAL ORGANIZATIONS:
"Advanced Mathematical Methods for Finance (AMaMeF)" ESF grant, 2005-2010, member of the Steering Committee,
EMS Applied Mathematics Committee, member (2006-2013)
IFIP TC7 (System Modelling and Optimization), member of the Committee (2007-), vice chair since 2013, chair since 2018
ICIAM - Polish representative since 2005
Family status: married with three children,

# TOMASZ CIEŚLAK

*Graduated in mathematics from MIMUW, Warsaw, june 2004. Phd, IMPAN, Warsaw under supervision of prof. Dariusz Wrzosek, January 2008. Habilitation, IMPAN April 2015 with a dissertation „Blowup in a fully parabolic Keller-Segel system"*

**MAIN AREAS OF INTEREST:**
partial differential equations, in particular chemotaxis system, Euler system. Inviscid hydromechanics, Hamiltonian mechanics.

**THREE SELECTED PAPERS:**
-T. Cieślak, Ph. Laurencot, Finite time blow-up for a one-dimensional quasilinear parabolic–parabolic chemotaxis system Ann. Inst, H. Poincaré Anal. Non Linéaire 27 (2010), 437-446,
- T.Cieślak, C.Stinner, Finite-time blowup and global existence of unbounded solutions to a parabolic-parabolic quasilinear Keller-Segel system in higher dimensions, J. Differential Equations, 252 (2012), 5832-5851,
- T.Cieślak, G. Jamróz, Maximal dissipation in Hunter-Saxton equation for bounded energy initial data, Adv. Math., 290 (2016),590-613.

**PRIZES AND ACTIVITIES:**

1. Minister of science and higher education prize for the outstanding PhD thesis, 2009.
2. Scholarship for young outstanding researchers of the Polish Ministry of science and higher education, 2013-2016.
3. Wacławek Prize for the best PhD thesis at IMPAN, 2008
4. Member of jury of the Kuratowski Prize, 2012-2016
5. Member of the executive board of the Polish Math. Society, 2017-2019

**NO. OF POST-DOCS SUPERVISED: 4**

**INVITED PLENARY LECTURES:**
85th anniversary of Andrzej Krzywicki and 40th anniversary of differential equation seminar at the University of Wrocław, february 2013,title:'Wolibner's estimates and Yudovich's uniqueness result'.

**LONG STAYS ABROAD:**
06.2009-12.2011 post-doc University of Zuerich (under supervision of Camillo De Lellis);
04.2016-09.2016 full professor (W2) Ludwig-Maximilians-Universitaet Muenchen;

**SCIENTIFIC POSITIONS:**
2007-2008 assistant MIMUW, 2008-2009 assistant professor MIMUW, 2009-12.2011 post-doc University of Zuerich, 01.2012-06.2015 assistant professor IMPAN in Warsaw, 06.2015- today associate professor IMPAN in Warsaw, 04.2016-09.2016 full professor (W2) Ludwig-Maximilians-Universitaet Muenchen, from 06.2018 scientific director of the IMPAN.

**WORK FOR INTERNATIONAL ORGANIZATIONS:**
representing Polish Mathematical Society in the steering committee meetings of 'Silk Road', 2017, 2018.
Family status: married with one child,

## PIOTR NOWAK

*Graduated with a Magister in mathematics from the University of Warsaw in 2003 and a Master of Arts from Vanderbilt University (Nashville, TN, USA) in 2006. He obtained a Ph.D. under the supervision of prof. Guoliang Yu at Vanderbilt University in 2008 and habilitation in 2016 at IMPAN with a dissertation „Cohomology with coefficients in Banach modules".*

**FIELD OF INTERESTS:**
geometric and analytic properties of discrete group and their applications in index theory, topology of manifolds and noncommutative geometry.

**3 SELECTED PAPERS**
Cornelia Drutu, Piotr W. Nowak
Kazhdan projections, random walks and ergodic theorems
Journal für die reine und angewandte Mathematik (Crelle's journal), to appear

Piotr W. Nowak
Poincaré inequalities and rigidity for actions on Banach spaces,
Journal of the European Mathematical Society (JEMS) 17 (2015), no. 3, 689–709.

Piotr W. Nowak
Isoperimetry of group actions
Advances in Mathematics 219 (2008), no. 1, 1-26.

**BOOKS:**
Piotr W. Nowak & Guoliang Yu
Large Scale Geometry
EMS Textbooks in Mathematics. European Mathematical Society Publishing House, 2012.

**DISTINCTIONS:**
- ERC Starting grant 2015
- Prime Ministers Award for Habilitation, 2017
- Plenary lecture at the 6th Forum of Polish Mathematicians, 2015

**EMPLOYMENT:**
- Associate Professor, IMPAN, 2017- present
- Joint Assistant Professor poisition at IMPAN and MIMUW, 2011-2017
- Research Associate, Mathematical Institute, University of Oxford, 1 semestr w 2014
- Postdoctoral Fellow, Mathematical Sciences Research Institute, Berkeley, 1 semestr w 2011
- Visiting Assistant Professor, Texas A&M University, College Station, 2008–2011

From 06.2018 Scientific Director of IMPAN.

**FAMILY STATUS:**
Married, 2 children

## RENATA PODGÓRSKA-ZAJĄC

*Graduated from Jan Kochanowski University in Kielce in 1998. Since 2008 till 2018 head of the Secretary Office at IMPAN. In June 2018 nominated to Deputy Director of general affairs in IMPAN*

**FAMILY STATUS:**
married with one son.

# ADAM SKALSKI

*Graduated in mathematics (2000) and in physics (2002) from University of Łódz. PhD in 2006 under supervisor Martin Lindsay, University of Nottingham, habilitation in 2013 at IMPAN with a dissertation "Certain approximation properties of C\*\_ -algebras and the noncommutative Voiculescu entropy of their endomorphisms"*

**FIELDS OF INTERESTS**:
theory of operator algebras and its applications, with special focus on topological quantum groups

**SELECTED PAPERS**
The Haagerup property for locally compact quantum groups (with M.Daws, P.Fima and S.White), Journal fur die Reine und Angewandte Mathematik 711 (2016), 189-229.
The Haagerup property for von Neumann algebras via quantum Markov semigroups and Dirichlet forms (with M.Caspers), Communications in Mathematical Physics 336 (2015), no.3, 1637-1664.
Quantum symmetry groups of C\*-algebras equipped with orthogonal filtrations (with T. Banica), Proceedings of the London Mathematical Society, 106 (2013), no.5, 980-1004.

