Science *‘Made in Poland’*

Flagship Research Areas

2015 — 2025

Science *'Made in Poland'*

A report by the Foundation for Polish Science (FNP),
commissioned by the Polish Ministry of Foreign Affairs

Flagship Research Areas

2015 — 2025

Contents

Executive Summary 3

Science in Poland – Potential, Development, and Internationalisation 6

Leading Areas and Researchers 14

Exact and Engineering Sciences 18

- Light, Electronics, and Measurement Technologies 19
- Modern Materials and Molecular Chemistry 27
- Fundamental Properties of Matter 33
- Quanta: Physics and Quantum Technologies 40
- Mathematics, Computer Science, and Artificial Intelligence 46
- Astronomy and Astrophysics 51

Life Sciences and Earth Sciences 55

- Molecular Foundations of Life 56
- Drugs and Therapies of the Future 62
- Neuroscience 68
- Evolution, Ecology, and the Environment 72

Humanities and Social Sciences 76

- History, Archaeology, and Cultural Heritage 77
- Ideas, Values, and Institutions 82
- Decisions, Behaviour, and Social Systems 87
- Language, Communication, and Identity 91

Summary 96

Executive Summary

At its best, Polish research punches well above its weight. As one of Europe's largest economies, Poland has considerable research potential, and it is expanding in many areas. However, R&D funding remains below the EU average, which means that potential is only partly realised and the degree of advancement is uneven across disciplines. In some fields, Polish teams rank among the world's best and work at the very vanguard of their disciplines. This report focuses on precisely those areas.

In recent years, Polish science has steadily become more competitive internationally. Participation in Horizon Europe has grown, more European Research Council (ERC) grants are being won, and both domestic research infrastructure and international collaboration have expanded. However, the Polish system remains at the stage of gradually closing the gap with the most advanced scientific centres in Europe.

The structure of Polish science is highly concentrated – both geographically and institutionally. The main centres of Warsaw, Kraków, Poznań, Wrocław, and the Tri-City region around Gdańsk account for the bulk of research activity, alongside the specialised institutes of the Polish Academy of Sciences, which in many fields achieve results that are highly competitive internationally.

Judging Polish science solely in terms of its universities' positions in global league tables does not fully reflect its true quality. Despite relatively modest institutional rankings, in many disciplines there are research teams whose work is on a par with the world's top institutions. The real strength of Polish science, therefore, primarily lies at the level of individual disciplines and teams, rather than entire universities.

Poland's scientific excellence is concentrated but spans a wide range of fields. Particularly strong international positions are held in mathematics, computer science, physics, astronomy, chemistry, life sciences, and selected areas of the social sciences and humanities, where Polish teams are increasingly able to compete with the leading European and global centres.

The most valuable assets of Polish science are its highly specialised researchers and strong research groups, who drive its international reputation and competitiveness. It is at the level of group leaders and research communities that the most significant achievements are concentrated, including prestigious grants and high-impact publications. Their work defines the fields where Poland is particularly strong internationally.

This report identifies 130 researchers who represent areas of Polish science with the greatest international visibility and competitiveness. This is not a ranking of individual achievement; it is a map of the areas of Polish research that are most active and successful in the international arena, indicating at the same time where there is potential to strengthen Poland's global position further.

Science in Poland – Potential, Development, and Internationalisation

Poland has one of the largest higher education and research systems in Central and Eastern Europe and is an important participant in the European Research Area. With an economy ranked around twentieth in the world and among the top 10 in Europe, the country possesses considerable research potential: an extensive network of universities, scientific institutes, and specialised research units, staffed by tens of thousands of researchers across every major discipline, from mathematics and physics to the social sciences, humanities, and medicine.

Over the past two decades, Polish science has undergone a profound transformation. EU membership opened up substantial investment in research infrastructure, international collaboration on a new scale, and drew Polish institutions into Europe's most important scientific networks. In many fields, laboratories and research centres are now outfitted to a standard comparable with the very best in Europe, and Polish scientists are regular participants in international consortia and large collaborative projects.

At the same time, this progress has been achieved with relatively limited financial outlays. Poland's R&D spending remains below the EU average, which affects the country's position in international rankings and its ability to compete for the most prestigious grant programmes. Despite these constraints, Polish research teams are steadily expanding their presence in the European research space, with growing success in programmes like Horizon Europe and at the European Research Council (ERC).

Poland ranks fifth in the EU by number of researchers – with approximately 141,000 of them in total nationwide.[1] Of these, around 72,000 work in academic research institutions,[2] focused primarily on basic and academic research.

The backbone of the Polish system is made up of higher education institutions – including technical, medical, natural sciences, and economics universities (with 135 of them in total nationwide). It is here that most Polish researchers work and the great majority of doctoral students are trained. The largest and most internationally connected academic centres are Warsaw, Kraków, Poznań, Wrocław, and the Tri-City around Gdańsk. In recent years, universities have invested heavily in international partnerships, joining European university alliances and running projects funded from both national and European sources.

Another distinctive element of the Polish system is the Polish Academy of Sciences (PAS). Unlike many science academies elsewhere, PAS is not only a learned society of distinguished scholars – it also has its own network of 69 specialist research institutes covering almost every field, from mathematics, physics, and chemistry to biology, the social sciences, and humanities. These PAS institutes rank among the most internationally engaged research units in Poland, with consistently strong publication records, a high rate of grant success, and broad participation in international projects.

Poland is also growing more attractive to researchers from abroad. This both confirms the appeal of Polish science and brings tangible benefits: it raises the quality of teaching and research at universities, facilitates the exchange of knowledge and experience, and advances the internationalisation of Polish academic institutions. Foreign nationals now account for more than 3.5% of academic staff,[3] with the University of Warsaw, Jagiellonian University, and Adam Mickiewicz University leading the way in this respect.

1 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=R%26D_personnel#Researchers Researchers are defined as research personnel, that is, persons who conduct research and improve or develop concepts, theories, models, techniques, instrumentation, software, or operational methods. This is the Polish equivalent of the "researchers" category used in the Frascati Manual (OECD 2015; Statistics Poland 2022a, p. 155).

2 Number of full-time-equivalent positions. *Nauka w Polsce 2024* [Science in Poland 2024]. National Information Processing Institute – National Research Institute (OPI PIB).

3 *Nauka w Polsce – szanse i wyzwania* [Science in Poland: Opportunities and Challenges]. December 2025. National Information Processing Institute – National Research Institute.

The trend is particularly pronounced among doctoral students: even as total doctoral enrolment fell sharply – by 42% between 2019 and 2024 – the number of international doctoral candidates rose by around 44%, bringing their overall share of doctoral school places up to approximately 14% in 2024.

A significant financial injection for Polish science comes from structural funds – drawn primarily (80–85%) from the EU budget but managed by Poland as a member state, with a 15–20% contribution from the Polish national budget. In the current, fourth framework, Poland has access to nearly €76 billion, earmarked primarily for economic modernisation and social development, but with science also benefiting – notably for advanced technology development and R&D infrastructure. Poland is also among the largest recipients of funding under the EU's Recovery and Resilience Facility:[4] its national recovery plan (known as the KPO) is worth nearly €60 billion, of which approximately 45% is allocated to the green transition and approximately 20% to digital transformation. Research institutions are also among the KPO beneficiaries.

Poland has a well-developed grant system that supplements institutional funding based on subsidies to universities and institutes. Competitive calls for research projects, selected through expert peer review, allow funding to be directed to the best teams and most promising projects, strengthening research quality and the efficiency of resource use. The main grant-awarding bodies include:

THE NATIONAL SCIENCE CENTRE (NCN) is the primary agency for competitive basic research funding across all disciplines, supporting researchers at every career stage. In recent years, one in three qualifying applications (32%) involved international collaboration. Total awards in 2019–2024: PLN 9 billion.[5]

4 The NextGenerationEU fund, launched in 2021, aims to mitigate the effects of the crisis caused by the COVID-19 pandemic and to strengthen the socioeconomic resilience of the Member States.

5 *Nauka w Polsce – szanse i wyzwania* [Science in Poland: Opportunities and Challenges], op. cit.

THE NATIONAL CENTRE FOR RESEARCH AND DEVELOPMENT (NCBR) is a state agency responsible for funding applied research with the potential for practical application in the economy. It supports the development of new technologies, products, and services through projects run by companies, science-industry consortia, and academic units working with business. Total funding awarded in 2019–2024: PLN 18.3 billion.[6]

THE POLISH NATIONAL AGENCY FOR ACADEMIC EXCHANGE (NAWA) is a state institution supporting international academic and scientific cooperation. Its primary goal is to develop the exchange of students, researchers, and university staff. NAWA runs numerous scholarship, grant, and educational programmes aimed at both Poles going abroad and foreign nationals wishing to study or conduct research in Poland. The Agency also supports the internationalisation of universities and the building of cooperation between scientific institutions worldwide. Total funding awarded in 2019–2024: PLN 315.9 million.[7]

THE FOUNDATION FOR POLISH SCIENCE (FNP) is the largest non-governmental source of research funding in Poland. It supports both basic and applied research, with a strong emphasis on innovation, international collaboration, and implementation potential. Over its 35 years of activity, the Foundation has directed approximately PLN 2.4 billion to Polish science from its own resources and structural funds.[8]

THE MEDICAL RESEARCH AGENCY (ABM) is the state grant agency funding research in medical and health sciences. Its activities focus primarily on supporting non-commercial clinical trials, applied research, and projects aimed at developing modern methods of diagnosis and therapy. The ABM's goal is to increase the innovativeness of Polish medicine and accelerate the translation of research findings into clinical practice. Total funding awarded in 2019–2024: over PLN 4 billion.[9]

6 Ibid.

7 Ibid.

8 https://www.fnp.org.pl

9 https://abm.gov.pl/pl/o-nas/dzialalnosc/plan-finansowy-i-plan-d/sprawozdania-finansowe/2024/3196,2024.html

THE POLISH MINISTRY OF SCIENCE AND HIGHER EDUCATION's programmes are also an important source of research funding. In 2019–2024, over PLN 1.8 billion was allocated to the most significant of these, supporting the development of the humanities, collaboration between science and industry, socially significant projects, early-career researchers, and the internationalisation of research.[10]

Polish science is making increasing use of EU framework programmes dedicated to supporting research and innovation. Poland's 1,727 participations in Horizon Europe and the net funding of €927 million secured place it first among the countries that joined the EU after 2004 (the EU-13). Poland's share still does not fully reflect its potential based on economic size, but it is growing steadily. Under Horizon Europe (2021–2027), both the number of projects and the value of funding secured are growing significantly faster than under the previous Horizon 2020 programme. A comparison of Poland's participation in the two programmes reveals an important shift in structure and quality. Whereas Horizon 2020 was dominated by areas related to information technologies and researcher mobility, Horizon Europe shows both continued growth in those fields and a clear diversification towards climate, energy, and health research. At the same time, the number of ERC grants won is increasing and engagement in project coordination is growing – signs of the increasing competitiveness and maturity of the Polish research system. EU framework programmes play a very important role in building expertise and capacity for international collaboration and participation in large research consortia.

Thanks to increased R&D investment, largely from European funds, Poland's research infrastructure has been significantly expanded in recent years – including modern equipment, large-scale installations, and computing infrastructure. This has created conditions for conducting research at a level comparable to, and in some cases even surpassing, many European centres. An important feature of this infrastructure is its diversity and integration with the European research space. It encompasses specialised laboratories and competence centres as well as access to international research networks. This enables advanced

10 *Nauka w Polsce – szanse i wyzwania* [Science in Poland: Opportunities and Challenges], op. cit.

equipment to be used effectively by research teams and supports the pursuit of high-quality scientific projects.[11] Examples of key infrastructure embedded in leading research centres:

PHYSICS, MATTER, AND NUCLEAR TECHNOLOGIES:

- **The Solaris National Synchrotron Radiation Centre** – unique synchrotron infrastructure used by international research teams for studies of matter structure, advanced materials, and biological systems.
- **The National Centre for Nuclear Research** – advanced experimental infrastructure supporting research in nuclear physics, materials science, and medical and industrial applications.

DIGITAL AND COMPUTING INFRASTRUCTURE:

- **The Academic Computer Centre Cyfronet AGH** – a high-performance computing environment supporting breakthrough research in physics, artificial intelligence, and climate science.
- **The Poznań Supercomputing and Networking Centre (PCSS)** – a centre equipped with powerful computers and high-speed networks enabling scientists to analyse vast amounts of data and run complex simulations, from climate forecasting to AI development.

LIFE SCIENCES AND BIOTECHNOLOGY:

- **The International Institute of Molecular and Cell Biology (IIMCB) in Warsaw** – an international research centre offering access to modern platforms in molecular biology, imaging, and cell biology.
- **The Małopolska Centre of Biotechnology, Jagiellonian University** – an integrated research centre conducting advanced research into disease mechanisms and new therapies.
- **The Institute of Bioorganic Chemistry, Polish Academy of Sciences** – modern infrastructure in genomics, molecular biology, and bioinformatics supporting the development of personalised medicine.

11 Further details can be found in: *Wyniki przeglądu Polskiej Mapy Infrastruktury Badawczej* [Results of the Review of the Polish Research Infrastructure Roadmap]. https://www.gov.pl/web/nauka/wyniki-przegladu-polskiej-mapy-infrastruktury-badawczej

APPLIED RESEARCH AND INDUSTRY COLLABORATION:

- **The Wrocław Research Centre EIT+** – an interdisciplinary research environment supporting technology transfer and innovation development.
- **The Centre of New Technologies (CeNT), University of Warsaw** – a platform integrating basic and applied research in physics, chemistry, and the life sciences.

INTERNATIONAL INFRASTRUCTURE AND GLOBAL INTEGRATION:

- **Poland's participation in CERN** – active involvement in the largest particle physics experiments.
- **European XFEL** – gives Polish researchers access to one of the world's most powerful X-ray lasers.
- **The European Spallation Source** – cocreating modern neutron infrastructure for materials and biological research.
- **The Polish Polar Station in Hornsund** – one of the best-known research stations in the Arctic, conducting year-round research on the atmosphere, glaciers, geophysics, seismology, oceanography, and climate change.
- **The Henryk Arctowski Polish Antarctic Station** – conducting year-round research in biology, ecology, oceanography, geology, glaciology, and climate monitoring.

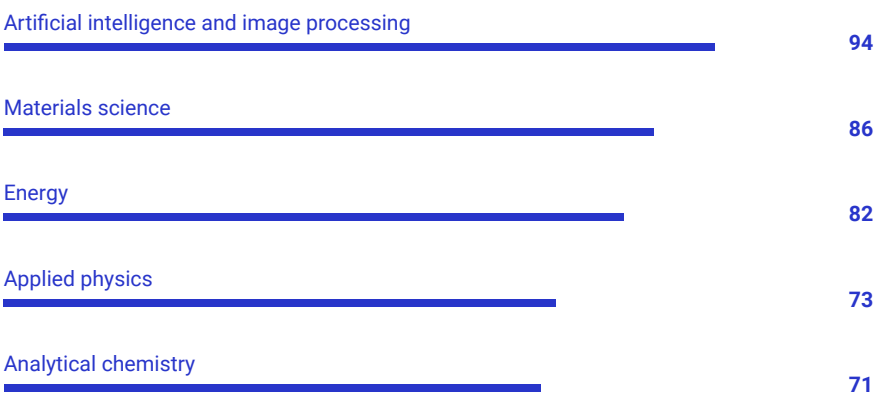
Leading Areas and Researchers

A defining feature of Polish science is the concentration of excellence around specific institutions, research teams, and disciplines. Although the system as a whole does not yet rank at the top globally in terms of funding scale or league-table positions, many Polish research communities achieve results comparable with the world's best. It is these teams that represent the most competitive and recognisable element of Polish science, contributing to its growing role in the global exchange of knowledge.

Assessing Polish science solely through the lens of how whole universities are ranked is therefore a serious oversimplification. Although Polish universities generally occupy relatively modest positions in international rankings such as QS, Times Higher Education and the Shanghai Ranking, individual faculties and disciplines often perform at a level much closer to the global forefront. The fields this applies to include:

- **physics,**
- **mathematics,**
- **chemistry,**
- **materials engineering,**
- **computer science,**
- **and biotechnology.**

NUMBER OF POLISH SCIENTISTS REPRESENTED IN "WORLD'S TOP 2% SCIENTISTS" RANKING, BY FIELD (AS OF 2026)



Similar conclusions emerge from international bibliometric analyses comparing publication output and citation impact, such as the SCImago Country Rank.[12] The social sciences and humanities are less well represented there, largely due to the nature of bibliometric indicators, which favour English-language publications and experimental sciences.

The aim of this report is therefore not to create a ranking of institutions or disciplines, but to identify those fields in which Polish scientists achieve particularly high international recognition – winning prestigious grants and publishing research with a significant impact on the development of contemporary science.

Identifying leading scientists and assessing scientific quality – understood as the value, rigour, and impact of research – are among the most complex challenges in contemporary science. Scientific quality is multidimensional and strongly dependent on discipline, institutional context, and cultural context, which means it does not lend itself to simple, uniform measurement (Martin, 2016; Moed, 2005).

The criteria for evaluating scholarly output are varied and contested, and reducing them to single indicators leads to simplifications and the risk of systematically favouring forms of research activity that are easily quantifiable. This phenomenon is described in the literature on the growing reliance on quantitative metrics in science evaluation and the unintended consequences of such evaluation systems (Strathern, 1997; Muller, 2018; Edwards & Roy, 2017).

A further challenge is the comparability of assessments across disciplines. Differences in publication practices and citation distributions limit the applicability of uniform indicators without appropriate normalisation (Radicchi et al., 2008; Waltman, 2016). The mechanical application of universal criteria can distort the picture of science and perpetuate structural inequalities between disciplines (Hicks et al., 2015; Wouters et al., 2015; Larivière et al., 2016).

12 SCImago Country Rank is an international ranking that assesses the scientific output of individual countries on the basis of publication numbers, citations, and research impact. It uses data from the Scopus database and is one of the most widely used tools for comparing countries' positions in the global research system.

This report has applied a methodology that is deliberately simple and transparent, even at the cost of omitting some outstanding researchers. The methodology draws on two types of evidence: success in prestigious peer-reviewed grant competitions, such as the ERC; NCN, including the NCN Award and MAESTRO grants; and FNP, including the FNP Prize, international prizes, MAB grants, and TEAM grants, and career-long impact in the World's Top 2% Scientists ranking. Given the contested nature of any criteria for identifying the "best" scientists or disciplines, the report should be treated not as a ranking of scientific quality, but as an attempt to identify those areas that currently function most effectively in the international scientific arena.

Although this report identifies specific researchers, it should nevertheless be noted that research is a collective endeavour. The researchers named here are not working alone – they are generally team leaders with other scientists gathered around them, often outstanding in their own right. Since the composition of such teams changes dynamically, this report confines itself to naming team leaders.

Exact and Engineering Sciences

Light, Electronics, and Measurement Technologies



Prof. Piotr Garstecki
Photo Grzegorz Krzyżewski

We want to create a system able to detect a stroke event virtually at the moment it starts, in order to immediately notify family members, caregivers, or the healthcare system. This matters most in the case of nocturnal strokes: family members only discover in the morning that a stroke has occurred, without knowing exactly when – and that is crucial for determining the course of treatment. Many consequences of stroke can be avoided if treatment is applied promptly.

Prof. Piotr Garstecki[13]

Research in this area focuses on how light, electronics, and advanced materials can be harnessed for new approaches to measurement, imaging, and information processing. Prof. Maciej Wojtkowski works on improving optical coherence tomography, enabling three-dimensional imaging of the interior of the eye. Prof. Małgorzata Barańska develops spectroscopic imaging methods that use light to probe the chemical composition of cells, tissues, and biological materials. Prof. Paweł Moskal is developing PET technologies based on highly precise time-of-flight measurements, enabling more accurate imaging of processes occurring inside the human body. The work of Prof. Wacław Urbańczyk and Prof. Dorota Pawlak, in turn, focuses on photonic materials and nanostructures that allow the flow of light to be controlled at very small scales, with potential applications in sensors, telecommunications, and information technologies.

