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SCIENCE COLLABORATION ACROSS BORDERS

Over the past two decades, Polish higher education institutions and research institutes have made significant progress in internationalizing their activity. Likewise, the Polish Academy of Sciences has taken many steps to boost the collaboration between the PAS researchers and their partners abroad.

ACADEMIA PART II The Challenges of Science



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Among science institutions in Poland, the Polish Academy of Sciences currently boasts the best results in terms of staff internationalization, the number of articles published collaboratively together with co-authors from other countries, and the number of grants won under the EU's framework programs. This situation, though still far from ideal, is the result of the commitment of many people working both at the PAS institutes and at the PAS Chancellery (including its auxiliary units).

Measures of internationalization

One of the main indicators used to gauge the degree of internationalization of research institutions is the number of scientific articles published internationally. At the PAS, publications with international co-authorship account for almost half of all publications each year (about 47%), 44% are results of national

collaboration, and single-author publications make up the remaining 9%.

The number of scientific articles published by PAS authors in collaboration with international co-authors has remained at the level of between 2500 and 3000 per year (Chart 1).

Another metric worth mentioning is the number of research projects financed or co-financed from the European Commission's framework programmes and the amount of the funding received. In the European Commission's latest framework programme "Horizon 2020," implemented in 2014–2020, PAS research units secured almost 103 million euros (Charts 2 and 3).

Another measure of internationalization is the number of foreign scholars who conduct research at a specific institution. In the Polish Academy of Sciences, their share is at the level of 8%, but it is very unevenly distributed. At some of the PAS institutes, more than one-fourth of the research staff is made up by foreign researchers – these include the Center for Theoretical Physics (40%), the Copernicus Astronomical Center (31%), the Institute of Physical Chemistry (25%), and the Institute of Mathematics (25%, data collected in October 2021). However, there are several institutes with no foreign researchers. Many foreign scholars are also attracted by doctoral schools created or co-created by the PAS institutes (Table 1).

Table 1

Selected doctoral schools of the Polish Academy of Sciences with the percentage of doctoral students from abroad (data as of 31 December 2020)

School name	PAS Institutes	Share of foreign doctoral students in the number of the PAS doctoral students in a given school
BioPlanet	<ul style="list-style-type: none"> • Museum and Institute of Zoology, PAS • Mammal Research Institute, PAS • Institute of Paleobiology, PAS • Institute of Parasitology, PAS 	60%
GeoPlanet	<ul style="list-style-type: none"> • Copernicus Astronomical Center, PAS • Space Research Centre, PAS • Center for Theoretical Physics, PAS • Institute of Geophysics, PAS • Institute of Geography and Spatial Organization, PAS • Institute of Geological Sciences, PAS • Institute of Oceanology, PAS 	53%
Doctoral School of Information and Biomedical Technologies at the PAS Institutes	<ul style="list-style-type: none"> • Systems Research Institute, PAS • Institute of Biocybernetics and Biomedical Engineering, PAS • Institute of Theoretical and Applied Informatics, PAS • Mossakowski Medical Research Center, PAS • Institute of Computer Science, PAS • Institute of Fundamental Technological Research, PAS • Research and Academic Computer Network (NASK) – National Research Institute 	46%