**MONOGRAPHS**:
Uwe Franz and Adam Skalski, Noncommutative Mathematics for Quantum Systems, Cambridge IISc Series, 2015.
Guillaume Aubrun, Adam Skalski and Roland Speicher Quantum Symmetries, Springer Lecture Notes in Mathematics 2189, 2017.
No. of PhD students: 2

**EDITORIAL WORK**
- Executive Editor, Studia Mathematica (since 2015)
- Subject Editor (Analysis), Glasgow Mathematical Journal (since 2014)

**PRIZES**:
2010 - Sierpiński Prize (awarded by the III Department of the Polish Academy of Sciences)
2008 - Kuratowski Prize (awarded by the Polish Academy of Sciences and Polish Mathematical Society)
2005 - Polish Mathematical Society Prize for Young Mathematicians

**LONG-TERM STAYS ABROAD**
10.-12.2014 Professeur Invité, CNRS, Université Franche-Comté, Besançon,
2007-2010 EPSRC Postdoctoral Fellow, Lancaster University,
1.10.2009 – 30.11.2009 JSPS Postdoctoral Fellow, University of Tokyo.

**EMPLOYMENT**
2000 – 2004 PhD student-assistant, University of Łódź,
2006 – 2007 Postdoctoral Fellow, University of Nottingham,
2007 – 2010 EPSRC Postdoctoral Fellow, Lancaster University
2010 – 2013 Marie Curie fellow, IMPAN
2012 – 2015 assistant profesor, MIMUW
2013 – present, associate profesor, IMPAN
Scientific Director of IMPAN since 2015

**FAMILY STATUS**:
married with one daughter

# ERC Starting Grant:

*The ERC Starting Grants are part of the main ERC frontier research grants funded by the European Union's Horizon 2020 Framework Programme for Research and Innovation. ERC STG grants support individual researchers that are starting their own independent research team or programme and who can demonstrate the ground-breaking nature, ambition and feasibility of their scientific proposal.*

## Homotopy Theory of Algebraic Varieties and Wild Ramification (KAPIBARA)
## Coordinator: Piotr Achinger
## (06.2019 - 06.2024)

The proposed research concerns topological aspects of algebraic and arithmetic geometry. I plan to deal with algebraically defined geometric objects - |roughly speaking, sets of solutions of polynomial equations over a field k | using tools from algebraic topology, such as the fundamental group  homology and cohomology groups, or the higher homotopy groups  for . The **homotopy type** of  is a space which remembers all these invariants while discarding irrelevant geometric information. Homotopy theory proved essential in the study of topological spaces; when applied to algebraic varieties, the ideas of homotopy theory turn out to be even more powerful, as the resulting invariants have far more structure, often coming from either complex analysis (Hodge theory) or arithmetic (an action of the Galois group of ). In particular, as predicted e.g. by the Hodge conjecture, the Tate conjecture, or Grothendieck's section conjecture, they should be able to detect algebraic cycles and rational points on.

If the base field k is a subfield of the field of complex numbers , then the set of complex points  has a natural analytic topology making it a nice topological space, and one can apply methods of algebraic topology directly to that space. From the point of view of arithmetic and algebraic geometry over more general fields, it is of key importance to construct algebraically defined topological invariants. Probably the most successful development to this date achieving this goal is the introduction of the **étale topology** by Artin and Grothendieck. The resulting cohomology theory allowed in particular for the spectactular resolution of the Weil conjectures, the Mordell conjecture, and for the proof of Fermat's Last Theorem.



Figure 1: Patching procedure on a wild geometric object

It is a natural question whether the étale cohomology groups are the cohomology groups of some actual space, which would serve as an algebraic variant of . A positive answer was given by Artin and Mazur, who defined the **étale homotopy** type of an algebraic variety . It is a space (more precisely, a pro-object in the homotopy category of simplicial sets) whose cohomology groups are the étale cohomology groups of . One obtains other topological invariants as a byproduct: higher homotopy groups, homology groups, K-theory, etc. The development of the étale homotopy theory led to significant progress in algebraic K-theory and the topology of real algebraic varieties, and gave new obstructions to the existence of rational points. It is also closely related to the anabelian program of Grothendieck.

Let us now explain the idea behind the construction of Artin-Mazur and the proposed direction of investigation in this project. The study of various kinds of geometric objects can often be divided into two steps:

1. The identification and analysis of a class of suitable local building blocks, which may be easier to understand than the global geometric object.
2. **A patching procedure** (also called descent): the given object can be put together from the above blocks, and if we know these pieces, we are left with describing the gluing.

We can see this approach successfully applied in two well-known contexts:

- **Topological and differential manifolds.** The building blocks are open balls in . The patching can be encoded in the convenient combinatorial form of a simplicial set (the nerve of a hypercovering by open balls) which remembers the homotopy type of the manifold.
- **Algebraic varieties and schemes.** The building blocks are affine schemes (spectra of rings), whose study can be reduced to commutative algebra. Descent using affine coverings reduces global questions to questions about rings. However, general affine schemes are much more complicated than open balls.

One circumstance where the two situations above play together in an interesting way is that of **smooth complex algebraic varieties.** If  is such a variety, then the associated topological space  is a manifold, but if  is an affine open subset of , then  is rarely contractible, e.g. because the inclusion induces a surjection on fundamental groups. However, as observed by Artin, the fundamental group is in some sense the only difficulty.

To make this precise we need the notion of a  space, which is in fact central to this proposal. A connected topological **space**  is called a  if the homotopy groups vanish for . An important source of geometric examples of such spaces is the class of hyperbolic manifolds, and the utility of the notion stems from the fact that the homotopy type of such a space is completely determined by its fundamental group. Artin proved that one can always find a covering of X by affine open subsets  such that each  is a  space. These open subsets, called Artin  neighborhoods, can thus be regarded as algebraic analogs of open balls covering a manifold, and hence form a natural class of building blocks.

Over fields of characteristic zero, Artin neighborhoods are also  spaces in the sense of the étale homotopy theory. In contrast, until my recent work very little was known about étale homotopy in positive characteristic, largely due to problems with an algebraic phenomenon called wild ramification. (Roughly speaking, the word ramification refers to the local behavior of maps between curves. In characteristic zero, every such map locally looks like  in the neighborhood of , but in positive characteristic, there are many more possibilities, which we collectively call wildly ramified.) One of the main goals of this project is to study **étale homotopy types in positive characteristic.** I hope to make progress on this question by means of my recent discovery that affne schemes in positive characteristic satisfy the  property. This result identifies the fundamental groups of such schemes as natural building blocks of étale homotopy types. The important next steps are to study these groups and the patching procedure.