Developing the electronic materials of the future also forms a significant part of this research area. Prof. Tomasz Dietl, Prof. Wojciech Knap, Prof. Michał Leszczyński, and Prof. Michał Boćkowski study semiconductors and functional materials that could enable the development of faster electronics, new radiation sources, and more efficient optoelectronic devices. Prof. Konrad Szaciłowski, meanwhile, designs intelligent materials and chemical systems capable of processing information, bridging chemistry, electronics, and computer science.

13 Original interview in Polish: "Trzeba być ciekawskim i odważnym, by tworzyć odkrycia". *Wprost*, August 6, 2024. https://www.wprost.pl/nauka-dla-rozwoju-medycyny/11776047/prof-garstecki-trzeba-byc-ciekawskim-i-odwaznym-by-tworzyc-odkrycia.html

Modern measurement and microfluidic technologies represent another important avenue of research. Prof. Piotr Garstecki develops microfluidic systems that allow precise control of small volumes of liquid, with applications in medical diagnostics and biology. Prof. Zbigniew Brzózka develops advanced sensors that use physical phenomena to monitor biological and chemical processes. Prof. Marek J. Samoć conducts research into optical materials with unique properties, used in photonics and modern detection systems.

This area also encompasses research into information processing and electronic systems. Prof. Tomasz Skotnicki is a pioneer in microelectronics and integrated circuit technology. Prof. Ryszard Buczyński conducts research into modern optical fibre and photonic techniques used in telecommunications and precision measurement systems.

Taken together, the work of these researchers shows how the close integration of physics, chemistry, electronics, and engineering gives rise to technologies with real-world applications in medicine, energy, communications, and the industries of the future.

Prof. Tomasz Dietl | PHYSICIST

Affiliation: Institute of Physics PAS, MagTop

Awards: Top 2%, MAB 2015, MAB 2023

The work of Prof. Tomasz Dietl and his group focuses on the physics of magnetic semiconductors and *spintronics* – a field that seeks to use not only the electron's electric charge, as conventional electronics does, but also its spin, a quantum property associated with magnetism. One of his most important contributions was explaining how semiconductor materials can be given magnetic properties by introducing a small quantity of metal atoms, such as manganese, creating materials that simultaneously conduct electricity and behave like a magnet. He also investigates quantum phenomena in these materials. His work has had a major impact on the development of condensed matter physics and nanotechnology, linking quantum theory, magnetism, and electronic materials. His publications are among the most highly cited in the fields of spintronics and magnetic semiconductors. In practical terms, his research helps address the question of how to build electronics that run faster and consume less energy than today's technologies – from better computers to smart devices that respond to magnetic fields and light. Although many of these solutions

remain at the laboratory stage, similar ideas are being pursued by the largest technology companies working on next-generation memories and quantum computers. His career illustrates how discoveries in basic physics can, years later, give rise to transformative technologies.

Prof. Wojciech Knap | PHYSICIST

Affiliation: Warsaw University of Technology, CEZAMAT Advanced Technology Centre, CENTERA

Awards: Top 2%, TEAM 2016, MAB 2017, ERC Advanced Grant 2021, MAB 2023, FNP Prize 2025

Prof. Wojciech Knap's work focuses on semiconductors and modern electronics – on the materials from which diodes, lasers, and electronic circuits are made. Together with his team, he investigates how the properties of these materials can be modified to allow faster conduction of current, sensitivity to light, and operation in new, advanced devices. Prof. Knap is particularly interested in technologies using terahertz electromagnetic waves, which could enable information transmission with very high bandwidth or allow the properties of materials to be measured quickly and safely – with applications in medicine, security, and advanced electronics. Another line of work for his group involves the integration of semiconductor materials with new optoelectronic structures, enabling the design of lasers with specific properties, fast transistors, and circuits that may find future applications in computing, telecommunications, and radiation detection.

Prof. Maciej Wojtkowski | PHYSICIST

Affiliation: Institute of Physical Chemistry PAS, International Centre for Eye Research

Awards: Top 2%, MAESTRO 2016, MAB 2018, MAB 2023, MAESTRO 2024

Prof. Maciej Wojtkowski works on using light for non-invasive imaging of the biological structures of the eye. He is one of the pioneers in the development of optical coherence tomography (OCT), a technique that produces three-dimensional images of the retina without any surgical intervention. This method has found wide application in ophthalmology, enabling very early detection of retinal diseases, as well as in other fields of medicine requiring precise diagnostics.

A key area of his research is the development of advanced methods for detecting and analysing optical signals, paving the way for significant improvements in imaging resolution and speed. This encompasses both the design of new measurement systems and the development of data-processing algorithms, making it possible to obtain highly detailed images of biological structures and to observe dynamic processes occurring in eye tissues. In parallel, Prof. Wojtkowski is developing techniques that use light to study the properties of materials and physical and chemical processes more broadly. His work demonstrates how combining physics, engineering, and the life sciences can lead to new diagnostic and research tools – with applications not only in medicine but also in biology and materials science.

Prof. Małgorzata Barańska | CHEMIST AND BIOPHYSICIST

Affiliation: Jagiellonian University, Faculty of Chemistry

Awards: Top 2%, MAESTRO 2022

Uses advanced spectroscopic methods to study the chemical composition of cells and tissues, developing techniques for "reading" biological changes based on the way matter interacts with light.

Prof. Michał S. Boćkowski | MATERIALS PHYSICIST

Affiliation: Institute of High Pressure Physics PAS

Awards: Top 2%, MAB 2025

Studies modern semiconductor materials for electronics and optoelectronics, specialising in the production of very high-quality crystals, particularly nitride-based materials essential for blue LEDs and semiconductor lasers.

Prof. Zbigniew Brzózka | CHEMIST

Affiliation: Warsaw University of Technology, Faculty of Chemistry

Awards: Top 2%, MAESTRO 2024

Works on microfluidics, developing miniature laboratories and chemical sensors capable of analysing tiny quantities of substances. Known for creating lab-on-a-chip systems that integrate complex analytical processes into devices just a few centimetres in size.

Prof. Ryszard Buczyński | PHYSICIST

Affiliation: University of Warsaw, Faculty of Physics

Awards: Top 2%, MAESTRO 2022, MAB 2025

Specialises in the design of advanced optical fibres and photonic materials with unusual properties that allow precise guiding and control of light in scientific and technological applications.

Prof. Piotr Garstecki | PHYSICIST

Affiliation: Institute of Physical Chemistry PAS

Awards: Top 2%, MAESTRO 2018

Studies microscale fluid dynamics, creating systems that use microscopic liquid droplets as miniature reactors for automated chemical or biological processes. His research has found practical application in the publicly listed company Scope Fluidics, which he leads.

Prof. Wiktor Koźmiński | CHEMIST

Affiliation: University of Warsaw, Biological and Chemical Research Centre

Awards: Top 2%, MAESTRO 2015

Specialises in NMR spectroscopy – methods that reconstruct molecular structure from magnetic field measurements – developing techniques for analysing increasingly complex chemical compounds and biomolecules.

Prof. Michał Leszczyński | MATERIALS PHYSICIST

Affiliation: Institute of High Pressure Physics PAS

Awards: Top 2%, TEAM 2016

Studies how to produce perfectly ordered crystals that allow light to be generated and controlled with high efficiency, with applications in energy-efficient LEDs, semiconductor lasers, and electronics for demanding conditions.

Prof. Paweł Moskal | PHYSICIST

Affiliation: Jagiellonian University, Faculty of Physics, Astronomy and Applied Computer Science

Awards: Top 2%, TEAM 2017, MAESTRO 2021, ERC Advanced Grant 2024

Develops J-PET scanner technology enabling highly precise imaging of processes occurring in the human body and investigations of the fundamental properties of matter, with applications in both medicine and physics research.

Prof. Dorota Pawlak | MATERIALS CHEMIST

Affiliation: ENSEMBLE3

Awards: TEAM 2016, MAB 2017, MAB 2024

Designs microscopic crystals that manipulate light, creating materials with precisely engineered optical properties for use in photonics, telecommunications, and advanced sensors.

Prof. Marek J. Samoć | CHEMIST

Affiliation: Wrocław University of Science and Technology, Faculty of Chemistry

Awards: Top 2%, FNP Prize 2016

Uses light and lasers to study matter at the level of individual molecules and nanostructures, with applications in medicine, photonics, and detection systems. His research includes the detection of protein aggregates associated with neurodegenerative diseases, including the beta-amyloid deposits characteristic of Alzheimer's disease.

Prof. Tomasz Skotnicki | ELECTRONICS ENGINEER

Affiliation: Warsaw University of Technology, CEZAMAT Advanced Technology Centre

Awards: Top 2%, ERC Advanced Grant 2023

A pioneer in microelectronics and integrated circuit technology, researching how to design transistors and semiconductor materials for faster, more energy-efficient devices. His work has contributed to technologies used in modern processors and electronic circuits.

Prof. Konrad Tadeusz Szaciłowski | INORGANIC AND MATERIALS CHEMIST

Affiliation: AGH University in Kraków, Academic Centre for Materials and Nanotechnology

Awards: Top 2%, MAESTRO 2015

Works at the intersection of chemistry, electronics, and computer science, creating chemical systems capable of processing information – exploring how chemical reactions can perform functions analogous to simple logic circuits and computing systems.

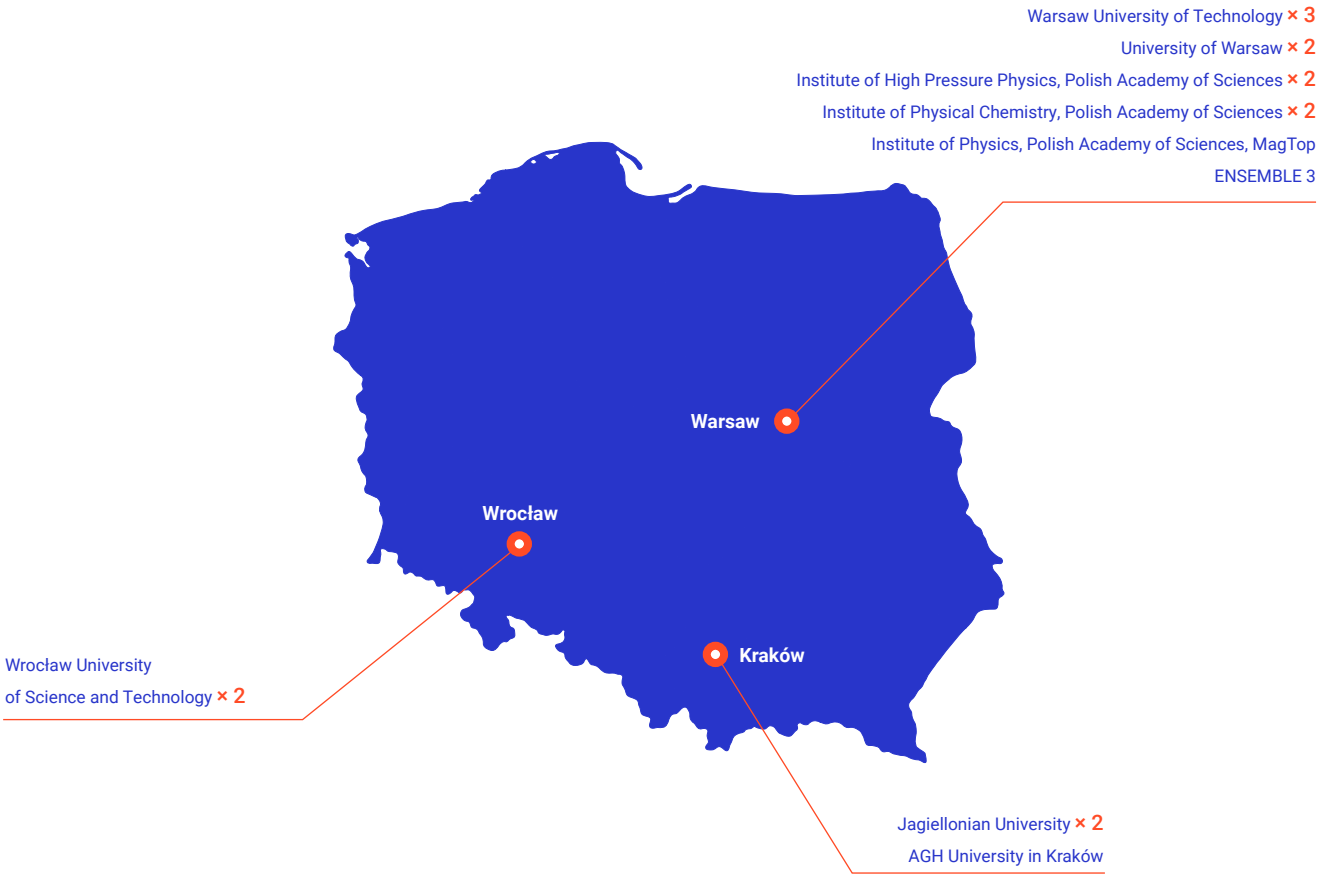
Prof. Wacław Urbańczyk | PHYSICIST

Affiliation: Wrocław University of Science and Technology, Faculty of Fundamental Problems of Technology

Awards: Top 2%, MAESTRO 2016

Specialises in optical fibres and technologies that exploit the propagation of light through glass fibres, designing fibres with tailored properties for telecommunications, sensing, and precision measurement.

SITES OF TOP RESEARCH IN LIGHT, ELECTRONICS, AND MEASUREMENT TECHNOLOGIES, BY RESEARCHER AFFILIATION



ERC	FNP	MAB	MAESTRO	TEAM	TOP 2%
3	2	10	10	4	15



Prof. Ewa Górecka
Photo Magdalena Wiśniewska-Krasińska

Modern Materials and Molecular Chemistry

Just fifteen years ago, to carry out more precise measurements, we used to travel to foreign research centres. Now researchers come to us – to use our X-ray laboratory for soft matter research. (If I may say so myself, as head of that unit: it is probably one of the best in the world).

Prof. Ewa Górecka[14]

This area covers research into the creation of chemical compounds and materials with precisely engineered properties, with potential applications in medicine, electronics, energy, and nanotechnology. Researchers such as Prof. Karol Grela, Prof. Daniel Gryko, Prof. Dorota Gryko, Prof. Jacek Młynarski, and Prof. Szczepan Zapotoczny develop new organic molecules, catalysts, dyes, polymers, and other functional materials – often drawing inspiration from solutions found in nature. Their work makes it possible to create compounds capable of accelerating chemical reactions, selectively interacting with biomolecules, processing light, or fulfilling specialised functions in modern technologies.

Research into materials with unusual physical and chemical properties is a second major direction. Prof. Wojciech Grochala, Prof. Piotr M. Kaszyński, Prof. Ewa Górecka, Prof. Krzysztof Fic, Prof. Dawid Pinkowicz, and Prof. Stanisław Penczek design and study compounds and materials with distinctive electrical, magnetic, optical, or electrochemical properties. These include next-generation liquid crystals, advanced polymers, energy storage materials, and molecular systems that respond to light, temperature, or magnetic fields.

The rational design of materials and chemical processes also plays an important role. Prof. Bartosz Grzybowski develops methods that use computational modelling and artificial intelligence to discover new chemical reactions and predict molecular behaviour. Prof. Janusz Lewiński, meanwhile, studies self-assembling molecular systems and nanomaterials, showing how the formation of complex structures can be controlled at the level of individual molecules. Taken together, research in this area

14 Original interview in Polish: "Laureaci Nagród Fundacji na rzecz Nauki Polskiej 2020. Wywiad". https://www.fnp.org.pl/component/fnp_pages/page/wszystkie-publikacje

reflects a fundamental shift in contemporary chemistry – away from discovering new substances by trial and error, towards the conscious design of molecules and materials with predetermined properties. This approach is today the foundation for the development of many future technologies, from new drugs and functional materials to advanced electronics and energy storage.

Prof. Krzysztof Fic | ELECTROCHEMIST

Affiliation: Poznań University of Technology, Faculty of Chemical Technology

Awards: ERC Starting Grant 2017, ERC Proof of Concept 2023

Prof. Krzysztof Fic and his team work on the design and study of materials used for energy storage – supercapacitors, batteries, and other electrochemical systems. His research focuses on how a material's structure determines its capacity to store and rapidly release energy, with the goal of developing more efficient, durable, and safe storage technologies for applications in electronics, transport, and energy. Particular attention is devoted to increasing the capacity, durability, and stability of storage materials by shaping their structure at the molecular level. Prof. Fic also studies materials that respond to external stimuli such as light and temperature, enabling the creation of intelligent molecular systems capable of storing and releasing energy in a controlled manner – a capability of growing importance in modern energy technology and materials science.

Prof. Dorota Gryko | CHEMIST

Affiliation: Institute of Organic Chemistry PAS

Awards: Top 2%, FNP Prize 2025, TEAM 2017

Prof. Dorota Gryko and her team work in organic chemistry, and in particular on the design of new molecules and chemical reactions inspired by processes occurring in nature. One of the main themes of her research is porphyrins – chemical compounds present in haemoglobin, chlorophyll, and other important molecules. Prof. Gryko investigates how their exceptional properties can be harnessed to drive chemical reactions using light, allowing many processes to be conducted more gently, rapidly, and cleanly, without the need for high temperatures or toxic heavy metals.

A particularly important area of her research is photocatalysis – using light to control chemical reactions. Prof. Gryko's team develops porphyrin-based photocatalysts that can serve as alternatives to catalysts relying on rare and costly metals, fitting squarely within the broader project of *green chemistry* – an approach aimed at creating safer and more environmentally friendly methods of chemical synthesis. This research may find applications in drug manufacturing, the modification of biomolecules, and the development of new medical therapies. Prof. Gryko is also widely recognised for developing modern methods for the synthesis of complex organic molecules, yielding new compounds with controlled optical and photochemical properties, with potential applications in organic electronics, sensors, and light-based technologies.

Prof. Dawid Pinkowicz | MATERIALS CHEMIST

Affiliation: Jagiellonian University, Faculty of Chemistry

Awards: ERC Consolidator Grant 2021, NCN Prize 2019

Prof. Dawid Pinkowicz and his team conduct research into modern molecular materials that combine magnetic and optical properties controllable at the level of individual molecules. One of the main areas of his research is molecular magnets and quantum nanomagnets. He designs chemical compounds whose magnetic properties can be controlled by light, temperature, or a magnetic field. He has demonstrated that light can change the properties of certain molecular magnets, pointing to possibilities for using such materials in future memory technologies and quantum devices.

A characteristic feature of Prof. Pinkowicz's research is the combination of highly advanced chemical synthesis with quantum physics and materials science. His work shows that individual molecules can act as functional components of future technologies – responding to light, storing magnetic information, or exhibiting properties not observed in conventional magnetic materials. On the one hand, this research advances fundamental knowledge about the relationships between structure and material properties; on the other, it points toward practical applications such as molecular data carriers, next-generation electronic components, and advanced sensor systems.

Prof. Ewa Górecka | MATERIALS CHEMIST

Affiliation: University of Warsaw, Faculty of Chemistry

Awards: FNP Prize 2020, MAESTRO 2016

Studies liquid crystals and other soft materials that combine the characteristics of liquids and solids. She creates ordered molecular structures with exceptional optical properties and investigates the self-assembly processes of molecules that lead to the formation of complex structures resembling those found in nature.

Prof. Karol Grela | ORGANIC CHEMIST

Affiliation: University of Warsaw, Biological and Chemical Research Centre

Awards: Top 2%, MAESTRO 2019

Specialises in the design of catalysts and new methods for the synthesis of organic compounds, enabling complex chemical reactions to be carried out under milder conditions, with reduced energy consumption and waste generation.

Prof. Wojciech Grochala | INORGANIC CHEMIST

Affiliation: University of Warsaw, Centre of New Technologies

Awards: Top 2%, MAESTRO 2017

Studies chemical compounds with unusual properties and materials capable of existing under extreme conditions, such as very high pressures, expanding knowledge of the limits of matter's stability.