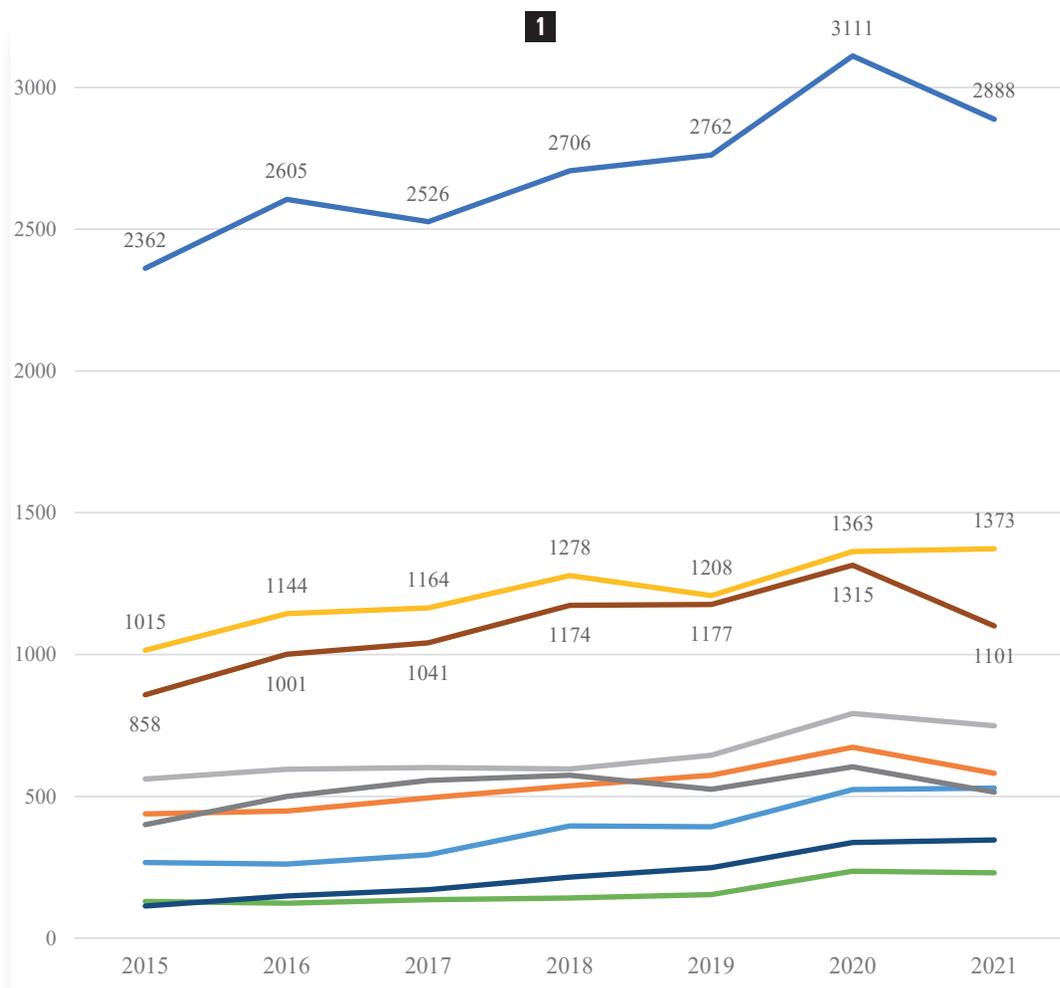


Chart 1
Number of articles with international co-authorship published in 2015–2021, after SciVal (29 October 2021)

- Polish Academy of Sciences
- Jagiellonian University
- University of Warsaw
- AGH University of Science and Technology
- Adam Mickiewicz University in Poznań
- Warsaw University of Technology
- Nicolaus Copernicus University in Toruń
- Silesian University of Technology
- Poznan University of Technology