Recent advances in non-archimedean geometry in mixed characteristic and in the closely related field of p-adic Hodge theory motivate the need for further investigation of the topology and **homotopy theory of p-adic non-archimedean spaces** (also called rigid analytic spaces). Philosophically, the reason this field is challenging is that one is sufficiently close to characteristic p geometry to get many of its pathologies related to wild ramification (e.g. the fundamental group of the closed disc is huge), but far enough not to be able to apply its methods (e.g. there is no Frobenius morphism). A new bridge between nonarchimedean geometry in characteristic p and in mixed characteristic appeared very recently with the theory of **perfectoid spaces** of Scholze. In this context, a useful class of building blocks is formed by affinoid perfectoid spaces, and patching is done in the pro-étale topology. In the world of perfectoid spaces, the procedure of tilting allows one to pass between mixed characteristic and positive characteristic. This way I hope to obtain results about rigid analytic spaces in mixed characteristic via positive-characteristic techniques.

# MAESTRO

*MAESTRO is very prestigious research grant financed by the Polish National Science Centre (NCN), an agency of the Polish Ministry of Science and Higher Education. There are 4 such grants at IMPAN: "Geometric Group Theory" by prof. Tadeusz Januszkiewicz, 2013 – 2016, "Geometry of Jets and Field theories" by prof. Janusz Grabowski, 2013 - 2018, "Invariant measures, entropy and other parameters of growth in classical and nonclassical dynamical systems", by prof. Tomasz Downarowicz, 2013 – 2018, "Dynamic asymptotic combinatorics" by prof. Piotr Śniady, 2018 – 2023.*

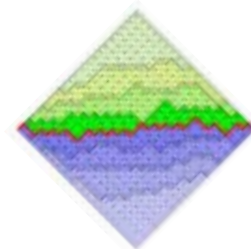## Dynamic asymptotic combinatorics
## coordinator: Piotr Śniady

**What is asymptotic combinatorics?** Suppose we consider some nice combinatorial object such as the one on the picture below: a tiling of a square grid (with a specific configuration of convex and concave knobs on the boundary) with puzzles, each having two concave and two convex knobs. Since there are many such tilings of a given square, we choose one at random.

*What happens to such a randomly chosen tiling in the limit when the size of the square tends to infinity?* Computer experiments (such as the one on the picture on the right) hint at existence of some frozen regions in the corners while the disk in the center seems to behave like a random liquid. Rigorous mathematical treatment shows that it is indeed the case.

This is just an example of a problem studied by asymptotic combinatorics; its methods (apart from the usual combinatorics) include tools from mathematical physics, real and complex analysis, probability theory, random matrix theory and other seemingly unrelated branches of mathematics.
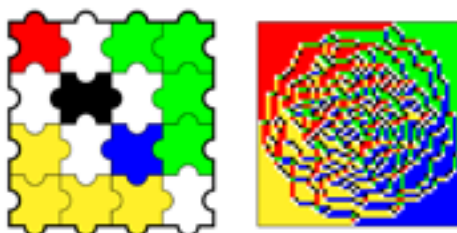
**What is asymptotic representation theory?** *What can we say about representations of a sequence the symmetric groups Sn in the limit as their size tends to infinity?* This sample question from the asymptotic representation theory is not very far from the aforementioned asymptotic combinatorics; the reason is that the irreducible representations of the symmetric groups are closely related to combinatorial objects such as Young diagrams and Young tableaux. For this reason it should not come as a surprise that asymptotic representation theory is a source of even more pictures (such as the one below) of the flavor we have seen above.

**What is dynamic asymptotic combinatorics?** What happens if large (or even infinite) combinatorial objects we have seen above are equipped with some dynamics? This dynamics can be provided by some combinatorial algorithm (such as Robinson--Schensted--Knuth algorithm), often applied to a random input. Such a dynamical transformation can be iterated; for this

reason we may ask whether the corresponding random transformations of the combinatorial objects converge to some deterministic evolution of some continuous object such as a liquid. Such dynamics of combinatorial objects related to the asymptotic representation theory such dynamics often corresponds to some natural dynamical system which can be studied in the framework of the ergodic theory.

**What is this research about?** We plan to address several concrete questions from the realm of the dynamic asymptotic combinatorics and to investigate the links of these questions to other branches of mathematics including the random matrix theory and Voiculescu's free probability theory. If you have more questions, please feel free to contact me directly.

# The General Assembly of the International Mathematical Union

## *The meeting in Sao Paulo, July 29-30*

Poland has 4 seats; representatives at Sao Paulo were Z. Błocki (UJ, director of NCN), T. Januszkiewicz (IMPAN, head of the Polish National Committe for cooperation with IMU), W. Marzantowicz (AMU, president of PTM) and F. Przytycki (IMPAN)

Important decisions made at the GA in Sao-Paulo:

- A new president of IMU has been elected. He presents himself (in the recent IMU bulletin) as follows: "I am Carlos Kenig, President elect of the IMU. [...] I was born and raised in Buenos Aires, Argentina, where I received my early education. I obtained my PhD from the University of Chicago, in 1978. I returned to the University of Chicago as professor in 1985, and I have remained there ever since. My research is in harmonic analysis and partial differential equations. Besides doing research and teaching, I have been, over the years, fortunate to serve the

mathematical community in several capacities. My approach to all of these activities has always been collaborative."

- A Structure Committee for future ICM's was created. This committee will be responsible for the general scientific structure of the ICM, that is, the size and description of the sections, and all related issues. This will alleviate the huge workload of the Program Committee that was previously tasked with this as well as the selection of all invited and plenary speakers The Structure Committee will be a forum in which to constantly update the scientific structure of the ICM, reflecting the changes in mathematics and its applications. The first chair of the Structure Committee will be L. Lovasz, past president of the IMU.

- ICM22 will take place in St Petersburg, Russia. Martin Hairer, Imperial College, has agreed to chair the

Program Committee for ICM22."
- Nevanlinna Prize will change its name but stay with the same purpose and scope.