Prof. Daniel Gryko | ORGANIC CHEMIST

Affiliation: Institute of Organic Chemistry PAS

Awards: Top 2%, TEAM 2016, ERC Advanced Grant 2022, FNP Prize 2017, Polish-French Marie Skłodowska-Curie and Pierre Curie Scientific Prize 2024, MAB 2025

Designs and synthesises complex molecules inspired by solutions found in nature. Particularly known for his research into porphyrins and dyes capable of absorbing and processing light, similarly to the molecules involved in photosynthesis.

Prof. Bartosz Grzybowski | CHEMIST AND PHYSICIST

Affiliation: Institute of Organic Chemistry PAS

Awards: MAESTRO 2018, FNP Prize 2022

Studies complex chemical systems capable of self-organisation, developing models and algorithms – including AI-based tools – for predicting the course of chemical reactions and planning chemical syntheses.

Prof. Piotr M. Kaszyński | MATERIALS CHEMIST

Affiliation: University of Łódź, Faculty of Chemistry

Awards: Top 2%, TEAM 2016

Designs organic molecules with unusual electronic and optical properties, developing materials that respond to light and electrical current, with potential applications in optoelectronics.

Prof. Janusz Lewiński | CHEMIST AND MATERIALS SCIENTIST

Affiliation: Warsaw University of Technology, Faculty of Chemistry;
Institute of Physical Chemistry PAS

Awards: Top 2%, FNP Prize 2024, MAESTRO 2019, TEAM 2016

Studies the self-assembly of molecules and designs nanomaterials with new properties. Particularly known for his work on perovskites as next-generation materials for efficient solar cells.

Prof. Jacek Młynarski | ORGANIC CHEMIST

Affiliation: Institute of Organic Chemistry PAS

Awards: Top 2%, TEAM 2017

Develops new methods for the synthesis of complex molecules, often inspired by processes occurring in living organisms, enabling more precise and efficient strategies for constructing organic compounds.

Prof. Stanisław Penczek | POLYMER CHEMIST

Affiliation: Centre of Molecular and Macromolecular Studies PAS

Awards: Top 2%, FNP Prize 2015

Studies polymerisation mechanisms and methods for producing biodegradable materials. His work has laid the foundations for many modern polymer materials used in, among other areas, biomedicine.

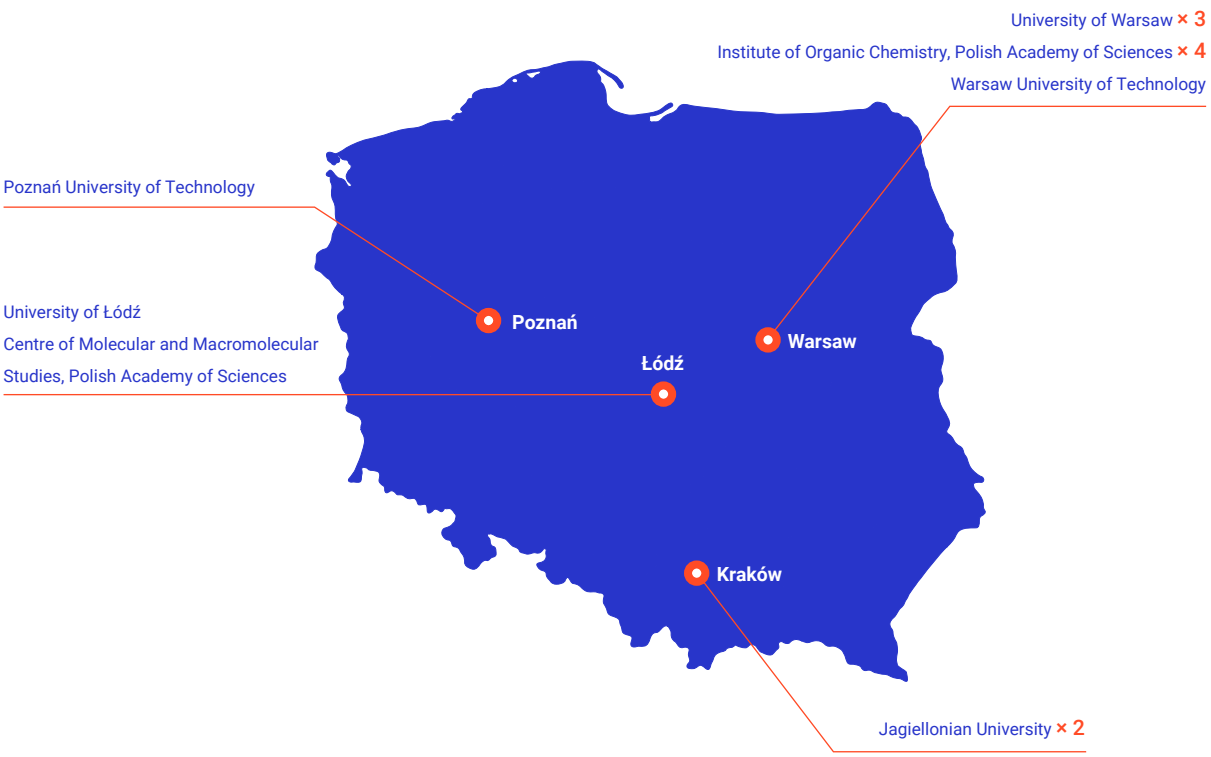
Prof. Szczepan Zapotoczny | ORGANIC AND MATERIALS CHEMIST

Affiliation: Jagiellonian University, Faculty of Chemistry

Awards: TEAM 2016, MAESTRO 2023

Designs functional materials and nanostructures with precisely controlled properties, studying thin films and microcapsules capable of carrying or controlled-releasing various substances.

SITES OF TOP RESEARCH IN MODERN MATERIALS AND MOLECULAR CHEMISTRY, BY RESEARCHER AFFILIATION



ERC	FNP	MAB	MAESTRO	TEAM	TOP 2%
4	7	1	6	6	8

Fundamental Properties of Matter



Prof. Krzysztof Pachucki
Photo Magdalena Wiśniewska-Krasińska

We want to find out how accurate our current laws of nature really are. We verify the laws of physics by comparing very precise calculations with experiments. If they don't agree, that is a signal to us that perhaps there is something we don't know. It is quite possible that there are some other, as yet unknown forces. We would very much like to discover them. It usually turns out that the experimental results are at fault. But if, upon re-examination, a discrepancy still appears, that becomes the basis for discovering new laws of physics, new forces. (…) Everyone hopes that it will be they who find something. And will they succeed? None of us knows. Discoveries cannot be made to order.

Prof. Krzysztof Pachucki[15]

Research into the fundamental properties of matter seeks to answer the most basic questions: What is the world made of? What fundamental laws govern it? Scientists working in this field strive to understand how the Universe came into being and why it has its current properties. Prof. Marek Andrzej Gaździcki and Prof. Grzegorz Zuzel study collisions of elementary particles and nuclear matter – processes occurring at the most fundamental level of matter's structure, often under conditions recreating those that prevailed just after the Big Bang. Prof. Leszek Roszkowski, meanwhile, works on the theory of elementary particles and cosmology, including the problem of dark matter, which – though invisible – according to current models accounts for a substantial fraction of the mass of the Universe.

Another important strand of research studies the properties and behaviour of materials and molecules under various conditions. Prof. Marian Paluch and Prof. Michał Tomza analyse the properties of matter under extreme conditions such as high pressures and low temperatures. Prof. Robert Hołyst studies complex systems – from fluids to biological processes – showing how simple interactions between individual particles give rise to complex collective phenomena.

Another group of researchers works on the more abstract dimension of reality, described in the language of theory and mathematics. Prof. Krzysztof Pachucki studies the precise properties of atoms and quantum interactions, testing the fundamental laws governing them.

15 Original interview in Polish: "Laureaci Nagród Fundacji na rzecz Nauki Polskiej 2018. Wywiady 2018" https://www.fnp.org.pl/component/fnp_pages/page/wszystkie-publikacje

Prof. Józef Spałek works on the theory of condensed matter, seeking to explain the remarkable properties of many materials that standard theories cannot account for.

Prof. Krzysztof Pachucki | THEORETICAL PHYSICIST

Affiliation: University of Warsaw, Faculty of Physics

Awards: Top 2%, FNP Prize 2018

Prof. Krzysztof Pachucki works in theoretical physics, producing extremely precise calculations describing the behaviour of atoms and the simplest molecules. He develops theoretical predictions of record accuracy that allow experimental results to be compared with the predictions of quantum mechanics and quantum electrodynamics. Together with his team, he develops mathematical and computational methods for calculating energies, spectra, and subtle quantum effects to many decimal places – a level of precision at which it becomes possible to examine whether the current laws of physics are truly complete. His work has been particularly important in research on the hydrogen molecule, where it proved possible to account for exceedingly fine effects arising from quantum electrodynamics and the coupled motion of electrons and atomic nuclei.

Prof. Pachucki's research is significant for modern precision physics as a whole, enabling better determination of fundamental physical constants and testing the boundaries of existing theories of matter and interactions. In practical terms, his work demonstrates how far the precision of scientific measurements and calculations can be pushed today – to the level at which the smallest effects predicted by quantum physics are already being examined.

Prof. Józef Spałek | THEORETICAL PHYSICIST

Affiliation: Jagiellonian University, Faculty of Physics, Astronomy and Applied Computer Science

Awards: Top 2%, FNP Prize 2016

The work of Prof. Józef Spałek and his group concerns materials in which electrons interact so strongly with one another that the movement of each particle affects all the others. Such "strongly correlated" materials often display remarkable properties that cannot be explained by classical solid-state theory. One of the most important areas of his research in theory of

strongly correlated materials is high-temperature superconductivity – the phenomenon in which certain materials conduct current without resistance at temperatures significantly higher than those of classical superconductors. He seeks to explain why, in certain materials, electrons form a distinctive quantum state that allows electric current to flow without resistance.

Prof. Spałek's research is primarily theoretical in character, based on advanced mathematical models and computer simulations, and aimed at understanding the fundamental laws governing modern quantum materials. Although it addresses basic questions in physics, it is potentially relevant to future technologies in energy-efficient electronics, new conducting materials, and quantum technologies. His work is among the important achievements of the Polish school of condensed matter theory and is widely cited in research on superconductivity and quantum materials.

Prof. Grzegorz Zuzel | PARTICLE PHYSICIST

Affiliation: Jagiellonian University, Faculty of Physics, Astronomy and Applied Computer Science

Awards: TEAM 2016, MAESTRO 2023

Prof. Grzegorz Zuzel studies some of the rarest processes occurring in nature. His goal is to detect extraordinarily weak signals that may provide information about the fundamental properties of matter and help answer questions that go beyond the current limits of physical knowledge. Neutrinos – nearly massless, weakly interacting particles – play a central role in this research, as they may provide clues about the origins of the Universe and the reasons why matter came to dominate over antimatter.

To observe such rare phenomena, Prof. Zuzel's team develops exceptionally sensitive detectors and methods for reducing natural background radiation that would otherwise mask the signals being sought. Many experiments are carried out in underground laboratories, where a thick layer of rock shields the equipment from cosmic radiation. This makes it possible to record events that occur extremely rarely – sometimes less than once in 10^{18} ordinary processes.

This research forms part of the global search for "new physics" – phenomena unexplained by the current Standard Model of particle physics. Although fundamental in character, it deepens our understanding of the structure of matter, the evolution of stars and galaxies, and the limits of our current theories describing nature.

Prof. François Béguin | MATERIALS CHEMIST

Affiliation: Poznań University of Technology, Faculty of Chemical Technology

Awards: Top 2%, MAESTRO 2016

Works on materials for rapid, efficient energy storage, particularly supercapacitors used in modern electronics and energy systems.

Prof. Piotr Bizoń | MATHEMATICAL PHYSICIST

Affiliation: Jagiellonian University, Faculty of Physics, Astronomy and Applied Computer Science

Awards: Top 2%, MAESTRO 2017

Studies the fundamental laws governing spacetime, gravity, and the propagation of waves in the Universe, combining advanced mathematics with computer simulation. His work is among the most significant achievements of contemporary mathematical physics.

Prof. Marek Andrzej Gaździcki | PARTICLE PHYSICIST

Affiliation: Jan Kochanowski University in Kielce, Faculty of Exact and Natural Sciences

Awards: Top 2%, MAESTRO 2018

Studies high-energy collisions of atomic nuclei, having co-created experiments that analyse matter under conditions similar to those present just after the Big Bang, advancing understanding of how matter behaves under extreme conditions.

Prof. Robert Hołyst | PHYSICIST AND PHYSICAL CHEMIST

Affiliation: Institute of Physical Chemistry PAS

Awards: Top 2%, MAESTRO 2016

Studies how particles and molecules move and interact in complex systems such as liquids and biological materials, illuminating processes in both inanimate matter and living organisms.

Prof. Dariusz Kaczorowski | PHYSICIST

Affiliation: Institute of Low Temperature and Structure Research PAS

Awards: Top 2%, MAESTRO 2015

Analyses the properties of quantum materials, including superconductors and compounds with unusual magnetic and electronic characteristics. Known for experimental work on materials in which rare quantum effects and strong electron correlations emerge.

Prof. Marian Paluch | PHYSICIST

Affiliation: University of Silesia in Katowice, Faculty of Mathematics, Physics and Chemistry; Silesia MacroSynth Group

Awards: Top 2%, MAESTRO 2018

Studies how matter – glasses, liquids, and related systems – changes its properties under extreme conditions, particularly as it transitions between states of aggregation in ways that do not produce a classical solid.

Prof. Marek Potemski | PHYSICIST

Affiliation: Warsaw University of Technology, CEZAMAT Advanced Technology Centre, CENTERA

Awards: Top 2%, TEAM 2016

Conducts experiments in very strong magnetic fields and at low temperatures, observing unusual electron behaviour that cannot be explained by classical physics, including quantum phenomena in semiconductors and two-dimensional materials such as graphene.

Prof. Leszek Roszkowski | THEORETICAL PHYSICIST

Affiliation: Nicolaus Copernicus Astronomical Center PAS, AstroCeNT; International Institute for Particle Astrophysics PAS

Awards: Top 2%, MAESTRO 2015, MAB 2016

Develops theoretical models of elementary particles and dark matter, working to establish what properties dark matter might have and how it could be detected experimentally.

Prof. Michał Tomza | THEORETICAL PHYSICIST

Affiliation: University of Warsaw, Faculty of Physics

Awards: ERC Starting Grant 2021, NCN Prize 2020

Studies how atoms and molecules behave under extreme, ultracold conditions and how individual particles can be controlled with very high precision, enabling the creation of new states of matter and quantum-level control of reactions.

Prof. Jacek W. Waluk | PHYSICAL CHEMIST

Affiliation: Institute of Physical Chemistry PAS

Awards: Top 2%, MAESTRO 2016

Specialises in spectroscopy and photochemistry, studying how individual molecules change their structure under the influence of light and transfer energy on timescales measured in picoseconds and femtoseconds. His research is making it possible to observe chemical processes playing out almost "frame by frame".

SITES OF TOP RESEARCH IN FUNDAMENTAL PROPERTIES OF MATTER, BY RESEARCHER AFFILIATION



ERC	FNP	MAB	MAESTRO	NCN	TEAM	TOP 2%
1	2	1	9	1	2	11

Quanta: Physics and Quantum Technologies



Prof. Konrad Banaszek
Photo OneHD

Poland has always been strong in theoretical science, in mathematics and theoretical physics. That laid a very solid foundation for work in quantum computing. For many years, however, underfunding of experimental research was a chronic problem in Poland, because equipment costs money. Today, as far as laboratories go, the vast majority of Polish academic centres have no reason to feel inferior internationally. We have the potential to conduct research at the same level as teams from Western Europe, the USA, or China.

Prof. Konrad Banaszek[16]

Physics and quantum technologies describe the world at its most fundamental scale – a scale governed by rules that are often deeply counterintuitive. Researchers such as Prof. Paweł Horodecki, Prof. Marek Żukowski, Prof. Dariusz Chruściński, and Prof. Karol Życzkowski analyse the fundamental properties of quantum systems, from entanglement and non-locality to the mathematical and theoretical underpinnings of quantum information. These questions are central to understanding the nature of reality at the level of atoms and particles.

Work on the technologies that exploit these phenomena is proceeding in parallel. Prof. Konrad Banaszek and Prof. Adam Miranowicz study how quantum states of light and matter can be controlled and applied to the processing, transmission, and securing of information – the foundation for quantum computers and secure communications.

Prof. Krzysztof Sacha, Prof. Piotr Wcisło, and Prof. Jakub Zakrzewski, meanwhile, study systems of many atoms and molecules under precisely controlled experimental conditions. Their work shows how quantum systems can be designed and used as platforms for testing theories and building new technologies – an area where fundamental physics meets the technologies of the future.

16 Original interview in Polish: "Druga rewolucja kwantowa". *Polityka*, January 18, 2023 https://www.polityka.pl/tygodnikpolityka/nauka/2197746,1,druga-rewolucja-kwantowa.read?

Prof. Konrad Banaszek | QUANTUM PHYSICIST

Affiliation: University of Warsaw, Centre for Quantum Optical Technologies (QOT)

Awards: Top 2%, TEAM 2016, MAB 2017, MAB 2023

Prof. Konrad Banaszek and his group work at the intersection of quantum information theory and quantum optics, focusing on the precise control and measurement of quantum states – especially of light. Their research addresses how very subtle quantum phenomena, which are easily disrupted, can in practice be reconstructed and analysed, and how reliable information can be extracted from them. In particular, they are developing methods for accurately reading quantum states and transmitting information over long distances, with errors arising from equipment imperfections and environmental noise minimised.

This team's work is of major importance for the development of quantum technologies, as it demonstrates how abstract models can be translated into functioning laboratory systems. The solutions being developed find application in quantum communications and in very precise measurement methods. The research thus bridges theory and practice, contributing to technologies that exploit quantum phenomena in real-world applications.

Prof. Paweł Horodecki | QUANTUM PHYSICIST

Affiliation: University of Gdańsk, International Centre for Theory of Quantum Technologies (ICTQT)

Awards: Top 2%, MAB 2017

Prof. Paweł Horodecki works on quantum information theory – studying how the laws of quantum mechanics can be used to store, process, and transmit information. A central theme in his work – as well as that of Prof. Marek Żukowski – is *quantum entanglement*.

Prof. Horodecki co-created some of the most important tools for the study of quantum entanglement, including the "Horodecki criteria" – conditions that allow the question of whether a given quantum state is entangled to be definitively resolved. These have become a standard element of modern quantum information theory and are used by researchers worldwide. He also discovered a specific type of entanglement that cannot be directly used for standard quantum communication tasks – a finding that opened up a rich line of research into the diverse forms and practical limits of entanglement. His work combines highly abstract

mathematics with potential technological applications, laying theoretical foundations for secure quantum communications, quantum computers, and future information technologies. It belongs to the bedrock of modern quantum information theory and continues to shape the direction of the field globally.

Prof. Marek Żukowski | THEORETICAL PHYSICIST

Affiliation: University of Gdańsk, International Centre for the Theory of Quantum Technologies (ICTQT)

Awards: Top 2%, MAB 2017, MAB 2023

Prof. Marek Żukowski and his team work in quantum physics, and in particular on one of its most puzzling phenomena: quantum entanglement. This describes a situation in which two particles remain correlated in such a way that measuring one instantly determines the state of the other, regardless of the distance between them. Prof. Żukowski investigates how these correlations work and what they reveal about the nature of reality.

One of his most celebrated contributions was co-developing the concept of *entanglement swapping* – demonstrating that two particles which have never previously interacted can become entangled via the entanglement of their respective partners. The effect was subsequently confirmed experimentally. This places Prof. Żukowski among the most internationally recognised Polish physicists working in quantum information.