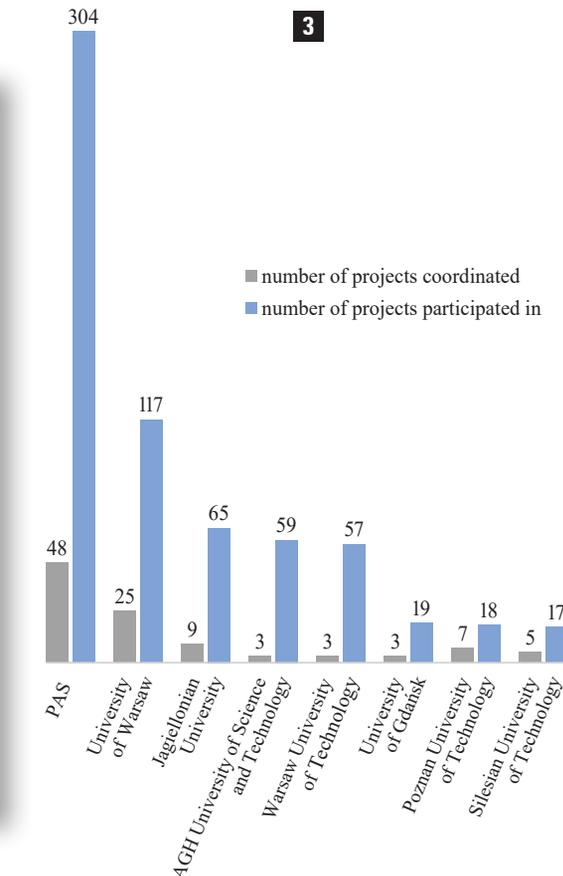
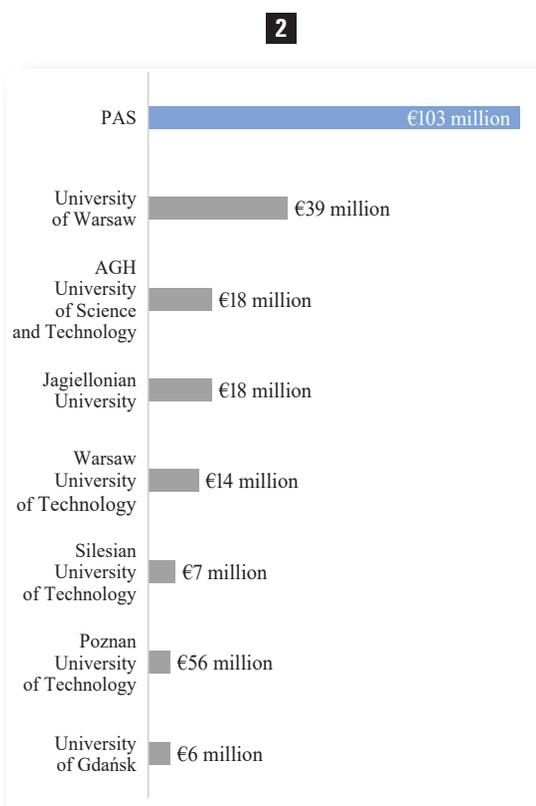


Chart 2
The value of net funding from H2020 secured by selected Polish scientific institutions (NCP, data as of 5 March 2021)

Chart 3
Number of H2020 projects participated in and projects coordinated (NCP, data as of 5 March 2021)

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Fig. 1
Number of PIAsT fellows
by country of origin



The PAS Scientific Center
in Paris



International initiatives of the Polish Academy of Sciences

In 2017, the Polish Institute of Advanced Studies (PIAsT) began operating within the structure of the Academy. The Institute recruits exclusively foreign researchers to come to Warsaw for five or ten months to conduct research primarily in the field of humanities and social sciences. Since its inception, the PIAsT has so far granted fellowships to 92 individuals from 27 countries. Since 2021, PIAsT fellowships have also been partially funded by the Polish-US Fulbright Commission (Fig. 1).

The Academy's initiatives addressed to foreign scholars also include the PASIFIC fellowship program, co-financed by the Polish Academy of Sciences and the European Commission from the funds of the Horizon 2020 framework programme. The aim of this program is to select and fund 50 two-year research fellowships at the PAS institutes. In the first call for applications, the Academy received 348 submissions from 60 countries, and selected 35 laureates. The second call closed on 30 December 2021.

In addition to financing stays of foreign scholars in its institutes, the Academy also offers funding to pay for visits made by researchers from Polish research units to foreign partner institutions. The Academy has already signed 80 cooperation agreements with institutions in 44 countries. Every year, the PAS Chancellery allocates about PLN 2.7 million to the funding of foreign travel. The PAS is also a member of 60 international organizations (see page 49), where the Polish scientific community is represented by the PAS committees. As for collaboration with international organizations, it is worth mentioning the European Federation of Acade-

The PAS is a member of the following international organizations:

- 1 AIEB (International Association of Byzantine Studies)
- 2 AIDP (L'Association Internationale de Droit Pénal)
- 3 ALLEA (European Federation of Academies of Sciences and Humanities)
- 4 APDIC (Alloy Phase Diagram International Commission)
- 5 CIEHS (Commission Internationale des Études Historiques Slaves)
- 6 CIHM (International Commission of Military History)
- 7 CIHS (International Committee of Historical Sciences)
- 8 CIN (International Numismatic Council)
- 9 CIPL (Permanent International Committee of Linguists)
- 10 CISM (International Centre for Mechanical Sciences)
- 11 COMNAP (Council of Managers of National Antarctic Programs)
- 12 COSPAR (Committee on Space Research)
- 13 EASAC (European Academies' Science Advisory Council)
- 14 EFB (European Federation of Biotechnology)
- 15 EFI (European Forest Institute)
- 16 EFNIL (European Federation of National Institutions for Language)
- 17 ENRIO (European Network of Research Integrity Offices)
- 18 EVSSAR (European Veterinary Society for Small Animal Reproduction)
- 19 EPB (European Polar Board)
- 20 Euro-CASE (European Council of Academies of Applied Sciences, Technologies and Engineering)
- 21 EU-SAGE (European Sustainable Agriculture through Genome Editing)
- 22 FARO (Forum of Arctic Research Operators)
- 23 FIB (International Federation for Structural Concrete)
- 24 IAF (International Astronautical Federation)
- 25 IAP (InterAcademy Partnership)
- 26 IASC (International Arctic Science Committee)
- 27 IAU (International Astronomical Union)
- 28 ICA (International Commission for Acoustics)
- 29 ICLAS (International Council for Laboratory Animal Science)
- 30 ICO (International Commission for Optics)
- 31 ICS (International Committee of Slavists)
- 32 IFIP (International Federation for Information Processing)
- 33 IFRWH (International Federation for Research in Women's History)
- 34 IFToMM (International Federation for the Promotion of Mechanism and Machine Science)
- 35 IGU (International Geographical Union)
- 36 I-INCE (International Institute of Noise Control Engineering)
- 37 IMU (International Mathematical Union)
- 38 INQUA (International Union for Quaternary Research)
- 39 IPA (International Permafrost Association)
- 40 ISC (International Science Council)
- 41 IUAES (International Union of Anthropological and Ethnological Sciences)
- 42 IUBMB (International Union of Biochemistry and Molecular Biology)
- 43 IUCr (International Union of Crystallography)
- 44 IUFoST (International Union of Food Science and Technology)
- 45 IUFRO (International Union of Forest Research Organizations)
- 46 IUGG (International Union of Geodesy and Geophysics)
- 47 IUGS (International Union of Geological Sciences)
- 48 IUHPST/DLMPST (International Union of History and Philosophy of Science and Technology – Division of Logic, Methodology and Philosophy of Science and Technology)
- 49 IUHPST/DHST (International Union of History and Philosophy of Science and Technology – Division of History of Science and Technology)
- 50 IUNS (International Union of Nutritional Sciences)
- 51 IUPAB (International Union for Pure and Applied Biophysics)
- 52 IUPAC (International Union of Pure and Applied Chemistry)
- 53 IUPAP (International Union of Pure and Applied Physics)
- 54 IUTAM (International Union of Theoretical and Applied Mechanics)
- 55 NuPECC (Nuclear Physics European Collaboration Committee of the ESF)
- 56 RILEM (International Union of Laboratories and Experts in Construction Materials, Systems and Structures)
- 57 SCAR (Scientific Committee on Antarctic Research)
- 58 SCOR (Scientific Committee on Oceanic Research)
- 59 UAI (Union Académique Internationale)
- 60 URSI (International Union of Radio Science)

mies of Sciences and Humanities (ALLEA), where Prof. Paweł Rowiński, Vice-President of PAS, serves as a member of the Board.

Support for scholars from Polish research institutions is also provided by the Academy's foreign offices: the foreign scientific centers in Paris, Vienna, and Rome, the Center for Historical Studies in Berlin, the Polish Science Contact Agency (PolSCA) in Brussels, and the PAS Representative Office in Kyiv. These institutions not only promote internationally the ac-

complishments of Polish scientific institutions and the scientists affiliated with them, but are also places where research projects are carried out (PAS Center for Historical Studies in Berlin), provide conference space for international scientific conferences (Paris, Vienna), and support Polish applicants in applying for grants from framework programs (PolSCA). In the latter realm, additional support is also provided by the Office for Scientific Excellence, established in 2016. It specializes in the European Research Council's

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(ERC) competitions and offers training and support for researchers applying for ERC grants.

