



Annual Report **2019**

National Science Centre in Poland

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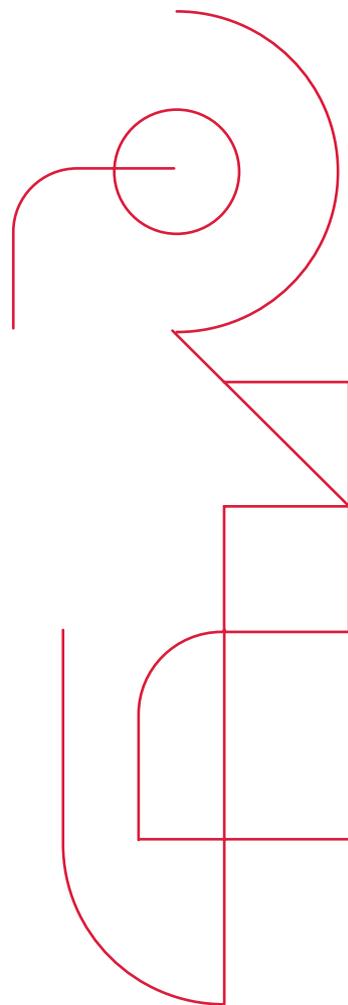
PERFORMING FOR
POLISH RESEARCH

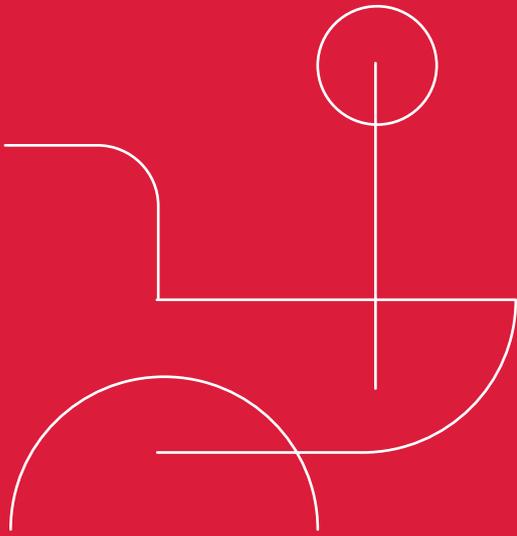


BASIC RESEARCH IS THE
ESSENCE OF ALL SCIENCE

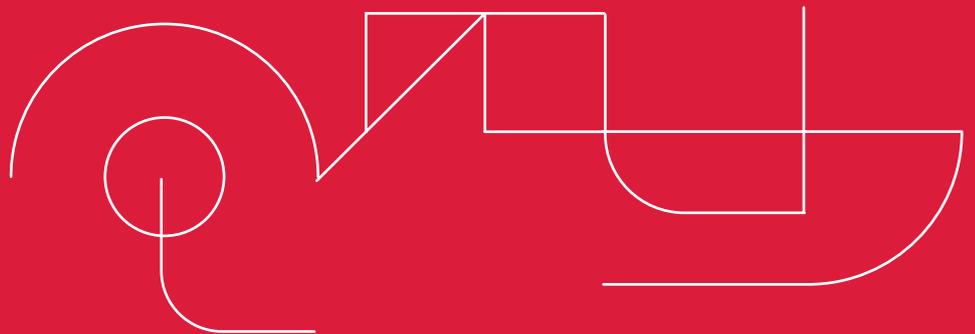
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ABOUT THE NATIONAL SCIENCE CENTRE



General information

National Science Centre (NCN) is a government executive agency funding basic research carried out at Polish research institutions. Basic research is defined as empirical or theoretical work seeking to expand knowledge of the fundamentals of phenomena and observable facts without any direct commercial use.

We have a rich offer of calls for proposals to fund projects, single research activities, scholarships and post-doc fellowships. Every researcher, regardless of their age, level of achievement, academic degree or title, or field of interest, will find a funding scheme matching their needs.

The funding is awarded to the best proposals, selected in the course of a two-stage peer review. The expert reviewers evaluate both the quality of the research and the applicant's achievements. We monitor the proper implementation of ongoing grants: we accept and verify annual reports on the projects under implementation, and we carry out audits at the host institutions for the projects.