His work is also relevant to future technologies, as quantum entanglement underpins quantum cryptography, quantum computing, and enhanced-security quantum communications. His theoretical work has helped establish the mathematical foundations for these technologies and shown how quantum phenomena can be translated into practical applications – for example, for transmitting information in a way that is essentially impossible to intercept undetected.

Prof. Katharina Boguslawski | QUANTUM CHEMIST

Affiliation: Nicolaus Copernicus University in Toruń, Faculty of Physics, Astronomy and Applied Computer Science

Awards: ERC Starting Grant 2022, NCN Prize 2023

Develops computational methods for describing multi-electron systems such as complex molecules and materials, focusing on improving the accuracy of electron theory in cases where strong electron–electron interactions make standard quantum chemistry approximations inadequate.

Prof. Dariusz Chruściński | THEORETICAL PHYSICIST

Affiliation: Nicolaus Copernicus University in Toruń, Faculty of Physics, Astronomy and Applied Computer Science

Awards: Top 2%, MAESTRO 2018

Works on the mathematical foundations of quantum mechanics and quantum information, studying how information behaves in quantum systems and how delicate quantum effects decay upon contact with the environment.

Prof. Adam Miranowicz | THEORETICAL PHYSICIST

Affiliation: Adam Mickiewicz University in Poznań, Faculty of Physics and Astronomy

Awards: Top 2%, MAESTRO 2019

Studies how quantum phenomena can be used to process and transmit information, and how quantum systems interact with their surroundings. His work addresses the foundations of quantum technologies including quantum communication and future quantum computing systems.

Prof. Krzysztof Sacha | THEORETICAL PHYSICIST

Affiliation: Jagiellonian University, Faculty of Physics, Astronomy and Applied Computer Science

Awards: Top 2%, FNP Prize 2024

Studies systems of many atoms and molecules in quantum experiments. He is known for pioneering work on time crystals – systems that repeat their behaviour in time in a manner analogous to the spatial periodicity of ordinary crystals.

Prof. Piotr Wcisło | PHYSICIST

Affiliation: Nicolaus Copernicus University in Toruń, Faculty of Physics, Astronomy and Applied Computer Science

Awards: ERC Starting Grant 2022, NCN Prize 2022

Conducts extremely precise measurements using lasers and atomic clocks, studying how light can be used to measure time and frequency with record accuracy – enabling tests sensitive enough to detect very subtle effects beyond the reach of classical measurement methods.

Prof. Jakub Zakrzewski | THEORETICAL PHYSICIST

Affiliation: Jagiellonian University, Faculty of Physics, Astronomy and Applied Computer Science; Centre for Theoretical Physics PAS

Awards: Top 2%, Polish-French Marie Skłodowska-Curie and Pierre Curie Scientific Prize 2019

Studies systems of many interacting quantum particles under ultra-cold conditions, analysing how complex collective phenomena and new states of matter arise from simple interactions between atoms.

Prof. Karol Życzkowski | THEORETICAL PHYSICIST

Affiliation: Jagiellonian University, Faculty of Physics, Astronomy and Applied Computer Science; Centre for Theoretical Physics PAS

Awards: Top 2%, MAESTRO 2015, ERC Advanced Grant 2023

Studies the mathematical foundations of quantum mechanics and quantum information theory, analysing complex random systems, quantum entanglement, and the geometry of quantum states – combining mathematics, physics, and information theory in the description of quantum phenomena.

SITES OF TOP RESEARCH IN QUANTA: PHYSICS AND QUANTUM TECHNOLOGIES, BY RESEARCHER AFFILIATION



ERC	FNP	MAB	MAESTRO	NCN	TEAM	TOP 2%
3	2	5	3	2	1	8



Prof. Rafał Latała
Photo Magdalena Wiśniewska-Krasińska

Mathematics, Computer Science, and Artificial Intelligence

The Hungarian mathematician Paul Erdős argued that there exists a book of mathematical proofs, in the hands of God or some other Supreme Being. In Erdős's view, a mathematician need not believe in God, but should indeed believe in the existence of this book – because the most beautiful proofs of theorems are recorded in it.

Prof. Rafał Latała[17]

This research area encompasses research into the foundations of information processing – from rigorous mathematical theories to algorithms and their applications in data analysis and decision-making. The work of such expert scientists as Prof. Mikołaj Bojańczyk and Prof. Piotr Sankowski focuses on the theoretical foundations of computation and the analysis of algorithms that enable complex problems to be solved efficiently. Prof. Stefan Dziembowski, meanwhile, works in cryptography – developing methods for the secure processing and transmission of information that are crucial to the modern digital world.

In parallel, advanced mathematical tools are being developed for describing uncertainty, randomness, and structures of high complexity with precision. Researchers such as Prof. Rafał Latała and Prof. Piotr Śniady work on advanced probability theory and mathematical analysis, which form the foundation for modern machine learning methods. Prof. Roman P. Słowiński and Prof. Piotr Faliszewski, meanwhile, work on decision-making mechanisms and the modelling of preferences – both in AI systems and in social contexts such as electoral analysis.

Research in this area also has a strong practical dimension. Prof. Przemysław Biecek develops methods for understanding how artificial intelligence models reach their decisions, and Prof. Piotr Skowron studies how to make fair decisions in data-driven systems.

17 Original interview in Polish: "Laureaci Nagród Fundacji na rzecz Nauki Polskiej 2023. Wywiady 2023" https://www.fnp.org.pl/component/fnp_pages/page/wszystkie-publikacje

Prof. Stefan Dziembowski | THEORETICAL COMPUTER SCIENTIST

Affiliation: University of Warsaw, Faculty of Mathematics, Informatics and Mechanics

Awards: Top 2%, TEAM 2016, Polish-German COPERNICUS Prize 2020, MAESTRO 2019, ERC Advanced Grant 2019

Prof. Stefan Dziembowski works on protecting information in the digital world – making data secure, private, and resistant to attack. His field is cryptography, which encompasses both the encryption of messages and the design of entire systems that function correctly even when subjected to deliberate deception or attack. In practice, this means developing methods that enable secure internet banking, online document signing, and electronic voting – systems whose security rests on mathematics and well-designed protocols rather than on the goodwill of their participants. He also works on the security foundations of cryptocurrencies and blockchain technology, analysing what conditions must be met for these systems to operate stably and honestly, even under adversarial conditions.

Prof. Rafał Latała | MATHEMATICIAN

Affiliation: University of Warsaw, Faculty of Mathematics, Informatics and Mechanics

Awards: MAESTRO 2015, FNP Prize 2023

Prof. Latała studies randomness and uncertainty in mathematics, seeking to understand how complex systems behave under the influence of random factors. His work encompasses the analysis of large mathematical structures and advanced probability theory, enabling the modelling and prediction of phenomena that appear chaotic or resistant to systematic description.

His research also has practical applications in computer science and artificial intelligence. The theoretical results he develops help to design algorithms that are robust to randomness in data or uncertainty in machine learning processes, making it possible to build systems that function stably even with unpredictable inputs or under changing conditions. More broadly, his work shows how the mathematics of randomness can bridge theory and practice: deepening our understanding of the fundamental properties of mathematical structures, while enabling the design of tools and algorithms useful in real-world applications, from data analysis to advanced computing systems.

Prof. Piotr Sankowski | THEORETICAL COMPUTER SCIENTIST

Affiliation: University of Warsaw, Faculty of Mathematics, Informatics and Mechanics; IDEAS Research Institute; MIM Fertility

Awards: ERC Proof of Concept 2015, ERC Consolidator Grant 2017, NCN Prize 2018, ERC Proof of Concept 2022

Prof. Piotr Sankowski creates and analyses algorithms and data structures – the methods by which computers store and process information. He is interested in designing fast and efficient solutions to computational problems, with a focus not only on speed of execution but on effectiveness when tackling mathematically complex problems. A major strand of his research concerns graph algorithms for analysing computer, communication and social networks. These methods can be used to identify connections, manage data efficiently and address practical challenges such as transport optimisation. His work spans both fundamental research and applications including network analysis, computer-system optimisation and large-scale data processing.

Prof. Przemysław Biecek | COMPUTER SCIENTIST

Affiliation: Warsaw University of Technology, Centre for Trustworthy Artificial Intelligence

Awards: MAB 2024, Top 2%

Works in data analysis and artificial intelligence, studying how algorithms learn from large datasets. He develops methods for understanding and explaining the decisions made by AI systems – important in fields such as medicine, finance, and public administration, where algorithmic transparency and accountability are essential.

Prof. Mikołaj Bojańczyk | THEORETICAL COMPUTER SCIENTIST

Affiliation: University of Warsaw, Faculty of Mathematics, Informatics and Mechanics

Awards: Top 2%, MAESTRO 2024

Studies the mathematical foundations of formal languages, algorithms, and computer logic, analysing which problems computers can solve efficiently and how complex data structures such as XML documents, trees, and relational networks can be formally described and analysed.

Prof. Piotr Faliszewski | THEORETICAL COMPUTER SCIENTIST

Affiliation: AGH University in Kraków, Faculty of Computer Science

Awards: Top 2%, ERC Consolidator Grant 2020

Specialises in computational social choice theory, studying algorithms for collective decision-making designed to be fair, resistant to manipulation, and genuinely representative of participants' preferences. His research finds application in both democratic processes and decision-support systems.

Prof. Piotr Nowak | MATHEMATICIAN

Affiliation: Institute of Mathematics PAS

Awards: ERC Starting Grant 2015, MAESTRO 2021

Studies complex mathematical structures arising in spaces of many – sometimes infinitely many – dimensions, developing tools for describing such objects rigorously and systematically.

Prof. Piotr Skowron | THEORETICAL COMPUTER SCIENTIST

Affiliation: University of Warsaw, Faculty of Mathematics, Informatics and Mechanics

Awards: Top 2%, ERC Starting Grant 2022

Analyses efficient methods for group decision-making and process organisation, developing algorithms that help produce fairer and more representative collective decisions, for example in elections or participatory budgeting.

Prof. Roman P. Słowiński | COMPUTER SCIENTIST AND MATHEMATICIAN

Affiliation: Poznań University of Technology, Faculty of Computing and Telecommunications

Awards: Top 2%, MAESTRO 2023

Studies methods for making decisions in complex situations requiring multiple, often conflicting criteria to be weighed simultaneously. Particularly known for developing multi-criteria analysis methods and the use of artificial intelligence in decision support systems.

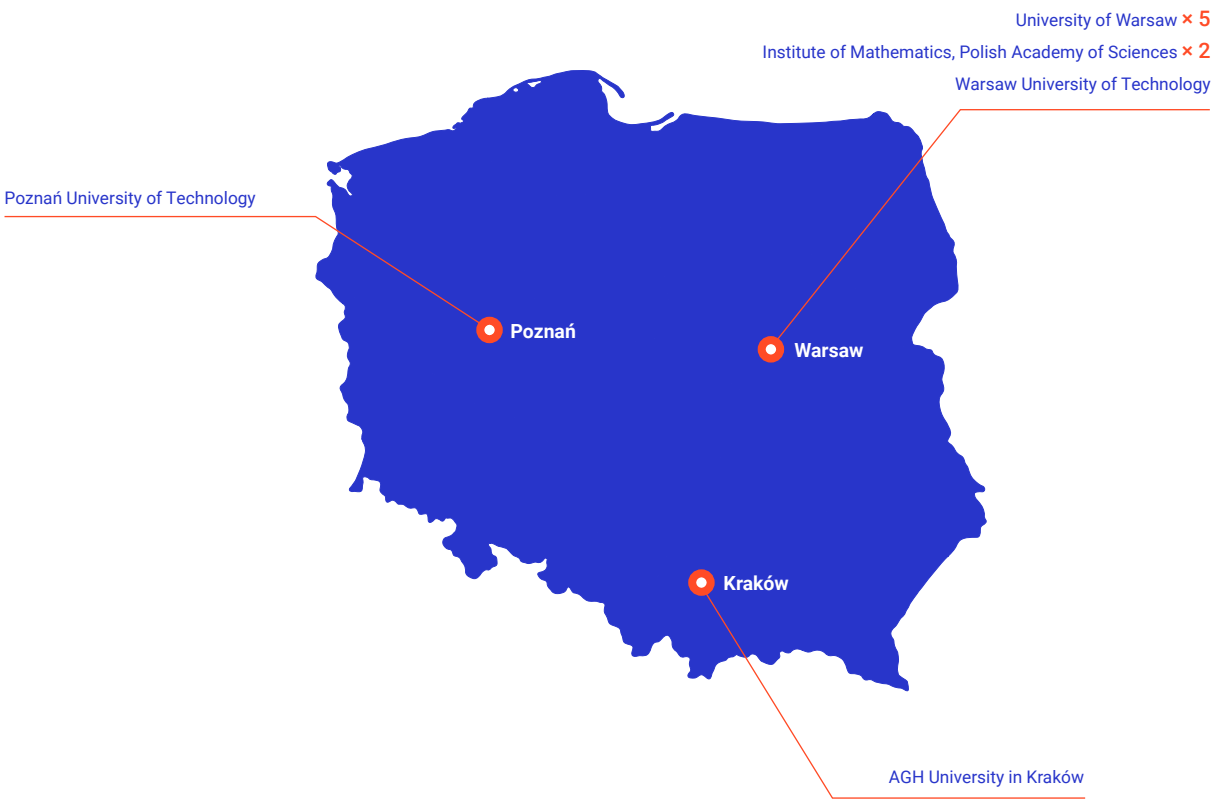
Prof. Piotr Śniady | MATHEMATICIAN

Affiliation: Institute of Mathematics PAS

Awards: NCN Prize 2015, MAESTRO 2017

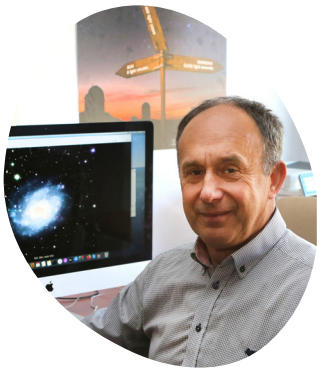
Studies probability theory and random mathematical structures and their connections to physics and data analysis, developing frameworks for describing complex systems characterised by high degrees of uncertainty and interdependence – from physical models to modern methods of information analysis.

SITES OF TOP RESEARCH IN MATHEMATICS, COMPUTER SCIENCE, AND ARTIFICIAL INTELLIGENCE, BY RESEARCHER AFFILIATION



ERC	FNP	MAB	MAESTRO	NCN	TEAM	TOP 2%
7	2	1	6	2	1	6

Astronomy and Astrophysics



Prof. Grzegorz Pietrzyński
Photo Magdalena Wiśniewska-Krasińska

If we look at the history of astrophysics, each successive improvement in precision has led to a revolution in our understanding. One example is the discovery of the expansion of the Universe. Measurements of distance became accurate enough for us to see that our Universe is expanding. That was an enormous discovery, with an impact not only on astronomy, but also on philosophy and literature. Our knowledge of the Universe is part of our cultural heritage. The next refinement in precision led to the discovery of dark energy. The Universe is not only expanding, but is doing so at an ever-increasing rate. We don't know why, and so the concept of dark energy has emerged – a mysterious phenomenon whose physical nature remains unknown.

Prof. Grzegorz Pietrzyński[18]

The research area of astronomy and astrophysics encompasses the study of the wider Universe – from its largest-scale structures down to individual stars and exotic cosmic objects. By combining sky observations with theoretical models, astronomers and astrophysicists study the evolution of cosmic objects and the fundamental laws governing matter and energy in the cosmos. Prof. Andrzej Udalski, Prof. Grzegorz Pietrzyński, and Prof. Igor Soszyński observe stars and galaxies, discover and characterise variable stars, and use these observations to determine distances in the Universe with high precision. This research is fundamental to establishing the cosmic distance scale and to better understanding the structure and evolution of the Universe.

Prof. Tomasz Bulik and Prof. Andrzej Zdziarski work in high-energy astrophysics, studying objects such as black holes, neutron stars, and sources of X-ray and gamma radiation. Their work helps to understand the processes occurring in the most extreme environments the Universe has to offer.

18 Original interview in Polish: "Laureaci Nagród Fundacji na rzecz Nauki Polskiej 2021. Wywiady". https://www.fnp.org.pl/component/fnp_pages/page/wszystkie-publikacje

Prof. Tomasz Bulik | ASTROPHYSICIST

Affiliation: Nicolaus Copernicus Astronomical Center PAS

Awards: Top 2%, TEAM 2016, MAB 2016

Prof. Tomasz Bulik and his team study the most energetic and extreme phenomena in the Universe – collisions of neutron stars, supernova explosions, and the cataclysmic events that release vast quantities of matter and energy in fractions of a second, generating gravitational waves and gamma-ray bursts among other things. In his research he combines theoretical models with observational data, analysing the various signals reaching Earth from distant corners of the cosmos: not only light, but also gravitational waves – subtle ripples in spacetime produced by cosmic catastrophes – and high-energy radiation. By combining these different sources of information, it becomes possible to reconstruct the most dramatic moments in the life of the cosmos, to understand how black holes form, how matter behaves under extreme conditions, and what processes lie behind the most powerful explosions ever observed.

Prof. Grzegorz Pietrzyński | ASTRONOMER

Affiliation: Nicolaus Copernicus Astronomical Center PAS

Awards: Top 2%, ERC Advanced Grant 2015, MAESTRO 2017, FNP Prize 2021, Polish-French Marie Skłodowska-Curie and Pierre Curie Scientific Prize 2022

Prof. Grzegorz Pietrzyński works on the precise determination of distances in the Universe. His primary tool is pulsating variable stars, which vary in brightness in regular patterns that allow them to be used as cosmic yardsticks. His measurements are among the most accurate determinations of cosmic distances made anywhere in the world, and they form an important element of the modern cosmic distance scale. Thanks to his work, astronomers are able to determine more accurately the sizes of galaxies, the distances to nearby star clusters, and the rate of expansion of the Universe. Prof. Pietrzyński and his group also observe the properties of stars in different galaxies, analysing their masses, chemical compositions, and evolutionary histories – contributing to a broader understanding of how the Universe has evolved. This work combines telescopic observation with advanced data analysis, making it possible to calibrate cosmic distances accurately and to test cosmological models. In short, his research helps not only to map out the Universe but also to understand how galaxies and stars form and evolve over time.

Prof. Andrzej Udalski | ASTRONOMER

Affiliation: University of Warsaw, Astronomical Observatory

Awards: Top 2%, Polish-German COPERNICUS Prize 2024

Prof. Andrzej Udalski works in observational astronomy, focused on the long-term monitoring of enormous numbers of stars in our own and neighbouring galaxies. He leads the OGLE project – one of the world's largest sky-monitoring programmes – which continuously collects brightness data on millions of objects, making it possible to discover planets, study variable stars, and track unusual events such as gravitational microlensing. In practice, this work is something like maintaining a vast, continuously updated cosmic database and searching it for the subtle signals that reveal how the Universe works. A primary focus is variable stars, which serve as cosmic distance markers: by tracking how their brightness changes, astronomers can calculate how far away they are, enabling the construction of a map of the Universe and a better understanding of its dimensions.

Prof. Udalski's team also discovers planets beyond our Solar System – planets that cannot be directly observed – by detecting the brief brightening of a background star as an intervening object bends its light, a phenomenon known as *gravitational microlensing*.

Prof. Igor Soszyński | ASTRONOMER

Affiliation: University of Warsaw, Astronomical Observatory

Awards: Top 2%, MAESTRO 2016

Studies variable stars – those that change their brightness over time. By analysing them, he helps to determine distances in the Universe and to understand the structure and evolution of our Galaxy and neighbouring galaxies.