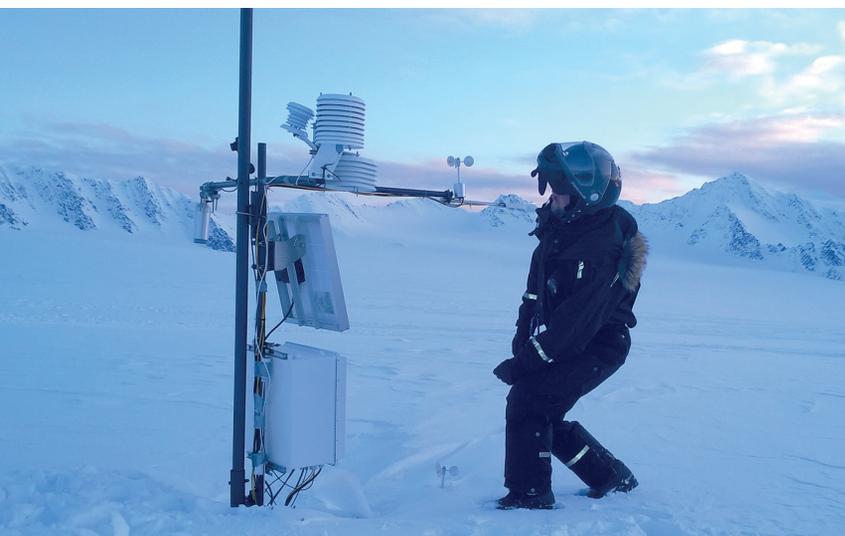
Polish polar stations

Also noteworthy are the PAS foreign research stations that conduct polar research. These are the Arctowski Polish Antarctic Station, which was established in 1977 and operates under the logistical and scientific auspices of the PAS Institute of Biochemistry and Biophysics, and the Polish Polar Station in Hornsund (in southern Spitsbergen), established in 1957 and managed by the PAS Institute of Geophysics. The Arctowski Station conducts research in the fields of oceanography, geology, geomorphology, glaciology, meteorology, seismology, and ecology. In turn, the polar station in Hornsund runs a monitoring program aimed at improving understanding of the Arctic nature and its changes. The station also records measurements in the areas of climate science, glaciology, hydrology, oceanography, seismology, atmospheric physics, geomorphology, and permafrost. Both stations and their scientific community work closely with researchers from other countries.

Science and the Web

The Poznań Supercomputing and Networking Center (PSNC), affiliated with the PAS Institute of Bioorganic Chemistry, also impacts significantly on the internationalization of the research conducted by Polish scholars. Established in 1993, the PSNC primarily acts as a national center for high-performance computing and as the operator of the Polish fiber-optic research and education network PIONIER. Using the GÉANT network, the PSNC connects PIONIER with European research and education networks and provides the Polish scientific community with access to the glob-

Climate mission:
the Polish Polar Station
in Hornsund, Spitsbergen



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al Internet. The network also has a direct fiber-optic connection with the scientific center of the European Organization for Nuclear Research (CERN) in Geneva. The Center's computing resources are used by the Polish scientific community, by foreign scholars under the framework of the PRACE (Partnership for Advanced Computing in Europe) computing power exchange agreements, in the field of nuclear physics (the Worldwide LHC Computing Grid, WLCG) and radio astronomy (Low-Frequency Array, LOFAR), as well as scholars linked to numerous international ESFRI projects (European Strategy Forum for Research Infrastructures). The Center in Poznań is one of Poland's largest centers involved in international research projects. Over 28 years of its activity, the PSNC has participated in nearly 300 such programs and initiatives, in particular in the area of information and communication technologies (AI/big data, multi-scale modeling, quantum communication and computing, and cyber security) and their applications in the digital transformation of science, the economy, and society.

The Academy and the borders

Thanks to the activity of the Polish Academy of Sciences and the programs of the National Science Center and the Polish National Agency for Academic Exchange, access to resources and tools enabling international cooperation has improved significantly in recent years. It should be noted, however, that Poland's is still among the less-mobile academic communities in Europe, and we still need systemic support in this area of scientific activity. A system of incentives for the internationally most active research units is needed, and so is support from Polish government agencies aimed at helping institutes open up to researchers from abroad. Another important form of support is that provided by central administration bodies in Poland, for example in speeding up the procedures for legalizing the stay of foreign scholars in Poland.

From the perspective of the Academy's 70 years of existence, we can see clearly its accomplishments and presence in international science: the articles published internationally, grants under the EU Framework Programmes, international prizes awarded to the PAS staff and members, international conferences organized by the PAS academic community, and above all research that pushes forward the leading edge of science and contributes to its development in the world. All those who participate in this international dialogue deserve recognition, as well as the kind of support that will allow them to successfully venture beyond the current boundaries of knowledge. ■

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