# The International Congress of Mathematicians in Rio de Janeiro, 1-9 August 2018

Marcelo Viana, head of the organizing committe in his brief report on ICM 2018 wrote: *"From August 1 to 9 this year, over 10,000 people (including the 3,018 registered participants) visited the Riocentro convention center in Rio de Janeiro to enjoy 21 plenary lectures, 176 invited section lectures, 18 prize or special lectures, 5 public lectures, 408 short communications, 240 posters, the opening and closing ceremonies, the social dinner and a wide range of social occasions. [...]. A few unpredictable incidents made our lives as organisers a whole lot more interesting during that period. The fire that ruined the main pavilion just two days before the opening, and the rush to set a new one in time. The theft of Caucher Birkar's Fields medal (which, according to Caucher himself, made him – and the medal – a lot more famous!), and the successful effort to have it replaced during the Congress. And a few other incidents the participants didn't even realize happened.[...] We are especially happy and proud that we were able to hold the award ceremony for the Brazilian Mathematical Olympiad (OBMEP) at the venue during the ICM. The presence of the 576 gold medalists, wearing distinctive blue jerseys, was a highlight of the Congress"*
There were two invited sectional lectures (45 min.) delivered by Polish mathematicians:

- Krzysztof Kurdyka (France) and Wojciech Kucharz (UJ, Poland), From continuous rational to regulous functions, Section 4. Algebraic and Complex Geometry.
- Feliks Przytycki (IMPAN, Poland),Thermodynamic formalism methods in one-dimensional real and complex dynamics, Section 9. Dynamical Systems and Ordinary Differential Equations.



The **Fields Medal** is awarded every four years on the occasion of the International Congress of Mathematicians to recognize outstanding mathematical achievement for existing work and for the promise of future achievement. The 2018 Fields medal winners:

**Caucher Birkar** - For the proof of the boundedness of Fano varieties and for contributions to the minimal model program.

**Alessio Figalli** - For contributions to the theory of optimal transport and its applications in partial differential equations, metric geometry and probability.

**Peter Scholze** - For transforming arithmetic algebraic geometry over p-adic fields through his introduction of perfectoid spaces, with application to Galois representations, and for the development of new cohomology theories.

**Akshay Venkatesh** - For his synthesis of analytic number theory, homogeneous dynamics, topology, and representation theory, which has resolved long-standing problems in areas such as the equidistribution of arithmetic objects.



Like the Fields medal the **Rolf Nevanlinna Prize** is awarded once every 4 years at ICM for outstanding contributions in Mathematical Aspects of Information Sciences. This year Nevallina Prize winner is **Constantinos Daskalakis** - professor of electrical engineering and computer science is honored for his contributions to theoretical computer science.

# FUTURE OF THE POLISH ACADEMY OF SCIENCES AND THEIR INSTITUTES

## *Conference, Będlewo Conference Center, June 13 -14, 2018*

The conference was organized by prof. Paweł Rowiński, deputy president of the Polish Academy of Sciences (PAS), prof. Feliks Przytycki (IM PAS) and prof. Mikołaj Sokołowski (IBL PAS). The meeting gathered directors or representatives of almost all Institutes of PAS. Various problems concerning Institutes of PAS were discussed. Proposals containing the form of future PAS, the role of Institutes and the way how to coordinate research within the Academy were presented.

# 15TH ANNIVERSARY OF THE MATHEMATICAL CENTER FOR SCIENCE AND TECHNOLOGY AND 65 ANNIVERSARY OF THE FOUNDATION OF APLICATIONES MATHEMATICAE,

## *Special session helf on March 23rd, 2018 at IMPAN*

Mathematical Center of Science and Technology was created in 2003 on the occasion of 50th anniversary of journal Applicationes Mathematicae. The purpose was to stimulate research in applications of mathematics as well as to create a platform for interaction between mathematicians and considered in wide sense industry. Starting from the beginning there were three research groups working in the center in mathematics of finance, biomathematics and mathematical physics. The center is open for mathematicians outside of IMPAN and help them to carry external research projects funded from other sources. Activities of the Center are supported by the scientific council representing various branches of applications of mathematics. The Center is also in charge of the annual National Conferences on Applications of Mathematics held in Zakopane Kościelisko (the recent one 47th was organized on September 4-11, 2018). The chair of the Center Łukasz Stettner (current vice chairs are: Tomasz Cieślak and Ryszard Rudnicki) is also the Editor of Applicationes Mathematicae, journal founded in 1953 by prof. Hugo Steinhaus. Applicationes Mathematicae was published first in June 1953 with Hugo Steinhaus as an Editor and Jan Oderfeld as his deputy. For the first period it was published in Polish under Polish name "Zastosowania Matematyki". Actual name Applicationes Mathematicae appeared first as a second title in 1965 and became the only title in 1993. There are 45 volumes of Applications consisting first of 4 issues, now of two approximately 150 pages issues. The idea of Hugo Steinhaus was to solve real world problems using mathematical and statistical tools, and this way to help Polish developing industry. This idea was seen in the papers published in the first issues of Applicationes. Among such papers one could mention: H. Steinhaus, "On Establishing Paternity" (1953), J. Oderfeld and S. Zubrzycki "On testing flowmeters" (1953), K. Urbanik, "Remarks on maximum quantity of bacteria in a population" (1954). Right now due to developing specialization the papers and their titles are less transparent to general audience, which of course does not contradict their applicability.

Special session to celebrate those anniversaries besides of the talk summarizing activities of the Center and describing history of Applicationes consisted of a lectures on applications of mathematics. Aleksander Weron (PWr) presented influence of Hugo Steinhaus on the applications of mathematics. Janusz Szwabiński (PWr) showed agent models in the construction of polls. Kamil Kulesza and his group presented examples of scientific innovation projects, which were completed in the Mathematical Center for Science and Technology.

# Simons Semesters in Banach Center

## *2015-2019*

Simons Semesters in Banach Center is a 5 years research and training program at IM PAN. The Institute has been an awardee in 2015 in the competition: Targeted Grants for Institutes, by Simons Foundation. The Simons Foundation's Mathematics and Physical Sciences program "is intended to support high-risk theoretical mathematics, physics and computer science projects of exceptional promise and scientific importance on a case-by-case basis".

The 3 months-long semesters of concentrated scientific activity are supposed to be focused on one, possibly broad, field of modern mathematics, and provide on one hand an excellent environment for the interaction between the top experts in the area and on the other hand training opportunities for young researchers.

### SUPPORT OFFERED

The program of mathematical semesters is mainly supported by the Simons Foundation grant 346300 and the Polish Government MNiSW 2015-2019 matching fund.

The support of the Simons Foundation covers salaries and basic mobility expenses of the 2-3 senior international leaders and 2-3 young outstanding researchers from abroad for the period of the semester.