Another area of our activities consists in inspiring funding of basic research from non-state sources, propagating information on the funding opportunities we launch and initiating international cooperation. Together with the German Max Planck Society (MPG) we have been operating the DIOSCURI programme to establish Centres of Scientific Excellence in Poland. We are a co-ordinator of the QuantERA programme – a network of 32 agencies funding scientific research in the field of quantum technologies cofunded by the European Commission from the Horizon 2020 Programme, and we are also the operator of the Research area in charge of basic research funded by the EEA and Norway Grants. Under the Central European Science Initiative (CEUS), which brings together NCN, agencies from Austria, the Czech Republic and Slovenia, in February 2020 we announced the CEUS-UNISONO call for projects carried out by research teams from these countries. Furthermore, in February 2020, we received a Marie Skłodowska-Curie COFUND grant for the POLONEZ BIS programme for incoming experienced researchers. The first call for proposals will be launched in September 2021.



Mission

Supporting the development of Polish research on the international arena and leveraging the quality and effectiveness of research through a competitive grant system.



Goals

- Funding excellent research projects in basic research
- Supporting early stage researchers
- Inspiring the creation of large, interdisciplinary research teams which are able to compete internationally
- Fostering international cooperation in research
- Creating new job opportunities in NCN-funded projects

Highlights 2019

4

March

Prof. Zbigniew Błocki is appointed for a second term as the Director of the National Science Centre

7

June

at the Ministry of Investment and Economic Development in Warsaw, the National Science Centre signs a Research Programme agreement within the framework of the third edition of Norway and EEA Grants, in which it serves as the operator in charge of basic research

12

September

the National Science Centre signs a cooperation agreement with the Polish National Agency for Academic Exchange (NAWA)

15-16

May

the seventh edition of the National Science Centre Days is held in Łódź

17

September

the first two Dioscuri Centres of Scientific Excellence are established at the Nencki Institute of Experimental Biology of the Polish Academy of Sciences. The respective research teams are headed by Aleksandra Pekowska and Grzegorz Sumara

17

June

the agencies of the Central European Science Partnership (CEUS) sign an agreement concerning a call for research projects carried out by teams from Poland, Austria, Slovenia and the Czech Republic

9

October

the NCN Awards 2019 go to
Dr hab. Dawid Pinkowicz (ST),
Dr Roman Szczęsny (NZ),
Dr hab. Michał Wierzchoń (HS)

27

November

Prof. Zbigniew Błocki, NCN Director,
is elected for a third term as
a member of the Governing Board
of Science Europe

14

November

the Director and the Council of
the NCN attend a meeting with
Jarosław Gowin, Deputy Prime
Minister, Minister of Science and
Higher Education, at the premises
of the NCN in Kraków

13

December

the Director and the Council of the
NCN hold a second meeting with
the research community under the
working title "Round Table" at the
permises of the NCN

NCN Structure



NCN Director

The National Science Centre's executive officer is its director, selected in a competition by the Council of the NCN, and appointed by the Minister of Science and Higher Education. Since March 2015, the role has been performed by Prof. Zbigniew Błocki. The director is the NCN's representative, and is in charge of the NCN's statutory tasks and financial policy. The director acts as a legal representative on behalf of the NCN.

NCN COUNCIL

The NCN Council is a policy body consisting of twenty-four distinguished researchers representing different academic fields. The Council sets priority areas in basic research, decides on the type of programmes and specifies the call regulations. Its range of competencies also includes electing members of the expert teams responsible for evaluation of proposals.

NCN Council in 2019

Prof. dr hab. Małgorzata Kossowska – President of the Council



Arts, Humanities and Social Sciences (HS)

Prof. dr hab. Krystyna Bartol
Dr hab. Joanna Golińska-Pilarek
Prof. dr hab. Dariusz Markowski
Dr hab. Justyna Olko
Prof. dr hab. Tomasz Szapiro
Dr hab. Joanna Wolszczak-Derlacz



Physical Sciences and Engineering (ST)

Prof. dr hab. Mikołaj Bojańczyk
Prof. dr hab. Grzegorz Karch
Prof. dr hab. inż. Wojciech Kucewicz
Prof. dr hab. Stanisław Lasocki
Prof. dr hab. Jerzy Łuczka
Prof. dr hab. Ewa Majchrzak
Prof. dr hab. Piotr Migoń
Prof. dr hab. Ewa Mijowska
Prof. dr hab. inż. Marek Samoć
Prof. dr hab. inż. Teresa Zielińska