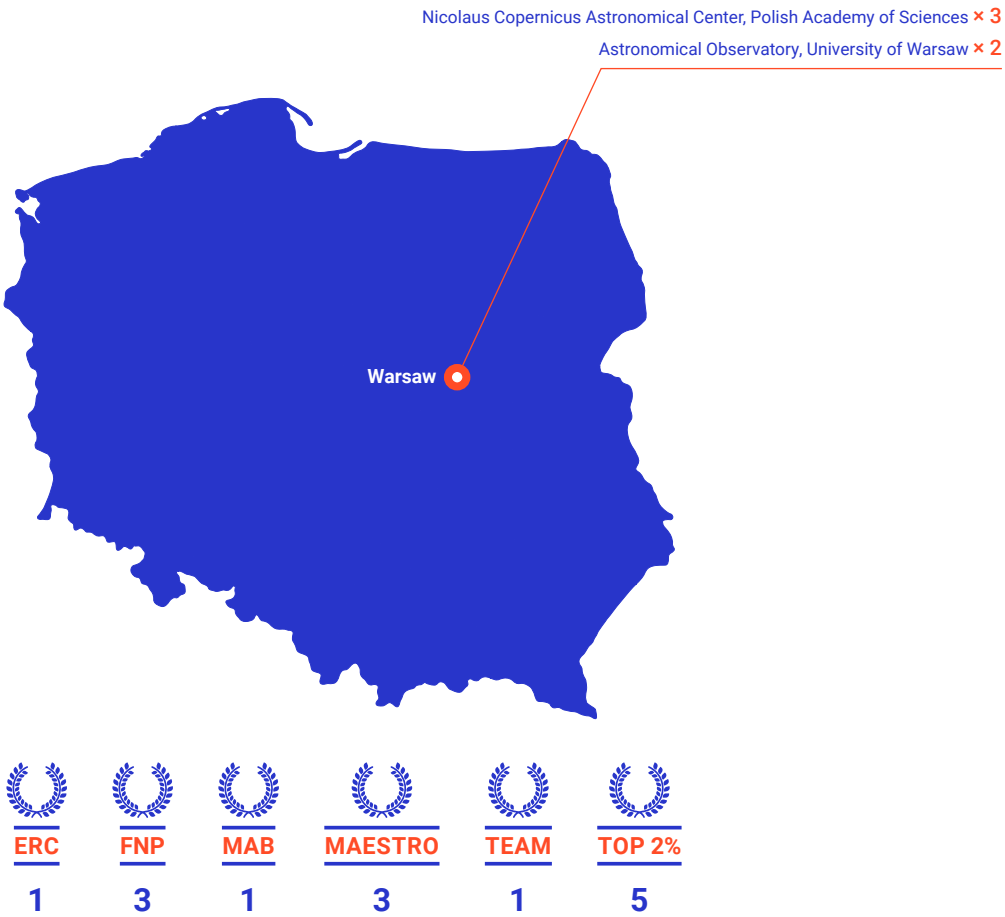
Prof. Andrzej A. Zdziarski | ASTROPHYSICIST

Affiliation: Nicolaus Copernicus Astronomical Center PAS

Awards: Top 2%, MAESTRO 2015

Studies some of the most extreme objects in the Universe, such as black holes and neutron stars. By analysing the X-ray and gamma radiation they emit, he seeks to understand how matter behaves under conditions that cannot be reproduced on Earth.

SITES OF TOP RESEARCH IN ASTRONOMY AND ASTROPHYSICS, BY RESEARCHER AFFILIATION



Life Sciences and Earth Sciences

Molecular Foundations of Life



Prof. Marta Miączyńska
Photo courtesy of IIMC

... one of our goals is to develop the foundations of innovative methods for treating human diseases for which current treatments are inadequate or unavailable. Under the RACE-PRIME project, we are pursuing two directions of research. The first is focused on antiviral and antibacterial therapeutic strategies; the second involves work on advanced models of rare diseases, which could ultimately enable the development of personalised therapies.

Prof. Marta Miączyńska

Research in this area focuses on understanding the life processes occurring in cells and organisms at the molecular level. It encompasses the analysis of DNA, RNA, proteins, and other biological molecules, as well as the mechanisms by which cells store information, communicate, produce energy, and respond to changes in their environment. This makes it possible to gain an ever-deeper understanding of the fundamental basis of how living organisms function and the mechanisms underlying many diseases. Researchers analyse how these molecules are constructed, how they interact, and how they control the most important processes occurring within the cell.

One of the key avenues of such research concerns the flow of genetic information and its regulation. Researchers including Prof. Marcin Nowotny, Prof. Andrzej Dziembowski, Prof. Janusz Bujnicki, and Prof. Ryszard Kierzek study mechanisms related to DNA and RNA, including their repair, processing, and structure. Prof. Szymon Świeżewski and Prof. Kinga Kamieniarz-Gdula analyse the regulation of gene activity and the processes that determine which pieces of genetic information are used under specific cellular conditions. Prof. Piotr Ziółkowski works on the mechanisms of inheritance and genetic variability, while Prof. Józef Dulak studies the molecular mechanisms of tissue regeneration and the role of genes and stem cells in the body's repair processes.

A second important strand of work concerns the organisation and functioning of the cell's interior. Prof. Marta Miączyńska and Prof. Agnieszka Chacińska analyse mechanisms of intracellular transport and the operation of specialised cellular structures such as mitochondria. Prof. Stefan Chłopicki studies the mechanisms of cardiovascular function at the molecular level, including processes related to oxidative stress and endothelial dysfunction.

Research into the processes by which living organisms obtain and process energy also forms an important part of this area. Prof. Artur Osyczka studies the molecular mechanisms of cellular respiration and energy production in cells, while Prof. Wiesław Ignacy Gruszecki analyses photosynthesis – the process by which plants convert solar energy into chemical energy.

Prof. Andrzej Dziembowski | MOLECULAR BIOLOGIST

Affiliation: International Institute of Molecular and Cell Biology in Warsaw

Awards: TEAM 2016, FNP Prize 2018, ERC Advanced Grant 2022, MAESTRO 2024

Prof. Andrzej Dziembowski works in RNA biology – studying the molecules that mediate between the information encoded in DNA and the functioning of the cell. He is particularly interested in how cells control the quality of RNA and recognise molecules that are damaged, incorrectly processed, or no longer needed. This can be compared to an elaborate quality-control system that continuously checks the accuracy of the biological instructions used by the cell.

His team studies the mechanisms responsible for the processing and degradation of RNA, as well as the proteins and molecular complexes that participate in these processes. This allows scientists to better understand how cells maintain the correct flow of genetic information and prevent the accumulation of errors that would disrupt their functioning.

This research is significant not only for understanding the fundamental mechanisms of life, but also for medicine. Disruptions in RNA function are associated with many diseases, including genetic disorders and cancers. A deeper understanding of these processes provides the knowledge needed to develop new RNA-based therapies and other modern treatment methods.

Prof. Marta Miączyńska | CELL BIOLOGIST

Affiliation: International Institute of Molecular and Cell Biology in Warsaw

Awards: TEAM 2016, MAB 2023

The research of Prof. Marta Miączyńska and her team concerns the way cells receive, transmit, and organise the information needed for their correct functioning. She is particularly interested in endosomes – small structures inside cells that were long regarded primarily as a transport system, moving various substances between different parts of the cell. Prof. Miączyńska's research has shown, however, that endosomes play a far more active role,

also functioning as coordination centres for signals within the cell. It is here that some signals arriving from the environment are integrated and processed, shaping the cell's "decisions" regarding growth, movement, division, and defensive responses. This means that the organisation of intracellular transport is closely connected to the control of cellular behaviour. Understanding how signals from the cell surface are processed inside it is crucial, because errors in these processes can lead to diseases including cancer. If a cell incorrectly reads or processes a signal, it may begin to divide in an uncontrolled way or fail to respond appropriately to stimuli from its surroundings. Cancer cells often exploit internal communication mechanisms for uncontrolled growth and the formation of metastases. A better understanding of the role of endosomes may in the future help develop more precise therapies.

Prof. Marcin Nowotny | STRUCTURAL BIOLOGIST

Affiliation: International Institute of Molecular and Cell Biology in Warsaw

Awards: TEAM 2016, FNP Prize 2022

Prof. Marcin Nowotny studies the molecular mechanisms responsible for maintaining and protecting the genetic information encoded in DNA and RNA. He is primarily interested in how cells detect damage to genetic material, repair the errors that arise, and ensure the correct course of processes related to the reading of genetic information. His research makes use of structural biology methods, which allow the structure of proteins and other biological molecules to be resolved with very high precision. His team is thereby able to analyse how the enzymes responsible for copying, repairing, and processing DNA and RNA function, and how they cooperate with one another in the complex processes occurring within the cell.

Prof. Nowotny's research advances understanding of the fundamental mechanisms underlying the functioning of living organisms and the disease processes that stem from damage to genetic material, while also providing knowledge applicable to the development of new diagnostic and therapeutic methods.

Prof. Janusz Bujnicki | BIOINFORMATICIAN

Affiliation: International Institute of Molecular and Cell Biology in Warsaw

Awards: Top 2%, TEAM 2016, MAESTRO 2017

Uses computational methods to predict the structure and function of RNA and proteins, designing new biological molecules and exploring how their functions can be programmed in a manner analogous to computer systems.

Prof. Agnieszka Chacińska | CELL BIOLOGIST

Affiliation: International Institute of Molecular Mechanisms and Machines PAS (IMol)

Awards: Polish-German COPERNICUS Prize 2016, MAB 2016, MAESTRO 2015

Studies mitochondria – the structures responsible for producing most of a cell's energy – analysing how the correct proteins reach mitochondria and how disruptions in these processes affect cell function and contribute to the development of disease.

Prof. Stefan Chłopicki | PHARMACOLOGIST

Affiliation: Jagiellonian University, Jagiellonian Centre for Drug Development

Awards: Top 2%, MAESTRO 2021

Studies the functioning of blood vessels and the role of the endothelium – the thin layer of cells lining their interior – analysing how vascular dysfunction contributes to the development of cardiovascular disease and how it can be detected earlier and treated more effectively.

Prof. Józef Dulak | MOLECULAR AND MEDICAL BIOLOGIST

Affiliation: Jagiellonian University, Faculty of Biochemistry, Biophysics and Biotechnology

Awards: Top 2%, MAESTRO 2018

Studies the mechanisms of tissue regeneration and the role of genes and stem cells in repairing damage to the body, with work that helps to develop gene and cell therapies for serious diseases.

Prof. Wiesław Ignacy Gruszecki | BIOPHYSICIST

Affiliation: Maria Curie-Skłodowska University in Lublin, Faculty of Mathematics, Physics and Computer Science

Awards: Top 2%, TEAM 2016, MAESTRO 2016

Studies how plants absorb, transfer, and protect light energy during photosynthesis, analysing the natural optical systems present in plant cells and the mechanisms that protect them from excess light.

Prof. Kinga Kamieniarz-Gdula | MOLECULAR BIOLOGIST

Affiliation: Adam Mickiewicz University in Poznań, Faculty of Biology; Centre for Genome Regulation

Awards: ERC Starting Grant 2021, ERC Proof of Concept 2024

Studies how cells control the termination of information readout from DNA, analysing how this process influences the production of different RNA molecules and how its disruption can lead to diseases including cancer.

Prof. Ryszard Kierzek | CHEMIST AND MOLECULAR BIOLOGIST

Affiliation: Institute of Bioorganic Chemistry PAS

Awards: Top 2%, Polish-American Scientific Prize 2016

Studies the structure of RNA and the ways in which RNA molecules interact with one another, developing methods for designing and modifying RNA used in biological research and the development of RNA-based therapies.

Prof. Artur Osyczka | BIOPHYSICIST

Affiliation: Jagiellonian University, Faculty of Biochemistry, Biophysics and Biotechnology

Awards: MAESTRO 2015, TEAM 2017

Studies how cells produce energy and how the molecular mechanisms of cellular respiration function, analysing the proteins responsible for electron transport and the conversion of energy into a form usable by living organisms.

Prof. Szymon Świeżewski | MOLECULAR BIOLOGIST

Affiliation: Institute of Biochemistry and Biophysics PAS

Awards: TEAM 2016, NCN Prize 2017

Works on epigenetics and gene regulation in plants, studying how plants control gene activity and adapt their development to changing environmental conditions.

Prof. Piotr Ziółkowski | MOLECULAR BIOLOGIST

Affiliation: Adam Mickiewicz University in Poznań, Faculty of Biology

Awards: TEAM 2017, MAESTRO 2024

Studies the mechanisms of genetic inheritance and the processes responsible for the exchange of DNA fragments during reproduction, explaining how cells control the stability of genetic material while also generating genetic diversity.

SITES OF TOP RESEARCH IN MOLECULAR FOUNDATIONS OF LIFE, BY RESEARCHER AFFILIATION



ERC	FNP	MAB	MAESTRO	NCN	TEAM	TOP 2%
3	4	2	8	1	8	5



Prof. Jacek Jemielity
Photo OneHD

Drugs and Therapies of the Future

mRNA technology is changing the way we think about medicines. Our goal is not only to harness its potential, but above all to push its limits. By designing new chemical solutions for mRNA, we are making it more effective and safer, opening the way to therapies that seemed impossible just a few years ago.

Prof. Jacek Jemielity

This area focuses on understanding the mechanisms of disease and developing new methods of diagnosis and treatment. Researchers such as Prof. Tadeusz Holak, Prof. Joanna Ida Sułkowska, Prof. Adam Szewczyk, and Prof. Henryk Kozłowski analyse the structure, properties, and interactions of biological molecules in order to better understand the processes occurring in cells and identify new therapeutic targets.

An important part of this research concerns the design of drugs and modern medical technologies. Prof. Marcin Drąg develops tools for studying enzymes used in diagnostics and the discovery of new therapies; Prof. Jacek Jemielity develops mRNA technologies with applications including vaccines and gene therapies; and Prof. Krzysztof Sobczak studies the molecular basis of genetic diseases associated with impaired RNA function. Prof. Jan S. Potempa, meanwhile, analyses the mechanisms by which pathogenic bacteria function, helping to develop new strategies for combating infections.

Research into therapies for specific diseases is also an important direction. Prof. Jakub Fichna seeks new methods for treating gastrointestinal disorders; Prof. Piotr P. Ponikowski develops diagnostics and therapies for cardiovascular diseases; and Prof. Magdalena Król studies modern methods for treating cancer, including those that harness the patient's own immune system. Prof. Magdalena Winiarska analyses the mechanisms of the immune response in blood and lymphatic system cancers, contributing to the development of new diagnostic and therapeutic methods.

Prof. Marcin Drąg | BIOLOGICAL CHEMIST

Affiliation: Wrocław University of Science and Technology, Faculty of Chemistry

Awards: TEAM 2017, FNP Prize 2019

Prof. Marcin Drąg and his group seek to understand how *enzymes* – proteins that act as highly precise operators of chemical reactions in the body – recognise their specific target molecules and what determines their high selectivity and effectiveness. Understanding these mechanisms is crucial, because enzymes control virtually all processes occurring in cells.

Prof. Drąg's team develops advanced sets of synthetic molecules that act as probes, allowing the activity of specific enzymes to be detected in real time. This makes it possible to observe which biochemical processes are occurring in cells at any given moment – both in healthy tissue and during the development of disease. Among other advantages, this approach enables the very early identification of changes associated with cancers or infections and a better understanding of the mechanisms of their development. This knowledge, in turn, enables the design of new drugs that can selectively block or modify the activity of enzymes associated with disease.

Prof. Jacek Jemielity | CHEMIST

Affiliation: University of Warsaw, Centre of New Technologies

Awards: TEAM 2016, FNP Prize 2021

Designs and modifies the chemical structure of mRNA molecules to increase their stability and effectiveness. His research has become an important component of the development of modern therapies and vaccines based on mRNA technology.

He investigates how to improve messenger RNA (mRNA) molecules, which carry into cells the instructions for producing particular proteins. Prof. Jemielity's team develops chemical solutions that make mRNA more stable and considerably more effective. One of the team's most important achievements has been to develop new ways of modifying the mRNA "cap" – a small element at the beginning of the molecule. Refining this structure allows mRNA to deliver the information needed for protein production more efficiently.

The solutions developed by Prof. Jemielity's team have been taken up in the global development of mRNA technology, including in vaccines against infectious diseases and in emerging therapies for cancers and genetic disorders. This research is an example of how discoveries in fundamental chemistry can lead to breakthrough applications in medicine.

Prof. Magdalena Król | MEDICAL BIOLOGIST AND ONCOLOGIST

Affiliation: Warsaw University of Life Sciences (SGGW), Centre for Cellular Immunotherapy

Awards: ERC Starting Grant 2016, ERC Proof of Concept 2020, ERC Proof of Concept 2022

The work of Prof. Magdalena Król and her team focuses on how tumours develop and how they interact with the body. In her work she combines oncology and immunology, studying both the mechanisms by which cancers arise and the ways in which the body can defend itself against them. She is particularly interested in the *tumour microenvironment* – all the cells, blood vessels, and signals surrounding a tumour that influence its growth and capacity to spread. Her research treats a tumour not merely as a collection of cancer cells, but as a whole ecosystem in which immune cells, blood vessels, and various chemical signals also play a role. She analyses how immune cells respond to the presence of a tumour and why they sometimes facilitate its development rather than fighting it.

A large part of her research feeds into *immunotherapy* – an approach in which, instead of directly destroying the tumour with drugs or chemotherapy, the patient's immune system is guided to more effectively recognise and eliminate cancer cells. Prof. Król studies immune cells that have anti-tumour potential, as well as the mechanisms that tumours use to evade detection by the body.

Prof. Magdalena Winiarska | MEDICAL BIOLOGIST

Affiliation: Medical University of Warsaw, Faculty of Medicine

Awards: ERC Starting Grant 2018, MAESTRO 2023

Prof. Magdalena Winiarska studies how the immune system recognises and combats cancer cells, and why these mechanisms sometimes fail. She is particularly interested in blood and lymphatic system cancers – lymphomas and leukaemias – in which immune cells and cancer cells are in constant interaction. Her team analyses the molecular processes that determine the survival, proliferation, and sensitivity to treatment of cancer cells, as well as the mechanisms that allow cancers to evade the body's

immune response.

Prof. Winiarska's research also has a direct practical dimension. Her team develops and tests new immunotherapy strategies and antibody-based therapies designed to help the immune system more effectively recognise and eliminate cancer cells. A better understanding of how these therapies work makes it possible to design more precise treatment methods – more effective and with fewer side effects.

Prof. Jakub J. Fichna | PHARMACOLOGIST

Affiliation: Medical University of Łódź, Faculty of Medicine

Awards: Top 2%, TEAM 2017

Studies the functioning of the gastrointestinal tract and develops new compounds with potential applications in the treatment of intestinal diseases and chronic pain, specialising in identifying molecules that interact with the receptors controlling the operation of the digestive system.

Prof. Tadeusz Holak | BIOCHEMIST AND STRUCTURAL BIOLOGIST

Affiliation: Jagiellonian University, Faculty of Chemistry

Awards: TEAM 2017, MAESTRO 2017

Studies the structure of proteins that regulate cell growth and protect the body against the development of tumours, using methods that allow him to observe how biological molecules interact at the atomic level.

Prof. Henryk Kozłowski | BIOINORGANIC CHEMIST

Affiliation: University of Wrocław, Faculty of Chemistry

Awards: Top 2%, MAESTRO 2017

Analyses chemical processes at the interface of biology and metal chemistry, particularly studying the role of metal ions in living organisms – how they affect the structure and functioning of proteins and

the course of biological processes.

Prof. Piotr P. Ponikowski | CARDIOLOGIST

Affiliation: Medical University of Wrocław, Institute of Heart Diseases

Awards: Top 2%, Polish-German COPERNICUS Prize 2018

Specialises in research into heart failure and the mechanisms leading to it, co-developing new strategies for diagnosing and treating patients with heart disease.

Prof. Jan S. Potempa | BIOCHEMIST AND MICROBIOLOGIST

Affiliation: Jagiellonian University, Faculty of Biochemistry, Biophysics and Biotechnology

Awards: Top 2%, MAESTRO 2018

Studies how bacteria evade the body's defence mechanisms and cause chronic infections. Particularly known for research into the bacteria that cause periodontal disease and their influence on other systemic conditions.