National resources (funds for international cooperation co-financed from the Ministry of Science and Higher Education and statutory resources of IMPAN) are intended for remuneration and other project implementation costs (including costs of stay, travel costs, co-financing of conferences, etc.). IMPAN apart from providing general infrastructure (office space, IT support, conference facilities) fund, mainly via the already existing programs, the stays of up to 10 pre- and post-doctoral researchers in the area of the semester. When appropriate, IMPAN can also employ Polish organizer(s) for the duration of the semester. Additional support for organizing research activities can be requested from Banach Center, the conference subsidiary of IMPAN.

### BASIC REQUIREMENTS

The organizing committee (2-4 people) should contain at least one mathematician based in Poland and at least one mathematician based outside of Poland. During each 3 months long semester one conference, one graduate school and one specialized workshop are recommended to be organized. Also organizing graduate (mini-) courses is recommended together with individual tutoring.

### LOCAL SCIENTIFIC AND ORGANIZING COMMITTEE OF THE PROGRAM

Coordinators: T. Regińska (the main coordinator), R. Latała, T. Januszkiewicz, F. Przytycki, and J. Buczyński, J. Grabowski, S. Janeczko, P. Nowak, K. Oleszkiewicz, A. Skalski, Y. Tomilov.

### SEMESTERS

In the frame of the Simons Semester program 8 semesters have already been held (in parentheses the main semester organizers):

1. **Dynamical Systems**, 1.09-31.12. 2015 (K. Barański, P. Gałązka, M. Lemańczyk, F. Przytycki, M. Rams) **Topics:** Analysis and holomorphic dynamics (September 2015); Fractals (October 2015); topics in smooth dynamics (November 2015); Ergodic theory (November-December 2015). Some survey articles are published in Banach Center Publications Vol. 115 (2018).
2. **Algebraic Geometry** 18.04-18.06. 2016 (J. Buczyński, S. Cynk, T. Szemberg) Scientific scope: Algebraic geometry, in particular Hyperkähler manifolds, K3 surfaces, Fano varieties, Calabi-Yau varieties, linear series.
3. **Noncommutative Geometry the Next Generation** 1.09-30.11. 2016 (P.F. Baum, A. Carey, P.M. Hajac, T. Maszczyk) Scientific scope: topological quantum groups, Hopf algebras, cyclic homology, noncommutative index theory, structure and classification of C*-algebras, noncommutative topology, spectral

triples, graph C*-algebras.

4. **CrossFields PDEs** 1.12.2016- 30.03.2017 (E. Feireisl, P. Gwiazda, P. Mucha, A. Świerczewska-Gwiazda) Scientific scope: Mathematical theory of fluids and gases (analysis of incompressible and compressible flows), hyperbolic conservation laws, kinetic theory, multi-scale flows, singular models of image processing, hydrodynamics of Cucker-Smale model.

5. **Emergent trends of Complex Analysis and Functional Analysis** 1.04.- 30.06.2017 (A. Borichev, A. Baranov, M. Sodin, Y. Tomilov) Scientific scope: The semester activities covered several topical domains of Complex and Functional Analysis and their application to Harmonic Analysis, Operator Theory, and Mathematical Physics

6. **Symmetry and Geometric Structures**, 1.09-30.11. 2017 (M. Eastwood, W. Kryński, P. Nurowski, B. Warhurst) Scientific scope: invariant differential operators, non-Riemannian holonomy, parabolic geometry, projective differential geometry, symmetry and geometric rigidity, Cartan and Tanaka methods

7. **Mathematical Biology**, 01.12.2017 - 31.03.2018 (O. Diekmann, P. Gwiazda, J. Miękisz, B. Perthame, J. Rencławowicz, R. Rudnicki) Scientific scope: Structured population models; Information transmission in biological systems; From individual based models to structured population level description; Chemotaxis: modeling and analysis

8. **PDEs/SPDEs & Functional Inequalities**, 1.04.2018 - 30.06.2018 (Sz. Peszat, T. Komorowski, D. Bakry, B. Zegarlinski) The semester is devoted to topics that arise in an interaction between stochastic analysis and the theory of differential equations. With extensive progress in the area of functional inequalities as well as many other new techniques of the analysis/stochastic analysis developed over last twenty years, new frontiers could be now explored.

Currently the ninth semester is taking place.

9. **Varieties: arithmetic and transformations,** 1.09.2018 - 30.11.2018 (P. Achinger, J. Buczynski, N. Ilten, M. Vlasenko) Focus points: Group actions: Mori Dream Spaces, TT-varieties, also toric varieties, homogeneous spaces, contact Fano manifolds, Cremona groups, actions of finite groups, GaGa and GmGmactions on affine varieties, Arithmetic: arithmetic aspects of differential equations, pp-adic cohomologies, crystals, Calabi-Yau varieties, arithmetic aspects of mirror symmetry, Parametrizing varieties: Hilbert scheme of points, rational curves on manifolds,

secant varieties, tensor ranks, Waring ranks and related notions with their applications to complexity theory, engineering and quantum physics. List of semesters scheduled for 2019

10. **Stochastic modeling and control**, 2.01.2019 - 31.03.2019 (J. Jakubowski, M. Niewęgłowski, M. Rasonyi, Ł. Stettner) The idea of the semester is to consider three important aspects of stochastic modeling and control: stochastic control, modeling and applications. Special attention will be devoted to new techniques in stochastic control.

11. **Geometric and Analytic Group Theory**, 1.04.2019 - 30.06.2019 (U. Bader, P-E Caprace, T. Januszkiewicz, P. Nowak, D. Osajda, P. Przytycki) The scientific activities envisaged in the course of the semester will be articulated around three distinct but interrelated major themes: Cohomological Methods; Non-positive curvature; Rigidity.

12. **Geometry and analysis in function and mapping theory on Euclidean and metric measure spaces**, 1.09.2019 - 30.12.2019 (T.Adamowicz, Nageswari Shanmugalingam, T. Cieślak) The main topics of the semester include: Geometric function and mapping theory in Euclidean spaces, Heisenberg and Carnot-Carathéodory groups and in more general metric measure spaces; Function spaces on metric measure spaces; Geometric measure theory.

# SIMONS SEMESTER UPCOMING EVENTS

**For more information on Simons Semesters, please check out:**
https://www.impan.pl/en/activities/banach-center/simons-semesters/accepted-semesters

| | TITLE | | ORGANIZERS | PLACE |
|---|---|---|---|---|
| | **Semester 10. Stochastic modeling and control** | 2-31.03.2019 | J.Jakubowski, M.Niewęgłowski, M.Rasonyi, Ł.Stettner | Będlewo & Warsaw |
| 1. | Workshop on Recent problems of stochastic control theory **(Simons Semester 10 school)** | 27–02.02.2019 | J.Jakubowski, M.Niewęgłowski, M.Rasonyi, Ł.Stettner | Warsaw |
| 2. | Conference on Stochastic modeling (in finance and insurance)**(Simons Semester10 conference)** | 10-15.02.2019 | J.Jakubowski, M.Niewęgłowski, M.Rasonyi, Ł.Stettner | Będlewo |
| 3. | Graduate school on Industrial applications of stochastic modeling followed by European Study Group with Industry **(Simons Semester 10 school)** | 10-22.03.2019 | J.Jakubowski, K.Kulesza, M.Niewęgłowski, Ł.Stettner | Warsaw |
| 4. | Portfolio theory and derivative pricing **(Simons Semester 10 conference)** | 27-29.03.2019 | D. Gątarek, I. Kaliszewski, Ł.Stettner | Będlewo & Warsaw |
| | **Semester 11. Geometric and Analytic Group Theory** | 01.04-15.07.2019 | M. Eastwood, W. Kryński, P. Nurowski, B. Warhurst | Będlewo & Warsaw |
| 5. | Cohomological methods (Simons Semester 11 **conference**) | 08-12.04.2019 | U.Bader, P-E.Caprace, T.Januszkiewicz, P.Nowak, D.Osajda, P.Przytycki | Warsaw |
| 6. | Non-positive curvature **(Simons Semester 11 conference)** | 20-24.05.2019 | U.Bader, P-E.Caprace, T.Januszkiewicz, P.Nowak, D.Osajda, P.Przytycki | Warsaw |
| 8. | Rigidity **(Simons Semester 11 conference)** | 24-28.06.2019 | U.Bader, P-E.Caprace, T.Januszkiewicz, P.Nowak, D.Osajda, P.Przytycki | Warsaw |

# Digital Repository

## *the OZwRCIN project*

 The Mathematical Institute of the Polish Academy of Sciences has started on August 1, 2018 the implementation of a three-year project entitled **Open Resources in Digital Repository of Scientific Institutes (OzwRCIN)** as part of the **Operational Program Digital Poland, 2014-2020 Measure 2.3;** Digital accessibility and usefulness of public sector information; fund from the European Regional Development Fund and national co-financing from the state budget.

 The Project's Beneficiary (the Leading Partner), is the Mathematical Institute of the Polish Academy of Sciences, and 15 other scientific institutions are its Project Partners: The Institute of Archaeology and Ethnology of the Polish Academy of Sciences , The Institute of Literary Research of the Polish Academy of Sciences, Systems Research Institute of the Polish Academy of Sciences , Forest Research Institute, Nencki Institute of Experimental Biology of the Polish Academy of Sciences, W. Szafer Institute of Botany of the Polish Academy of Sciences, The Institute of Bioorganic Chemistry of the, Polish Academy of Sciences, The Institute of Dendrology of the Polish Academy of Sciences, Institute of Philosophy and Sociology of the Polish Academy of Sciences, Stanisław Leszczycki Institute of Geography and Spatial Organization of the Polish Academy of Sciences, Mossakowski Medical Research Centre of the Polish Academy of Sciences, Institute of Nature Conservation of the Polish Academy of Sciences, Institute of Fundamental Technological Research of the Polish Academy of Sciences, The Institute of Systematics and Evolution of Animals of the Polish Academy of Sciences, Museum and Institute of Zoology of the Polish Academy of Sciences.

 **The aim of the Project is to increase the RCIN digital collection (in total by 146,107 items), the accessibility and use of Public Sector Information made available through open licenses, from the science resources gathered by our Project Partners and to adapt our services to the needs of the users, including those with disabilities.** This will be done with the use of the existing ICT infrastructure (including the PIONIER Network provided to the Project Partners free of charge) and the RCIN platform, ie the Digital Repository of Scientific Institutes (www.rcin.org.pl) which most our partners co-created under the EU's Innovative Economy Operational Programme.

 Currently the RCIN platform includes 66 thousand publications, which during the seven years since the platform was created  have been accesses 41 million users.

 The current activities will include the improved adaptation of the platform's functionality to the needs of its users and enabling online to scientific resources of 6 new institutions, via the platform. In particular, new items will be made available on the Internet, containing scientific content and data, including a complete set of metadata, that have previously only been  available to a select few of the researchers visiting the partners' premises. The scientific resources from all the disciplines of our project partners. These items are representative of the collected research in the scientific filed our partner institutions and will contribute to future development of that research. The RCIN IT system will also be modernized, taking into account the recognized needs of the users.

 After the completion of the Project, the resources of 23 institutes (17 current users and 6 new OZwRCIN Project Partners) will be available through via the platform.

# Institute's news

## PAN MEDAL

On October 17th 2018 IMPAN was awarded medal of the Polish Academy of Sciences for the special contribution to the development of science related to the social role of science



## BANACH CENTER SCIENTIFIC COUNCIL

In 2018 a new four-years' term started for the Scientific Council of the Banach Center, chosen jointly by the European Mathematical Society and the Directors of IMPAN.
Current members of the Council are

1. Pavel Exner (Doppler Institute for Mathematical Physics and Applied Mathematics, Czech Republic) - Chairman of the Council
2. Alexey Davydov (National University of Science and Technology "MISiS", Department of Mathematics, Moscow, Russia)
3. Alice Fialowski (University of Pecs, Hungary)
4. Gert- Martin Greuel (University of Kaiserslautern, Germany)
5. Grzegorz Karch (The University of Wrocław, Poland)
6. Sławomir Kołodziej (Jagiellonian University, Poland)
7. Sjoerd Verduyn Lunel (University of Utrecht, The Netherlands)
8. Domokos Szasz (Budapest University of Technology, Hungary)
9. Henryk Woźniakowski (University of Warsaw, Faculty of Mathematics, Informatics and Mechanics, Poland)

# IMPAN PRIZES
## *(see https://www.impan.pl/en/events/awards)*

- **IMPAN Scientific Prize**

The IMPAN Scientific Prize is conferred annually for exceptional accomplishments in the field of Mathematics. The laureate is chosen by a Jury made up of 7 members appointed by the Director of IMPAN after consulting the Scientific Council of IMPAN. The 2018 IMPAN Scientific Prize was granted to *Agata Smoktunowicz* from School of Mathematics, University of Edinburgh, for outstanding achievements in algebra.