Prof. Krzysztof Sobczak | MOLECULAR BIOLOGIST

Affiliation: Adam Mickiewicz University in Poznań, Faculty of Biology

Awards: TEAM 2017, MAESTRO 2020, MAB 2025

Studies genetic diseases associated with the abnormal functioning of RNA, analysing how errors in RNA molecules disrupt the functioning of nerve and muscle cells and lead to neurodegenerative diseases.

Prof. Joanna Ida Sułkowska | BIOPHYSICIST

Affiliation: University of Warsaw, Centre of New Technologies

Awards: Top 2%, NCN Prize 2018

Studies how proteins fold into their complex three-dimensional shapes and how those shapes determine their function. She is particularly interested in the unusual topological knots and entanglements that appear in some protein structures – features that can affect molecular stability and behaviour.

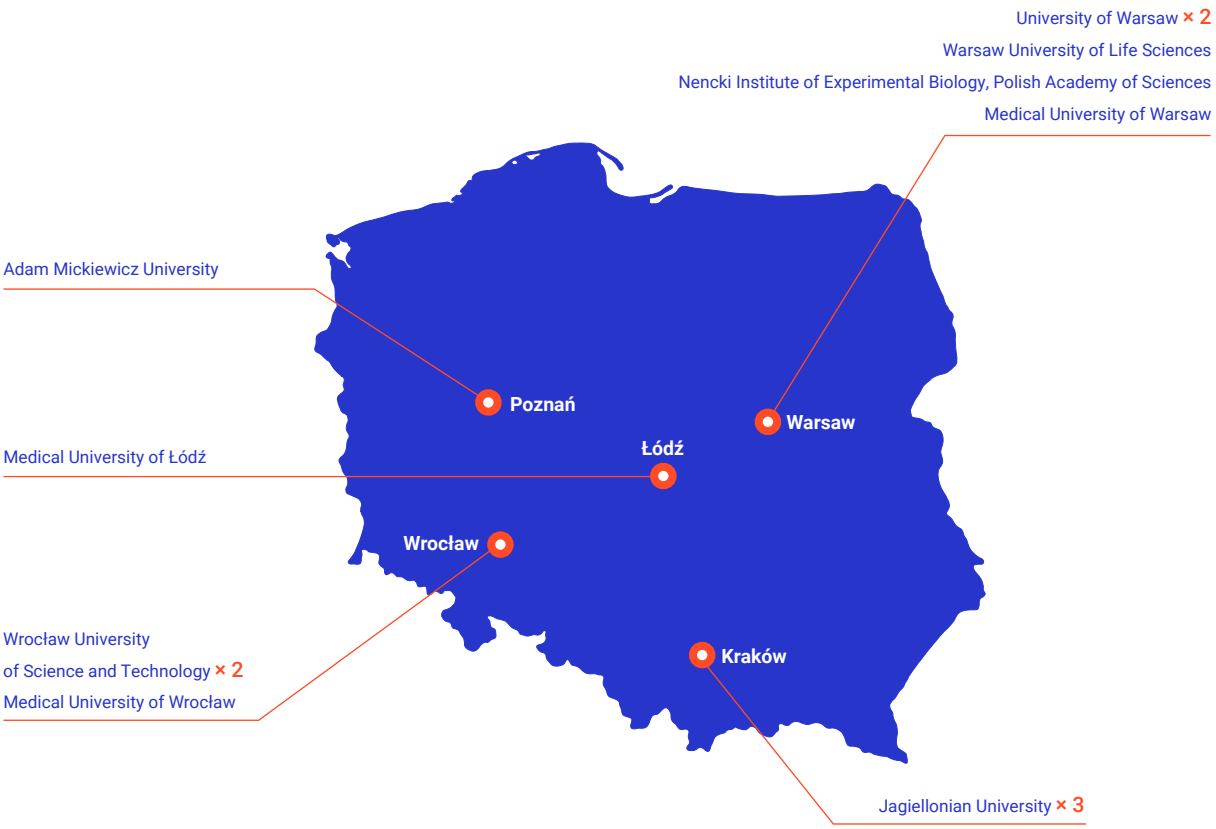
Prof. Adam Szewczyk | BIOCHEMIST

Affiliation: Nencki Institute of Experimental Biology PAS

Awards: Top 2%, MAESTRO 2019

Studies the mechanisms of energy production in cells and the role of mitochondria in regulating the body's functioning, specialising in the processes controlling ion flow and intracellular communication.

SITES OF TOP RESEARCH IN DRUGS AND THERAPIES OF THE FUTURE, BY RESEARCHER AFFILIATION



ERC	FNP	MAB	MAESTRO	NCN	TEAM	TOP 2%
3	2	1	6	1	4	6



Prof. Leszek Kaczmarek
Photo Magdalena Wiśniewska-Krasińska

Neuroscience

The medical and social costs of brain diseases in the EU exceed €800 billion per year. This is more than the costs associated with cancer, cardiovascular diseases and diabetes combined.

Prof. Leszek Kaczmarek[19]

Neuroscience is concerned with the functioning of the brain and nervous system – from the level of individual nerve cells to complex processes such as memory, emotion, perception, and decision-making. Researchers analyse how neurons communicate with one another, form networks responsible for processing information, and how changes in their functioning affect human behaviour, learning, and health. This makes it possible to gain an ever-better understanding of both the fundamental basis of how the brain works and the mechanisms of neurological and psychiatric diseases.

Some researchers focus on the molecular and cellular foundations of nervous system function. Prof. Leszek Kaczmarek and Prof. Jacek Jaworski study the mechanisms responsible for neuronal development, the formation of nerve connections, and the plasticity of the brain – its capacity for learning and memory formation. Prof. Bożena Kamińska-Kaczmarek, meanwhile, analyses the molecular mechanisms of brain diseases, particularly nervous system tumours, and the role of immune cells in their development.

Other researchers focus on how the brain processes information and shapes behaviour. Prof. Ewelina Knapska studies the neural mechanisms of emotion and social behaviour, while Prof. Marcin Szwed analyses how the brain recognises and interprets visual stimuli, including the words and symbols used in reading. Prof. Łukasz Bola works on brain *plasticity*, studying how brain functions reorganise in blind individuals and how the nervous system adapts to the absence of one of the senses.

19 Original interview in Polish: "BRAINCITY. Odkrywając tajemnice zdrowego oraz chorego mózgu i umysłu". https://mab.fnp.org.pl/centra-mab/braincity/

Prof. Łukasz Bola | PSYCHOLOGIST

Affiliation: Jagiellonian University, Faculty of Philosophy

Awards: ERC Starting Grant 2024

Prof. Łukasz Bola specialises in studying the plasticity of the human brain: how it adapts to changes and diverse life experiences. His work focuses particularly on what happens in the brains of blind people, and especially those blind from birth. He studies how the functions of the visual areas of the brain change when they have no access to visual stimuli, and how these brain areas can take on completely different functions in a situation where they are not being used for vision. One of his discoveries is that, in blind people, the visual areas of the brain cease to fulfil functions solely related to vision and begin to participate in the processing of auditory, tactile, and linguistic information. They also begin to represent abstract knowledge about the world.

This research is of great significance not only for science but also for future therapies and technologies supporting people with sensory deficits – for example, in the design of tools for restoring vision, including via retinal implants, or for improving cognitive engagement with the world without this sense. His findings also contribute to a broader understanding of neuroplasticity – the brain's general capacity for reorganisation and adaptation.

Prof. Bożena Kamińska-Kaczmarek | MOLECULAR BIOLOGIST

Affiliation: Nencki Institute of Experimental Biology PAS

Awards: Top 2%, FNP Prize 2021

Prof. Bożena Kamińska-Kaczmarek studies the molecular mechanisms of brain function and the processes leading to the development of nervous system tumours. She is particularly interested in glioblastoma multiforme – one of the most aggressive brain cancers. In her research she analyses how tumour cells communicate with their surroundings and how they influence the immune cells present in the brain.

Her team has demonstrated that glioblastoma cells are capable of reprogramming some immune cells so that, instead of fighting the tumour, they begin to support its growth and spread. This finding has contributed to a new understanding of the role of the immune system in brain tumours and has drawn attention to the significance of the tumour microenvironment in the course of the disease.

Prof. Kamińska-Kaczmarek also studies changes in gene activity and the epigenetic processes responsible for tumour development and resistance to treatment. Her work helps to better understand the biological basis of brain diseases and lays the foundations for more precise diagnostic methods and new therapies in neuro-oncology.

Prof. Ewelina Knapska | BIOLOGIST

Affiliation: Nencki Institute of Experimental Biology PAS, BRAINCITY

Awards: ERC Starting Grant 2016, MAB 2017, MAESTRO 2022, FNP Prize 2025

Prof. Ewelina Knapska and her team investigate how the brain recognises and processes emotional signals from others, and how emotions influence our decisions, behaviour, and social relationships. In her research she analyses the operation of specialised neuronal networks responsible for processing information related to fear, reward, stress, and social interaction. Her team has demonstrated that emotions can be transmitted between individuals through biological mechanisms present in the brain, and that observing the behaviour of others can activate specific neuronal circuits responsible for emotional reactions.

This research helps to better understand how the brain integrates information from its own experiences with signals from other people. Such knowledge may contribute to a better understanding of social behaviour and of psychiatric and neurological disorders in which emotional processing and social functioning are disrupted – such as depression, anxiety disorders, and autism spectrum conditions.

Prof. Jacek Jaworski | MOLECULAR BIOLOGIST

Affiliation: International Institute of Molecular and Cell Biology in Warsaw

Awards: TEAM 2017, MAESTRO 2020

Studies how neurons develop their connections and form networks in the brain, analysing the molecular mechanisms controlling the growth of nerve cells, the formation of synapses, and the changes occurring in the brain during learning and in the course of neurological disorders.

Prof. Leszek Kaczmarek | MOLECULAR BIOLOGIST

Affiliation: Nencki Institute of Experimental Biology PAS, BRAINCITY

Awards: Top 2%, TEAM 2016, MAESTRO 2017, MAB 2017, MAB 2024

Studies the molecular mechanisms of memory and brain plasticity – the capacity of neurons to form and restructure their connections – and in particular how experiences and brain activity alter the connections between neurons, enabling learning, memory formation, and adaptation to a changing environment.

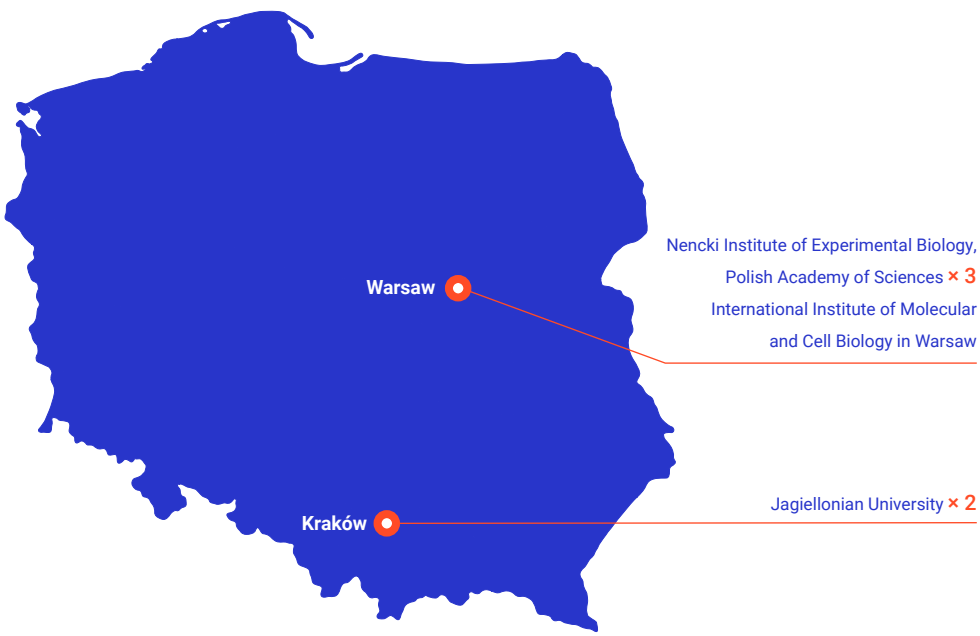
Prof. Marcin Szwed | NEUROBIOLOGIST

Affiliation: Jagiellonian University, Faculty of Philosophy

Awards: NCN Prize 2016, MAESTRO 2018, Polish-French Marie Skłodowska-Curie and Pierre Curie Scientific Prize 2019

Studies how the brain recognises and interprets visual stimuli, especially words, letters, and other complex objects. He uses brain imaging methods to analyse how reading experience and learning reshape the organisation of the areas responsible for processing visual information.

SITES OF TOP RESEARCH IN NEUROSCIENCE, BY RESEARCHER AFFILIATION



ERC	FNP	MAB	MAESTRO	NCN	TEAM	TOP 2%
4	3	3	3	1	1	2



Prof. Jacek Radwan
Photo Magdalena Wiśniewska-Krasińska

Evolution, Ecology, and the Environment

There is a constant arms race between pathogens and the host's immune system. Pathogens are constantly changing to evade the immune system, and the proteins of the immune system must change in order to maintain immunity. The immune system is probably the most complex of all the systems found in vertebrates. (…) To keep pace in the course of evolution, the immune system's protein-encoding genes must also be constantly changing.

Prof. Jacek Radwan[20]

The fields of ecology and evolutionary biology are concerned with how organisms adapt to their environment, interact with other species, and how these processes shape the diversity of life on Earth. Scientists seek to understand both the mechanisms governing present-day ecosystems and the long-term evolutionary processes responsible for the emergence of new species and their capacity to survive under changing conditions.

Research in this area addresses both individual organisms and entire ecosystems. Prof. Michał Bogdziewicz analyses the reproductive strategies of trees and the processes of forest regeneration, particularly in the context of climate change. Prof. Jan Kozłowski studies how evolution shapes the life-history strategies of organisms – such as growth rates, lifespan, and investment of energy in reproduction. Prof. Łukasz Michalczyk works on the mechanisms underlying the emergence and maintenance of biodiversity and the processes leading to species diversification.

Research into the relationships between organisms and their environment also forms an important part of this area. Prof. Marc-André Selosse analyses plant cooperation with fungi and microorganisms, showing how such associations influence the functioning of ecosystems. Prof. Jacek Radwan studies the evolution of immunity and sexual selection, explaining how natural selection maintains biological diversity. Prof. Patryk Oleszczuk, meanwhile, analyses the impact of environmental pollutants – including microplastics – on living organisms and ecosystems.

Taken together, this research helps to better understand how biodiversity arises and is maintained, and how organisms and ecosystems respond to the contemporary challenges of climate change, habitat degradation, and pollution.

20 Original interview in Polish: "Laureaci Nagród Fundacji na rzecz Nauki Polskiej 2020. Wywiady". https://www.fnp.org.pl/component/fnp_pages/page/wszystkie-publikacje

Prof. Michał Bogdziewicz | ECOLOGIST AND EVOLUTIONARY BIOLOGIST

Affiliation: Adam Mickiewicz University in Poznań, Faculty of Biology

Awards: ERC Starting Grant 2021, NCN Prize 2022

The work of Prof. Michał Bogdziewicz and his collaborators focuses on how forests function – and in particular on how trees reproduce: how often they produce seeds, why they sometimes produce enormous quantities simultaneously – in what are called *mast years* – and what consequences this has for the functioning of forest ecosystems. One of the key themes is the variability of this process: trees may produce almost no seeds for several years and then suddenly generate them in vast numbers. This matters because seed production determines whether new generations of trees will establish themselves and what the broader forest ecosystem will look like. Prof. Bogdziewicz investigates the mechanisms underlying this strategy and its consequences for seed-consuming animals and for entire ecosystems, helping us to better understand why forest regeneration is more complex than it might appear.

An important strand of his research concerns the impact of climate change on tree reproduction. Warming, droughts, and changes in pollination conditions can disrupt seed production and hinder forest renewal, which in the longer term may threaten entire ecosystems. Prof. Bogdziewicz's research shows that forest regeneration depends not only on the growth and survival of trees, but on the complex mechanisms regulating their reproduction.

Prof. Łukasz Michalczyk | EVOLUTIONARY BIOLOGIST

Affiliation: Jagiellonian University, Faculty of Biology

Awards: Top 2%, MAESTRO 2023

Prof. Michalczyk and his group study the mechanisms underlying the emergence and maintenance of biodiversity, addressing fundamental questions about how new species arise, what drives their diversification and capacity to adapt, and what determines their long-term survival. His primary model organisms are tardigrades – microscopic invertebrates celebrated for their extraordinary resistance to extreme environmental conditions. He combines classical zoology with modern genetic and genomic methods, uncovering hidden diversity in organisms that often look almost identical but represent distinct species. His research has significance extending well beyond zoology: tardigrades are an exceptionally useful model for studying the resilience of organisms to extreme conditions, making his work relevant to ecology, molecular biology, and even astrobiology.

Prof. Jacek Radwan | EVOLUTIONARY BIOLOGIST

Affiliation: Adam Mickiewicz University in Poznań, Faculty of Biology

Awards: MAESTRO 2019, FNP Prize 2020

Prof. Jacek Radwan's work centres on the evolution of immunity and sexual selection. He studies how sexual selection and pressure from parasites and pathogens influence the evolution of organismal traits – including why some animals develop costly or apparently impractical features, such as elaborate antlers or vivid colouration, that improve mating success but may impede survival.

A central focus of his group's work is the diversity of immune system genes. They analyse how genetic diversity – especially in immune-related genes – influences health and the capacity to survive, showing that high variability in these genes increases a population's chances of coping with a variable and threat-filled environment. They also investigate how this diversity is maintained through evolution, including through partner choice: in many species, the selection of a mate tends to favour combinations of different immune gene variants in offspring, producing individuals that are more resistant to disease. His research therefore illuminates not only the animal world, but the general principles of how evolution operates – principles that are also relevant to humans, for example in the context of partner choice and disease resistance.

Prof. Jan Kozłowski | EVOLUTIONARY BIOLOGIST

Affiliation: Jagiellonian University, Faculty of Biology

Awards: Top 2%, FNP Prize 2016

Studies how organisms allocate their available resources between growth, reproduction, and longevity, analysing the evolutionary mechanisms that lead different species to develop distinct survival and reproductive strategies.

Prof. Patryk Oleszczuk | ENVIRONMENTAL CHEMIST

Affiliation: Maria Curie-Skłodowska University in Lublin, Faculty of Chemistry

Awards: Top 2%, MAESTRO 2021

Works on microplastics and other pollutants present in soil and water, analysing how they spread in the environment, how they affect living organisms, and what methods may reduce their negative impact on ecosystems.

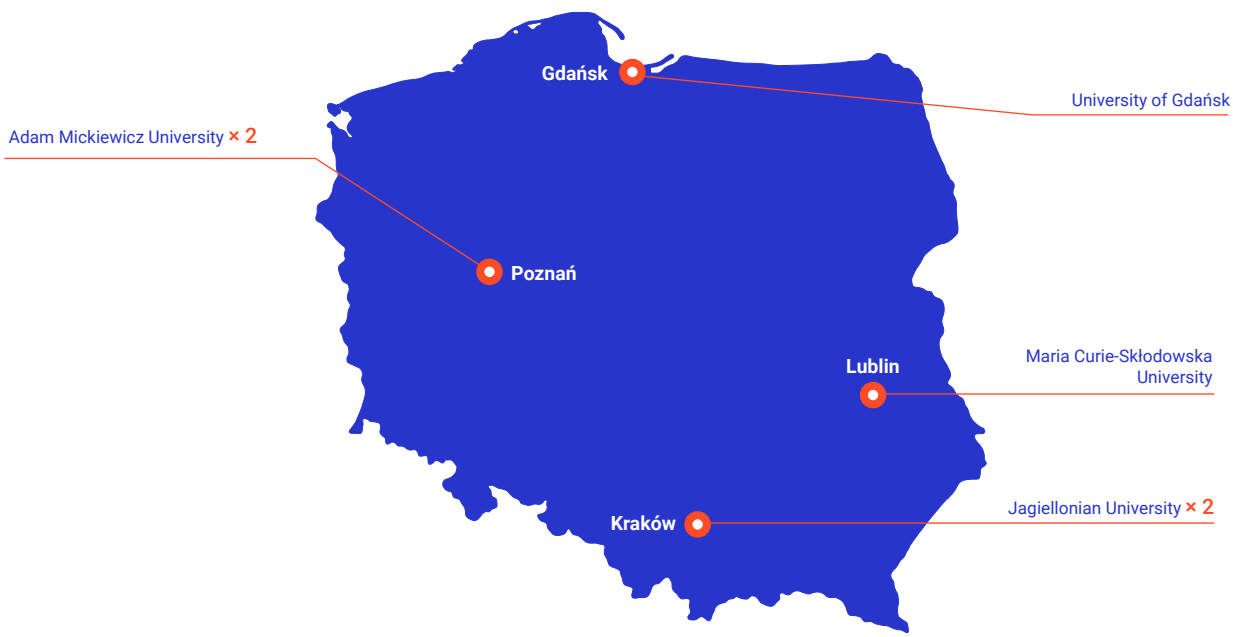
Prof. Marc-André Selosse | BOTANIST AND ECOLOGIST

Affiliation: University of Gdańsk, Faculty of Biology

Awards: Top 2%, MAESTRO 2015

Studies the relationships between plants and microorganisms, especially the mycorrhizal fungi that form associations with plant roots. He shows how these hidden networks of cooperation influence the uptake of water and nutrients and the functioning of entire ecosystems.

SITES OF TOP RESEARCH IN EVOLUTION, ECOLOGY, AND THE ENVIRONMENT, BY RESEARCHER AFFILIATION



ERC	FNP	MAESTRO	NCN	TOP 2%
1	2	4	1	4


Humanities
and Social Sciences

History, Archaeology, and Cultural Heritage



Prof. Grażyna Jurkowlaniec
Photo Mirosław Kaźmierczak

Today's understanding of Eastern Europe is deeply rooted in the post-war order, symbolised by the "Iron Curtain". In the early modern period, however, this region had different, less obvious contours. These were defined not only by political borders and geographical names, but also by ideas about the local natural world. The European bison, aurochs, and elk were described in chronicles and travellers' accounts, depicted on maps and in zoological treatises, and featured in natural history collections. These textual, visual, and material records show how, over the centuries, wildlife helped shape perceptions of the distinctiveness of the region – then known as Sarmatia or Scythia.

Prof. Grażyna Jurkowlaniec

This research area focuses on the study of the human past – its communities, and the material and artistic traces of human activity – as well as on the protection and interpretation of cultural heritage. Researchers work to reconstruct everyday life, social structures, and customs in past eras, as well as historical and artistic processes, drawing variously on historical documents, archaeological sites, and works of art. The field also encompasses heritage conservation, cultural education, and efforts to make knowledge about the past and its material legacy accessible to wider audiences.

Dr Agnieszka Brylak studies the cultures and religions of pre-Hispanic and early colonial Mesoamerica, using historical, linguistic, and ethnographic sources to reconstruct the social and cultural life of the Nahua peoples. Prof. Karolina Ćwiek-Rogalska analyses cultural memory, heritage, and the transformation of cultural landscapes, combining archival research with fieldwork. Prof. Grażyna Jurkowlaniec examines works of art and architecture in their cultural, social, and religious contexts. Prof. Małgorzata Kot conducts archaeological research into the earliest phases of human history and the protection of archaeological heritage. Prof. Katarzyna Marciniak, Prof. Artur Obłuski, and Prof. Paweł Nowakowski work on the history and culture of the ancient world, analysing written sources and the material remains of past civilisations.

Prof. Karolina Ćwiek-Rogalska | HISTORIAN (SOCIAL HISTORY)

Affiliation: Institute of Slavic Studies PAS

Awards: ERC Starting Grant 2021, NCN Prize 2023

Prof. Karolina Ćwiek-Rogalska works on social memory, cultural heritage, and the relationships between people and the places they inhabit. She is especially interested in how communities build a sense of belonging following experiences of displacement, migration, and border changes. In her research she analyses how the past remains present in contemporary life – both in the memories and stories of residents, and in the landscapes, architecture, and everyday objects themselves.

She pays particular attention to the territories that came within Poland's borders after the Second World War, studying how their new inhabitants came to terms with spaces that had previously been settled by other communities, how they formed their own attachments to places, and how the material traces of earlier populations shaped the local identity. Her work draws on the perspectives of anthropology, history, and cultural studies, using interviews, memoirs, archival documents, photographs, and fieldwork. This research not only deepens our understanding of how local and regional identities take shape, but also supports public engagement with history and the preservation of cultural heritage.

Prof. Grażyna Jurkowlaniec | ART HISTORIAN

Affiliation: University of Warsaw, Faculty of Arts

Awards: ERC Advanced Grant 2023

Studies paintings, sculptures, and prints produced in Europe from the late Middle Ages to the end of the early modern period, analysing the meanings embedded in religious symbols and representations and exploring how art shaped emotions, imagination, and ways of perceiving the world.

One of the main strands of her research is the way in which ideas about Eastern Europe took shape. Analysing paintings, prints, and depictions of animals, she shows that works of art did not merely document reality, but also shaped how distant places, their inhabitants, and their natural world were perceived. Prof. Jurkowlaniec's research offers a fuller understanding of how images helped to construct European knowledge of the world, and of the part they played in the exchange of ideas between different parts of the continent. This work also shows that Eastern Europewas an important participant in the development of culture and learning in the early modern period.

Prof. Katarzyna Marciniak | CLASSICAL PHILOLOGIST

Affiliation: University of Warsaw, Faculty of "Artes Liberales"

Awards: ERC Consolidator Grant 2015, ERC Proof of Concept 2023

Prof. Katarzyna Marciniak specialises in ancient culture and its presence in the contemporary world. Her interest is not only in what life was like in ancient Greece and Rome, but above all in how successive generations have interpreted and made use of the ancient legacy – how myths, heroes, and stories from antiquity function today in literature, education, film, art, and popular culture.

She pays particular attention to how the ancient world reaches young audiences, analysing books, films, and cultural texts addressed to children and young people, and showing how stories thousands of years old continue to help articulate contemporary concerns – identity, diversity, social relations, and exclusion. Her work demonstrates that antiquity is not a closed chapter of history but a living source of ideas and images that continually recur in contemporary culture. Drawing on classical philology, cultural history, and literary studies, she examines how societies reinterpret the past and invest it with new meaning.

Prof. Artur Obłuski | ARCHAEOLOGIST

Affiliation: University of Warsaw, Polish Centre of Mediterranean Archaeology

Awards: ERC Starting Grant 2017, ERC Consolidator Grant 2022

Prof. Artur Obłuski specialises in the archaeology of Nubia and the Nile Valley, studying the ancient communities that inhabited north-eastern Africa – their social organisation, economy, religion, and contacts with neighbouring cultures. Together with an interdisciplinary team he leads fieldwork including archaeological excavations, analysing monuments, artefacts, and traces of the everyday activities of past communities. This makes it possible to reconstruct power structures, religious and commercial practices, and the ways in which people adapted to the demanding environmental conditions of the region.

His work also carries significance for the protection and promotion of cultural heritage. It advances historical understanding of Nubia's place in ancient civilisation and supports educational efforts to protect the archaeological legacy of north-eastern Africa. Prof. Obłuski is a committed advocate for the social responsibility of archaeology and for the involvement of local communities in the management of their cultural heritage.

Dr Agnieszka Brylak | HISTORIAN AND MESOAMERICANIST

Affiliation: University of Warsaw, Faculty of Modern Languages

Awards: ERC Starting Grant 2022

Studies the history and culture of indigenous communities in Mesoamerica following the Spanish conquest, analysing documents produced by the inhabitants of colonial Mexico to understand how knowledge was transmitted, how administration was organised, and how relations between European and indigenous cultures took shape.

Prof. Małgorzata Kot | ARCHAEOLOGIST

Affiliation: University of Warsaw, Faculty of Archaeology

Awards: ERC Consolidator Grant 2024

Studies the lives of Stone Age peoples, analysing the traces left by hunter-gatherer communities to reconstruct how early humans adapted to climate and environmental change, and how their technologies, subsistence strategies, and daily life developed.

Prof. Paweł Nowakowski | HISTORIAN AND ARCHAEOLOGIST

Affiliation: University of Warsaw, Faculty of History

Awards: ERC Starting Grant 2021

Studies late antiquity and early Christianity in the eastern Roman Empire, analysing written and material sources to understand how religion shaped social life, communal organisation, and the development of sites of worship and pilgrimage.

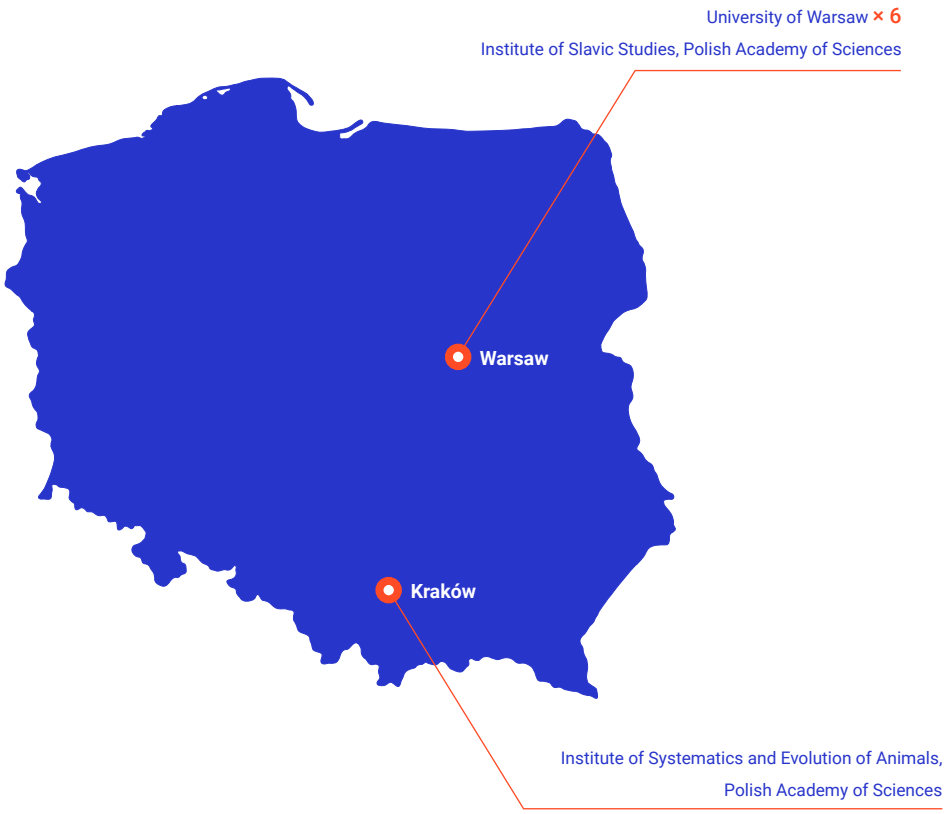
Prof. Jarosław Wilczyński | ARCHAEOLOGIST AND ARCHAEOZOOLOGIST

Affiliation: Institute of Systematics and Evolution of Animals PAS

Awards: ERC Consolidator Grant 2021

Studies animal remains from archaeological sites, using them to reconstruct early human lifeways – diet, economy, and the relationships between humans and the natural world.

SITES OF TOP RESEARCH IN HISTORY, ARCHAEOLOGY, AND CULTURAL HERITAGE, BY RESEARCHER AFFILIATION



ERC	NCN
10	1

Ideas, Values, and Institutions



Prof. Valentina Lepri
Photo Jarosław Deluga-Góra

I began by studying figures such as Machiavelli, Guicciardini, and Giordano Bruno, but what interests me is how ordinary people understood philosophical ideas and what they did with them. How students, clergymen, and politicians absorbed specific doctrines, how they processed them and created new interpretations based on them. That is why the research centre we have established at the Institute is called the Centre for the History of Renaissance Knowledge, rather than the Centre for the History of Philosophy. I am interested not only in philosophy, but in the entire process of the production of knowledge, its circulation, and the ways in which it was used.

Prof. Valentina Lepri[21]

This research area focuses on the foundations of social life: the ways in which people create knowledge, formulate norms and values, and organise collective existence through legal, political, and social institutions. Researchers address both fundamental philosophical questions – concerning truth, knowledge, rationality, and justice – and the functioning of the concrete institutions and systems that regulate social life.

Prof. Bartosz Brożek and Prof. Cezary Cieśliński work in philosophy and logic, studying respectively the processes of reasoning and interpretation and the foundational questions of language, truth, and meaning. Prof. Andrzej Indrzejczak develops these themes further, creating logical models and proof systems for the analysis of correct reasoning and argumentation. Prof. Kamil Mamak and Prof. Tomasz Żuradzki examine the normative dimensions of contemporary social life – from legal responsibility in the world of new technologies to the ethical problems of autonomy, choice, and moral accountability. Prof. Valentina Lepri investigates the relationships between philosophy, science, and the organisation of knowledge in the early modern period.

The social and institutional perspective is developed by Prof. Marta Bucholc, who studies the relationships between law, the state, social values, and citizens' experiences, and their influence on the functioning of contemporary societies. The historical dimension is taken up by Prof. Lepri and Prof. Piotr Alexandrowicz: Prof. Lepri on the connections between

21 Original interview in Polish: Nie interesują mnie wyłącznie wielcy myśliciele. Aktualności PAN, Polska Akademia Nauk, June 11, 2026. https://academia.pan.pl/prof-lepri-nie-interesuja-mnie-wylacznie-wielcy-mysliciele/

philosophy, science, and knowledge organisation in the early modern era; Prof. Alexandrowicz on the history of law and the development of the European legal tradition, showing how past ideas and institutions have shaped contemporary legal systems.

Prof. Cezary Cieśliński | PHILOSOPHER AND LOGICIAN

Affiliation: University of Warsaw, Faculty of Philosophy

Awards: MAESTRO 2019, FNP Prize 2021

Prof. Cezary Cieśliński works in analytic philosophy, logic, and the philosophy of language, focusing on fundamental questions concerning meaning, truth, and reference. He studies how language allows reality to be described and what conditions a statement must meet in order to be considered meaningful and true. A central focus of this work is the analysis of the relationships between formal and natural language, and the problems that arise at the intersection of logic, semantics, and the philosophy of mathematics.

An important strand of his research concerns semantic paradoxes and phenomena of self-reference – situations in which statements refer to themselves or to their own truth. These problems lead to questions about the limits of expressibility, the consistency of formal systems, and the nature of the concept of truth. In his research he uses the tools of formal logic and contemporary semantics, analysing the conceptual structures that underlie reasoning and communication. This work advances understanding of the foundations of logic, mathematics, and language, showing the limits that formal systems of description encounter and how the problems of ambiguity, self-reference, and paradox can be addressed.

Prof. Andrzej Indrzejczak | LOGICIAN AND PHILOSOPHER

Affiliation: University of Łódź, Faculty of Philosophy and History

Awards: ERC Advanced Grant 2021

Prof. Andrzej Indrzejczak studies the principles of sound reasoning – why certain conclusions follow from certain premises, and how to distinguish a valid argument from one that merely appears convincing. He seeks to uncover the general rules governing thinking and argumentation, whether the subject matter is mathematics, science, law, or everyday discussion.

In his research he uses the tools of formal logic, which allow processes of inference to be described with precision. He analyses both the classical principles of logic and more advanced systems designed for situations in which information is incomplete, uncertain, or context-dependent. This makes it possible to better understand how arguments are constructed and what conditions must be met for a conclusion to be genuinely justified. His work illuminates the foundations of rational thinking and argumentation, showing how the correctness of reasoning can be assessed systematically and how more transparent and consistent arguments can be built. This is significant not only for philosophy and mathematics, but also for computer science, artificial intelligence, and any domain in which clear rules of inference are required.

Prof. Valentina Lepri | HISTORIAN OF IDEAS

Affiliation: Institute of Philosophy and Sociology PAS

Awards: ERC Consolidator Grant 2019

Prof. Valentina Lepri works on early modern philosophy and the history of ideas, focusing on the transformation of knowledge and investigative methods in the seventeenth century – the period during which modern science was taking shape. Francis Bacon's work and the associated ideas of experience, observation, and the organisation of knowledge occupy a central place in her research. She analyses how understandings of science were shifting and what new models of knowledge came to replace earlier scholastic traditions.

An important recurring thread in her work concerns the ways in which knowledge was gathered, classified, and disseminated. She studies early modern encyclopaedic projects, systems for ordering information, and the institutions that supported the production and circulation of knowledge, as well as the relationships between philosophical ideas and the research practices developing at the birth of modern science. This research shows that the development of science was not only the result of new discoveries, but also of profound changes in the ways in which knowledge was organised and put to use – illuminating the intellectual origins of today's scientific institutions and the processes of creating and transmitting knowledge.

Prof. Piotr Alexandrowicz | LEGAL HISTORIAN

Affiliation: Adam Mickiewicz University in Poznań, Faculty of Law and Administration

Awards: ERC Starting Grant 2024

Studies the history of Roman law and its influence on the development of European legal systems, analysing how ancient legal concepts were interpreted, transmitted, and applied by successive generations of lawyers, shaping modern legal institutions.

Prof. Bartosz Brożek | PHILOSOPHER AND PHILOSOPHER OF LAW

Affiliation: Jagiellonian University, Faculty of Law and Administration

Awards: NCN Prize 2018, MAESTRO 2021

Studies how people reason, interpret norms, and make decisions, combining philosophy, law, and cognitive science to analyse the role of language, intuition, and argumentation in the processes of thinking and the application of law.

Prof. Marta Bucholc | SOCIOLOGIST

Affiliation: University of Warsaw, Faculty of Sociology

Awards: ERC Consolidator Grant 2021

Studies the relationships between law, institutions, and social life, analysing how ideas, values, and norms influence the functioning of societies and how relations between the state, citizens, and communities are changing. She pays particular attention to human rights, collective memory, and the transformations of contemporary democracy.

Prof. Kamil Mamak | LEGAL SCHOLAR

Affiliation: Jagiellonian University, Faculty of Law and Administration

Awards: ERC Starting Grant 2024

Studies the impact of new technologies and artificial intelligence on law – especially criminal law and liability – examining the challenges that autonomous systems, algorithms, and new forms of action in digital environments pose to traditional concepts of agency and responsibility, and how the legal system should respond to them.