- **The Kuratowski Award**

The Kuratowski Award awarded yearly by IMPAN and Polish Mathematical Society for young mathematicians (age limit: 30) for outstanding results, was awarded in 2018 to *Piotr Pokora* for results in complex algebraic geometry.

New awards:
- **Jaroslav and Barbara Zemánek Prize** in functional analysis is founded.

- **Robert Bartoszyński scholarships**

The author of the diplomais Mrs Anna Maria Karolak

# ROBERT BARTOSZYŃSKI SCHOLARSHIPS

Prof. Robert Bartoszyński worked for a long time (before leaving for USA) in the Institute of Mathematics and was a well-known specialist in applications of probability and statistics. To commemorate him his wife Sofia Zinkovskaya established two six months scholarships. The scholarships were awarded to:
*Łukasz Płocinniczak* (Wrocław University of Science and Technology) and
*Jan Poleszczuk* (Nalecz Institute of Biocybernetics and Biomedical Engineering of the Polish Academy of Sciences).
The recipients of the scholarship were asked to deliver lectures at 47th National Conference on Applications of Mathematics in Zakopane Kościelisko, September 4-11th 2018 It were:
Łukasz Płociniczak, Modeling of dynamics of climate,
Jan Poleszczuk, Mathematical modeling of pulse-wave propagation for cardiovascular diagnostics in patients on hemodialysis.

# Jaroslav and Barbara Zemánek Prize in functional analysis is founded.
## *The 2018 Prize is awarded to Karl-Mikael Perfekt.*

The Jaroslav and Barbara Zemánek Prize 2018 in functional analysis with emphasis on operator theory is awarded to **Karl-Mikael Perfekt** (University of Reading, UK) for an essential input in a variety of topics in operator theory. Jury emphasized his breakthrough work on spectral theory of singular integral operators, in particular on the essential spectrum of the double layer operators, and his penetrating study of "multiplicative" Hankel operators.

Prof. Jaroslav Zemánek was a prominent Polish-Czech mathematician working in operator theory and its applications. He was born on 3 September 1946, and graduated from Charles University in 1969. His PhD thesis "Asymptotic properties of linear operators", , written under the direction of prof. W. Żelazko, was defended at IM PAN in 1977. Since 1979 till 2017 (with a tiny break) J. Zemánek held a position at IM PAN.

His major achievements concerned the theory of Banach algebras and the spectral theory of linear operators. While Zemánek 's results had a substantial impact on several areas of functional analysis, a genuinely outstanding and unsurpassed was his passion for mathematics, for its beauty and elegance. That passion made mathematics his unique (although somewhat hermetic) world, and greatly influenced a number of people who were not related to Zemánek neither formally, nor even informally. Zemánek passed away on 18 February 2017 following the death of his wife earlier that month. His last and possibly a major contribution to mathematics was the idea to establish a prize for young mathematicians working in the field he liked the most.

Thus, following a generous donation of Zemánek's family, the annual Zemánek's Prize as founded by the Institute of Mathematics of the Polish Academy of Sciences (IM PAN) in March 2018, in order to encourage the research in functional analysis, operator theory and related topics. The Prize is established to promote young mathematicians, under 35 years of age, who made important contributions to the field. The monetary amount of the prize is 12000 PLN (approximately 3.000 Euro).

The Prize Jury for 2018 consisted of R. Latała (Warsaw University), V. Müller (Institute

of Mathematics of the Czech Academy of Sciences), N. Nikolski (University of Bordeaux), A. Skalski (IM PAN) and Y. Tomilov (IM PAN). The awarding ceremony and the inaugural recipient lecture took take place at IM PAN, Warsaw, on 12 October 2018.

A more detailed information about the Prize can be found on the web-page

https://www.impan.pl/en/eventsawards/b-and-j-zemanek-prize.



The author of the diploma is Mrs Anna Maria Karolak

# NEW FACULTY

## *Autumn 2018*

**OPEN CALLS FOR TEMPORARY RESEARCH POSITIONS**

**3−7 YEARS POSITIONS**

**Maciej Dołęga**, 7 - years adiunkt position, algebra and algebraic geometry

**Piotr Pokora**, 3 - years adiunkt position, algebra and algebraic geometry

**Aneta Wróblewska –Kamińska**, 3 - years adiunkt position, differential equations

**½−2 YEARS POSITIONS**

**Jan Dymara**, associate professor position, topology

**Światosław Gal**, adiunkt position, topology

**Bingbing Liang**, adiunkt position, dynamical systems

**Piotr Miłoś**, adiunkt position, probability theory and mathematics of finances

**Ebrahim Samei**, adiunkt position, noncommutative geometry

**Panayotis Smyrnelis**, adiunkt position, differential equations

**Maciej Ulas**, adiunkt position, number theory

**Dyi-Shing Ou** , adiunkt position, dynamical systems

**Szymon Pliś**, adiunkt position, differential equations

**Danuta Kołodziejczyk**, adiunkt position, topology

**Zuzanna Szymańska**, adiunkt position, biomathematics,

**1-2 YEARS POSITIONS FOR YOUNG MATHEMATICIANS**

**Boulos El Hilany**, adiunkt position, algebra and algebraic geometry

**Grzegorz Malara**, adiunkt position, algebra and algebraic geometry

**Arturo Antonio Martinez Celis Rodriguez**, adiunkt position, foundations of mathematics

**Maciej Rzeszut**, assistant position, functional analysis

**Grzegorz Świderski**, adiunkt position, functional analysis

**Ignacio Vergara**, assistant position, noncommutative geometry

**Adam Carl Abrams**, adiunkt position, differential equations

**Fulgencio Lopez Serrano**, adiunkt position, foundations of mathematics

**Dawid Marti – Pete**, adiunkt position, dynamical systems

**Asahi Tsuchida**, adiunkt position, differential equations

**Mitsuru Wilson**, adiunkt position, noncommutative geometry

**EXCHANGE**:

Agnieszka Kałamajska (MIM UW), associate professor position, differential equations

**OPEN CALLS FOR PERMANENT PROFESSOR POSITIONS IN SPECIAL FIELDS**.

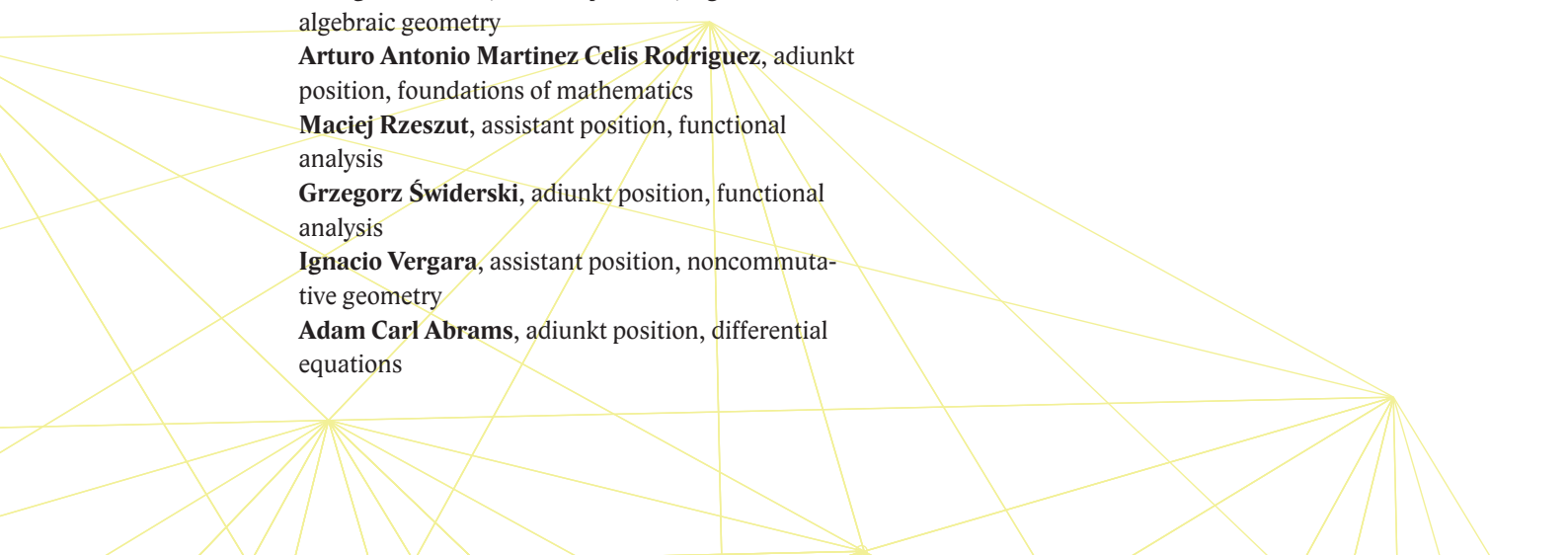**Piotr Gwiazda**, professor position, differential equations

**Piotr Nowak**, associate professor position, topology

**Tomasz Adamowicz**, associate professor position, differential equations

**POSITIONS IN THE FRAME OF NCN GRANTS**

**Aleksandra Borówka**, post-doc position, algebra and algebraic geometry, grant SONATA BIS

**Omar Tout**, post-doc position, functional analysis, grant MAESTRO

# BANACH CENTER SELECTED UPCOMING EVENTS 2018/2019

For more information, please check out:

https://www.impan.pl/pl/dzialalnosc/centrum-banacha/konferencje,

https://www.impan.pl/pl/dzialalnosc/centrum-banacha/konferencje?y=2019,

| | TITLE | DATE | ORGANIZERS | PLACE |
|---|---|---|---|---|
| 1. | Multivariate and Mixed Linear Models **(conference)** | 11-17.11.2018 | K.Filipiak, A.Markiewicz | Będlewo |
| 2. | Isocrystals and families of algebraic varieties **(workshop)** | 13-16.11.2018 | M.Zdanowicz, P.Achinger | Warsaw |
| 3. | XLIV Conference on Mathematical Statistics **(conference)** | 02-07.12.2018 | A.Zaigrajew, A.Goroncy, K.Jasiński, W.Rejchel | Będlewo |
| 4. | Workshop on Assembly Maps **(workshop)** | 06-07.12.2018 | Y.Chung, K.Li, P.Nowak | Warsaw |
| 5. | VII Hurwicz Workshop **(workshop)** | 07-08.12.2018 | M.Dziubiński, M.Lewandowski, Ł.Stettner, J.Werner, Ł.Woźny | Warsaw |
| 6. | Baby Horizons in Mathematics-school for students **(school)** | 07-10.03.2019 | M.Czapp, K.Jastrzębski, P.Rudnicki, O.Słowik, M.Szachniewicz, M. Szczepanowska, K. Szubiński | Będlewo |
| 7. | Dynamics, measures and dimensions **(conference)** | 07-12.04.2019 | L.Fishman, P.Gałązka, J.Kotus, F.Przytycki, S.Velani, A.Zdunik | Będlewo |
| 8. | Multivariate and Mixed Linear Models (MMLM 2019) **(conference)** | 28.04-05.05.2019 | K.Filipiak, D.Klein, J.Pielaszkiewicz, M.Mokrzycka | Będlewo |
| 9. | Probability and Analysis 2019 **(conference)** | 20-24.05.2019 | K.Bogdan, T.Jakubowski, M.Olszewski, A.Osękowski, G.Serafin, W.Świątkowski | Będlewo |
| 10. | BIOMATH19 **(conference)** | 16-22.06.2019 | R.Anguelov, J.Banasiak, A.Puchalska, M.Lachowicz, M.Piotrowska, G.Rempala, K.Szymańska-Dębowska | Będlewo |
| 11. | Derived Categories and Geometry in Positive Characteristic **(conference)** | 30.06-06.07.2019 | A.Bodzenta, L.Halle, A.Langer, S.Tirabassi | Warsaw |
| 12. | Derived Categories and Geometry in Positive Characteristic **(conference)** | 30.06-06.07.2019 | A.Bodzenta, L.Halle, A.Langer, S.Tirabassi | Warsaw |

**IMPAN**
8 Śniadeckich street
00-656 Warsaw
Poland
tel.: +48 22 5228100
fax: +48 22 6293997
www.impan.pl
im@impan.pl

**Stefan Banach International
Mathematical Center**
8 Śniadeckich street
00-656 Warsaw, Poland
tel.: +48 22 5228232
fax: +48 22 6225750
http://www.impan.pl/BC/
banach.center.office@impan.pl

**Będlewo Research
and Conference Center**
Będlewo, 1 Parkowa street
62-060 Stęszew, Poland
tel.: +48 61 8135187
fax: +48 61 8135393
http://www.impan.pl/EN/Bedlewo/
bedlewo@impan.pl