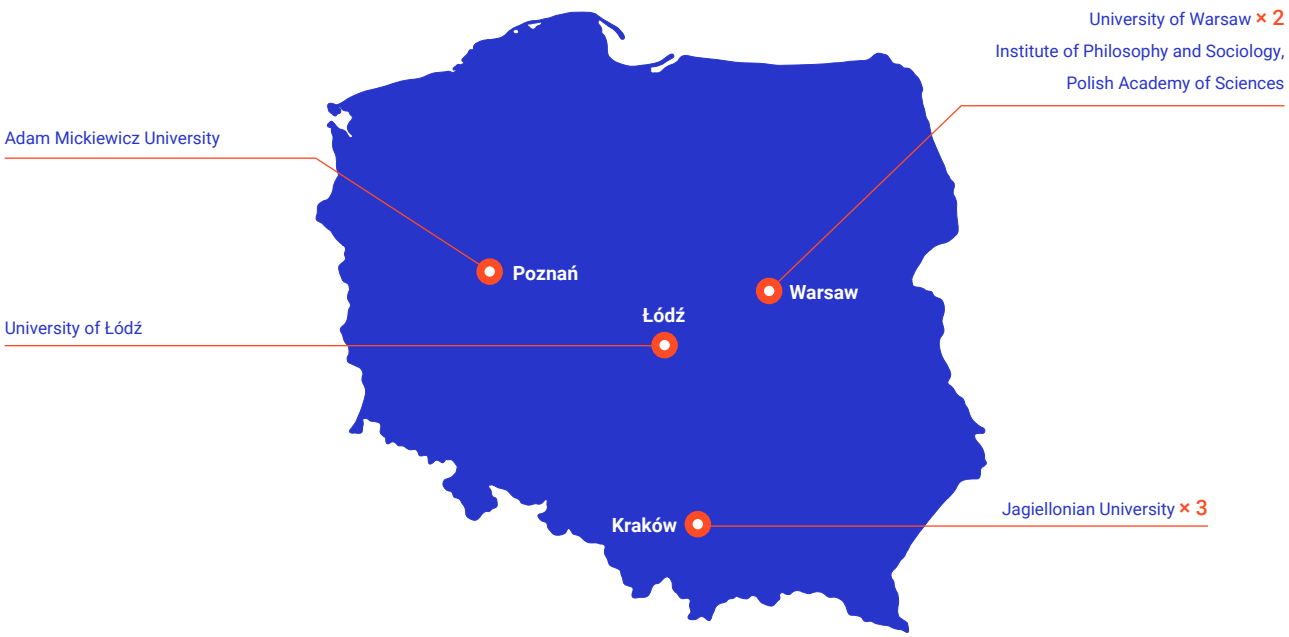
Prof. Tomasz Żuradzki | PHILOSOPHER AND ETHICIST

Affiliation: Jagiellonian University, Faculty of Philosophy

Awards: ERC Starting Grant 2018

Studies how people make moral decisions under conditions of uncertainty and how responsibility for the consequences of such decisions should be assessed. He works on problems in bioethics, individual autonomy, and rational choice, analysing ethical dilemmas related to medicine, public health, and social policy.

SITES OF TOP RESEARCH IN IDEAS, VALUES, AND INSTITUTIONS, BY RESEARCHER AFFILIATION



ERC	FNP	MAESTRO	NCN
6	1	2	1

Decisions, Behaviour, and Social Systems



Prof. Maria Lewicka
Photo Magdalena Wiśniewska-Krasińska

Winston Churchill once said that first people shape places, then places shape people. Indeed, in psychology we observe exactly this kind of dependency. (…) Places determine, to a large extent, who we are – how we perceive ourselves, how we communicate with one another, whether we communicate at all, whether we want to be in these places. The relationship works in both directions. (…) The more different functions such an environment can fulfil, the richer it is – the better it matches our varied needs. (…) All my research into people's attachment to place shows that one of the most important factors determining whether a person will feel attached to a given place is social contact. Cities should be designed to create semi-private, semi-public spaces in which people can meet one another. Ultimately, which cities do we find attractive? Those that pulse with life. Those in which things happen.

Prof. Maria Lewicka[22]

Research in this area focuses on how people make decisions, cooperate with others, and function in complex social, economic, and spatial systems. It combines the perspective of the individual – their motivations, preferences, and choices – with analysis of the broader processes shaping social life.

The psychological and social dimensions of these questions are represented by Prof. Maria Lewicka, Prof. Anna Matysiak, and Prof. Bogdan Wojciszke. Prof. Lewicka studies people's relationships with the places in which they live and the significance of these for identity and social memory. Prof. Matysiak analyses decisions about family and parenthood in the context of socio-economic conditions. Prof. Wojciszke seeks to explain the mechanisms of social judgement, trust, and interpersonal relationships.

The economic and systemic perspective is developed by Prof. Piotr Dworczak, Prof. Rafał Weron, and Prof. Rafał Kucharski. Prof. Dworczak studies how people make decisions and cooperate under conditions of uncertainty, and how to design rules that favour the efficient functioning of markets and institutions. Prof. Weron analyses complex economic systems – particularly energy markets – studying their dynamics, risks, and predictability. Prof. Kucharski works on the modelling of mobility and transport systems, showing how the organisation of infrastructure influences human behaviour and the functioning of cities.

22 Original interview in Polish: Miasto na miarę ludzi. *Pomorski Przegląd Gospodarczy*, no. 4/2014

Prof. Maria Lewicka | PSYCHOLOGIST

Affiliation: Nicolaus Copernicus University in Toruń, Faculty of Philosophy and Social Sciences

Awards: Top 2%, FNP Prize 2023

Prof. Maria Lewicka and her team work in environmental psychology, studying how people form relationships with the places they live in – from apartments and neighbourhoods to entire cities and regions. She devotes particular attention to the phenomenon of place attachment – why certain spaces become emotionally important to us and how they affect our sense of identity, security, and wellbeing. She is especially interested in how places become elements of individual and collective identity, how they shape social bonds and a sense of rootedness, and how history and social experience become inscribed in the built environment – in architecture, monuments, and place names. She also examines how changes in space – such as modernisation or revitalisation – affect social relations and the sense of continuity.

This research has important practical significance, providing knowledge that can help to create places that are more welcoming, conducive to social integration, and supportive of residents' wellbeing.

Prof. Anna Matysiak | ECONOMIST

Affiliation: University of Warsaw, Faculty of Economic Sciences

Awards: ERC Consolidator Grant 2019, FNP Prize 2025

Prof. Anna Matysiak's work combines demography, economics, and sociology to study how people make decisions regarding having children, work, and family life. She is interested in why birth rates are declining in many countries – especially in Europe – and what factors contribute to this. She analyses the role of the labour market, employment stability, and public policies such as parental leave and access to childcare. Her research shows that decisions about starting a family are not solely a private matter but are strongly shaped by socio-economic conditions. She examines which systemic solutions make it easier to combine professional work with family life and may encourage people to have children. The results of her research are used in shaping social policies and family support strategies – knowledge that is particularly important at a time when an increasing number of countries are grappling with low birth rates and ageing populations.

Prof. Bogdan Wojciszke | SOCIAL PSYCHOLOGIST

Affiliation: SWPS University, Faculty of Psychology in Sopot

Awards: Top 2%, FNP Prize 2016

Prof. Bogdan Wojciszke and his team study the mechanisms that allow people to quickly orient themselves in the social world – assessing potential collaborators, leaders, partners, or competitors, often on the basis of very limited information. His research shows that, despite the enormous diversity of people and situations, our social judgements rest primarily on two fundamental questions: does this person have good intentions, and are they capable of acting effectively? In psychology, these correspond to the dimensions of morality and competence. Prof. Wojciszke demonstrates that these apparently simple criteria drive many important social phenomena – from the building of trust and reputation to the selection of leaders, the assessment of politicians, and the functioning of organisations. His analyses also illuminate why people form stereotypes, how credit and blame for successes and failures are attributed, and how social authority develops. They also show how power and social status alter the way people think and perceive one another.

Prof. Piotr Dworczak | ECONOMIST

Affiliation: GRAPE (Group for Research in Applied Economics)

Awards: ERC Starting Grant 2021

Studies how to design rules and institutions that enable good decisions to be made in situations where participants have access to different information. He analyses mechanisms of resource allocation, cooperation, and the functioning of markets, using tools from behavioural economics, experimental economics, and game theory.

Prof. Rafał Kucharski | TRANSPORT ENGINEER

Affiliation: Jagiellonian University, Faculty of Mathematics and Computer Science

Awards: ERC Starting Grant 2022

Studies how people move around cities and how to design transport systems that better respond to residents' needs. He uses data, computer models, and simulations to analyse traffic and predict the effects of changes in the organisation of public transport and urban infrastructure.

Prof. Rafał Weron | ECONOMIST

Affiliation: Wrocław University of Science and Technology, Faculty of Management

Awards: Top 2%, MAESTRO 2018

Specialises in the analysis of energy markets and the forecasting of electricity prices, building mathematical models for predicting price changes and assessing risk in complex energy systems.

SITES OF TOP RESEARCH IN DECISIONS, BEHAVIOUR, AND SOCIAL SYSTEMS, BY RESEARCHER AFFILIATION



ERC	FNP	MAESTRO	TOP 2%
3	3	1	3

Language, Communication, and Identity



Prof. Justyna Olko
Photo Michał Jędrak

Our research in recent years shows that a sense of happiness and a good life also stems from the positive emotions a person experiences when speaking their native language. There are also more tangible benefits: corporations are increasingly valuing linguistic and cultural diversity, because behind it lie different intellectual and cognitive resources, different forms of creativity, and different ways of solving problems.

Prof. Justyna Olko[23]

This broad and highly diverse area spans both the humanities and the social sciences, bringing together researchers concerned with how people form relationships, transmit information, and build shared meanings – in everyday life, in public space, and in the digital sphere. Research into identity, language, and social diversity also forms an important part of this work.

Prof. Michał Németh and Prof. Justyna Olko study language through the lens of history and culture, focusing in particular on its role in shaping identity and social relations, and on endangered languages – their decline and potential revitalisation. Communication in the context of media and information flow is examined by Prof. Magdalena Wojcieszak, who analyses questions of identity, social relations, and the circulation of information, studying how people receive news and how media – especially online media – shape opinions and social divisions. Prof. Joanna Mizielińska works on how minority groups – and in particular members of the LGBT+ community – function in contemporary society. Together, this research demonstrates the crucial role of communication in the life of societies.

23 Original interview in Polish: "Różnorodność językowa to skarb". *Projekt Pulsar*. February 2, 2023. https://www.projektpulsar.pl/czlowiek/2200284%2C1%2Cjustyna-olko-roznorodnosc-jezykowa-to-skarb.read?

Prof. Joanna Mizielińska | SOCIOLOGIST

Affiliation: University of Warsaw, Faculty of Sociology

Awards: ERC Advanced Grant 2024

Prof. Joanna Mizielińska works on social relations, the family, and the diversity of forms of private life in contemporary society. Her research focuses among other things on the experiences of LGBTQ+ people and on how the understanding of family, partnership, and intimacy is changing. She analyses how social norms, law, and culture affect people's everyday lives and their possibilities for building relationships.

Her research makes use of qualitative methods such as interviews and analyses of participants' experiences, making it possible to capture the perspective of the people being studied. She shows how people living outside dominant family models manage in practice – for example, how they organise family life, childcare, and social relationships within the context of existing institutional and cultural constraints.

This research has significance not only for scholarship but also socially, providing knowledge that can support the development of more inclusive public policies and legal solutions that genuinely reflect the diversity of experiences and needs in contemporary societies.

Prof. Michał Németh | HISTORICAL LINGUIST

Affiliation: Jagiellonian University, Faculty of Philology

Awards: ERC Starting Grant 2018

The research of Prof. Michał Németh concerns minority languages, and in particular those associated with diaspora communities and their histories. One focus of his work is Karaim – a highly endangered language used by a small community of Turkic origin. Prof. Németh analyses historical texts, documents, and records in order to reconstruct how this language looked in the past and how it changed over the centuries. An important and interesting thread in his research concerns translations of religious texts – especially the Bible – into Karaim. By analysing these translations, he can see how complex religious concepts were once understood and expressed in this language, and how translators dealt with the absence of appropriate words, in a language influenced by Hebrew, Polish, and other tongues.

Prof. Németh's work involves the analysis of such historical materials, but also examines how the language functions today – whether it is still used, in what contexts, and by whom. This improves our understanding of the processes of language decline and of how endangered languages might be better protected from disappearance. In practice, his research helps to preserve a unique cultural heritage that might otherwise vanish without trace.

Prof. Justyna Olko | LINGUISTIC ANTHROPOLOGIST

Affiliation: University of Warsaw, Faculty of "Artes Liberales"

Awards: ERC Consolidator Grant 2020, TEAM 2016

Prof. Justyna Olko works on the languages and cultures of indigenous communities, particularly in Latin America – and above all on the Nahuatl language used by descendants of the Aztecs in Mexico. Her research extends well beyond linguistics, however: she takes a broader view of how language connects with identity, history, and people's everyday lives, and of how communities struggle to preserve their language and culture in the modern world.

Her work has a strong social and engaged dimension – it is not conducted from the outside but in genuine collaboration with the communities it concerns. Together they create educational projects, workshops, and language revitalisation programmes. These activities fit within a broader context of the struggle for linguistic and cultural rights. In many parts of the world, the languages of indigenous communities were for years marginalised or even banned – leading to losses of identity and social exclusion. Prof. Olko works to reverse this, supporting the presence of these languages in education, public life, and the media. As a result, her scholarship merges with activism, contributing to the empowerment of entire communities.

Prof. Magdalena Wojcieszak | SOCIOLOGIST OF MEDIA AND POLITICAL COMMUNICATION

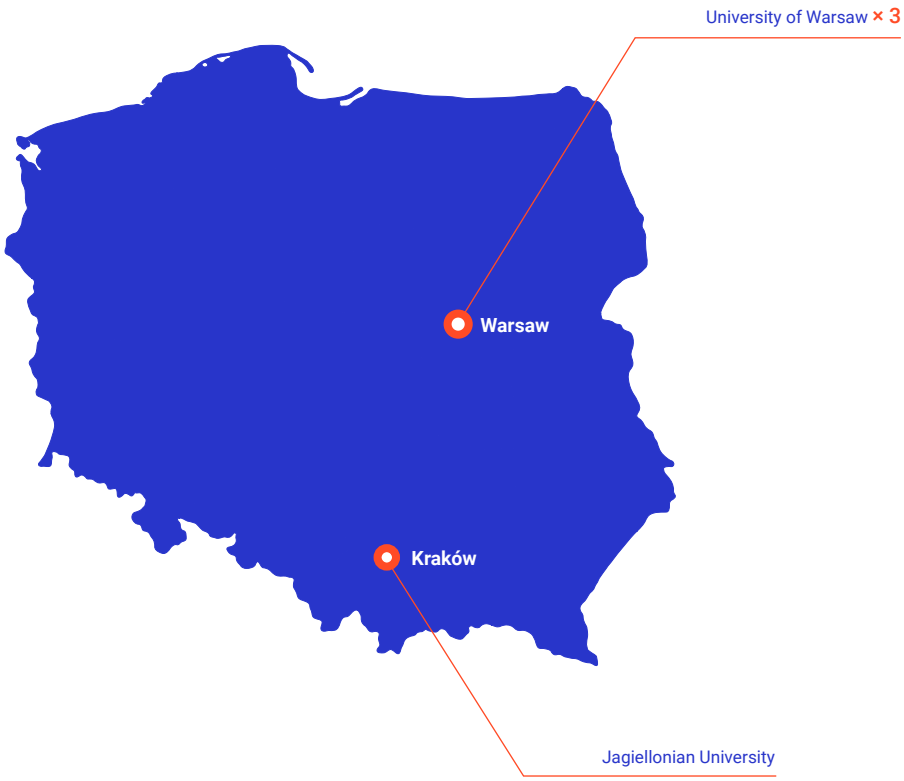
Affiliation: University of Warsaw, Centre of Excellence in Social Sciences;
University of California, Davis, Department of Communication

Awards: Top 2%, ERC Consolidator Grant 2023

Prof. Magdalena Wojcieszak studies how contemporary media – and in particular the internet and social media – influence our views, emotions, and the way in which discussions are conducted in society. She is interested not only in what people read, but in how it affects them – for example, whether exposure to differing opinions leads to greater understanding or rather to conflict and polarisation. In her research she combines different methods: she analyses online data such as user behaviour, conducts experiments, and carries out survey studies. She examines, for example, whether algorithms really do trap us inside information bubbles, or whether people are exposed in practice to a greater diversity of views than is commonly assumed.

An important aspect of her work is its social and practical relevance. Her findings matter not only to academics but to journalists, platform designers, and public institutions, helping to understand how the information environment should be structured so as to promote genuine debate rather than merely reinforcing existing divisions. In this sense, her research touches on one of the central questions of our time: How can we hold meaningful conversations in a world full of conflicting information and opinions?

SITES OF TOP RESEARCH IN LANGUAGE, COMMUNICATION, AND IDENTITY, BY RESEARCHER AFFILIATION



ERC	TEAM	TOP 2%
4	1	1


Summary

Poland currently ranks around 20th in the world by GDP. At the same time, its research system remains chronically underfunded. Despite this, Polish science is gradually strengthening its international position. Polish teams are competing more effectively for European funding, increasing their participation in Horizon Europe, winning more ERC grants, and building modern research infrastructure. The number of foreign researchers working in Poland is growing, as is the number of international doctoral students, internationally collaborative projects, and participation in European research networks. The internationalisation process remains at an earlier stage than in much of Western Europe, but the direction of change is clearly positive.

This development remains uneven and is concentrated to a large degree around particular institutions and disciplines. Polish science remains strongly geographically concentrated, with a marked dominance of a handful of major academic centres:

- **Warsaw,**
- **Kraków,**
- **Poznań,**
- **Wrocław,**
- **and the Tri-City region around Gdańsk.**

Although Polish science does not rank among the world's leading research systems, there are many research teams and communities that achieve world-class results and strong international competitiveness. These teams are today the most competitive and recognisable element of Polish science. Polish universities as institutions generally occupy relatively modest positions in the QS, Times Higher Education, and Shanghai rankings, but individual faculties and disciplines often perform at a level much closer to the global forefront – particularly in physics, mathematics, chemistry, materials engineering, computer science, and biotechnology.

A defining feature of Polish science is the concentration of the highest-quality research within particular teams and communities. This means that rankings based purely on quantitative indicators do not fully capture the quality of the research being conducted, nor the potential of the most dynamic groups. The most valuable assets of Polish science are the individual researchers and teams who take on the most important research challenges, publish the most influential work, win prestigious grants, and build international networks. These are the researchers and teams that should be highlighted when identifying the fields capable of showcasing Poland's strengths on the global scientific stage.

This report is an attempt to identify those communities and research areas. It should be emphasised, however, that no methodology can fully objectively identify the "best" scientists or disciplines. There is no single universal definition of scientific excellence, and different fields operate according to different standards of evaluation. Both bibliometric rankings and the grant system have significant limitations and favour certain types of research and certain disciplines over others.

This report is not a closed ranking of scientific quality, but an attempt to identify the areas that have functioned most effectively in the international scientific arena over the past decade and have the greatest potential to raise the visibility of Polish science abroad. The aim is not to create a hierarchy of disciplines, but to show where Polish science is already producing results that are competitive on a global scale – and where the potential for further growth is greatest.

Foundation for Polish Science

The Foundation for Polish Science (FNP) is an independent, non-political, non-profit organization established in 1991. Its core mission is to support Polish science by funding groundbreaking research, facilitating career development for researchers, and building a bridge between science, the economy, and society.

WHAT WE DO:

Fund research and development:

Award grants, prizes, and scholarships to scientists at various stages of their careers – with a special focus on young researchers and building new research teams.

Connect science with business:

Support technology transfer and the commercialization of innovations into the economy.

Shape standards:

Initiate debates on science policy, promote internationalization, and create incentives to conduct research in Poland.

Polish Ministry of Foreign Affairs

The Ministry of Foreign Affairs, through the activities of the Department of Promotion and Cultural Diplomacy, is actively engaged in advancing science diplomacy as an integral element of Polish foreign policy. The Department supports the internationalisation of Polish science and higher education, building connections between the diplomatic missions abroad, the academic community and institutions responsible for supporting research and innovation. These activities include supporting scientific cooperation within EU structures, promoting Polish research achievements on the international stage, and creating favourable conditions for establishing partnerships between Polish and foreign research centres. Through these initiatives, the Ministry seeks to strengthen Poland's international position as a credible and competitive partner in global scientific cooperation.

A report by the Foundation for Polish Science (FNP),
commissioned by the Polish Ministry of Foreign Affairs

PROJECT INITIATORS:

Jan Jerzy Malicki

Dr Anna Plater-Zyberk

AUTHORS:

Dr Marta Łazarowicz-Kowalik

Dr Tomasz Perkowski

Dr Anna Plater-Zyberk

Prof. Krzysztof Pyrć

Dr Judyta Węgrzyn

TRANSLATION:

Daniel J. Sax | Cutting Edge Science

GRAPHIC DESIGN AND LAYOUT:

Anna Piwowar | Siostry Piwowar Studio

Warsaw 2026

FNP

Ministry of Foreign Affairs
Republic of Poland

Foundation for Polish Science

www.fnp.org.pl

Polish Ministry of Foreign Affairs

www.gov.pl/web/diplomacy