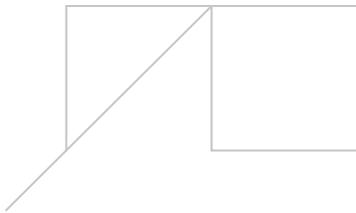
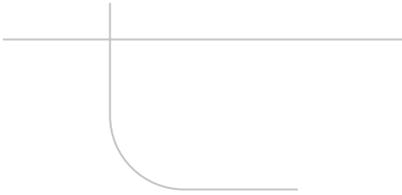
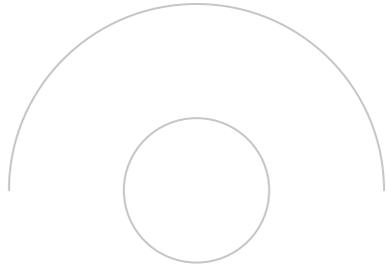


Life Sciences (NZ)

Prof. dr hab. Jakub Fichna
Prof. dr hab. n. farm. Krzysztof Józwiak
Prof. dr hab. Jacek Kuźnicki
Prof. dr hab. Barbara Lipińska
Prof. dr hab. Andrzej Sobczak
Prof. dr hab. Anetta Undas
Prof. dr hab. inż. Aneta Wojdyło

NCN Office

The NCN Office is composed of several departments and teams in three major divisions in charge of organisation, finances and grant management. On a day-to-day basis, the Office is responsible for processing calls for proposals and organising meetings for experts at the peer review evaluation stage. Furthermore, the Office provides day-to-day support to the grantees who carry out projects; it manages the process of signing funding agreements, oversees their implementation, initiates international co-operation in the scope of research funding, organises calls under the EEA and Norway Grants in co-operation with the Council and coordinators, as well as the Research Programme Committee, and disseminates information on the national calls throughout the scientific community.



NCN Coordinators

The NCN Coordinators are scientific officers responsible for organising and conducting calls for proposals for research projects. Their responsibilities also include evaluation of the impartiality of the peer review process, the eligibility check of proposals submitted within the calls, as well as the promotion of NCN funding programmes in the research community. Coordinators support the NCN Council in developing the research policy. Coordinators work within the NCN in three units: Arts, Humanities and Social Sciences; Life Sciences; and Physical Sciences and Engineering. They are selected by the NCN Council on the basis of competition. Candidates for this position must have at least a PhD.

National Science Centre's Council

NCN Director NCN Deputy Director

Organizational Division

Administration Department

Communications Team

IT Team

Financial Division

Finance and Accounting Department

Finance Team
Accounting Team

Project Monitoring Department

Audit and Compliance Team

Project Division

Research Projects Administration Department

Arts, Humanities and Social Sciences
Physical Sciences and Engineering
Life Sciences

Proposal Processing Department

International Cooperation Department

Evaluation Team

Expert Support Team

Electronic Submission System Team

EEA and Norway Grants Team

Commissioner for State Aid

Coordinators

The Arts, Humanities and Social Sciences Coordinator Unit
The Physical Sciences and Engineering Coordinator Unit
The Life Sciences Coordinator Unit

Legal Team

Chief Accounting Officer

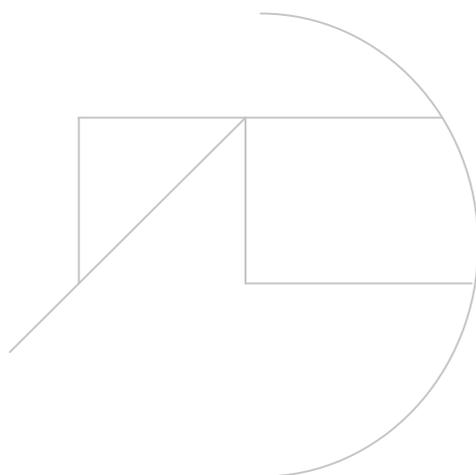
Office of the NCN Council

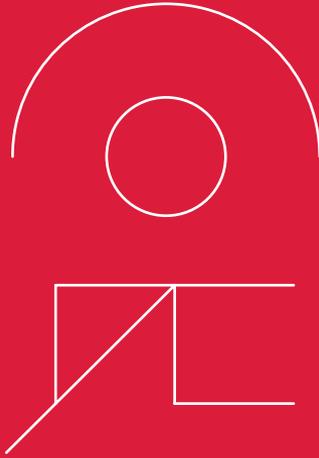
HR Department

Protection of Classified Information Officer

Data Protection Officer

Health and Safety Officer





NCN PERFORMANCE IN 2019



NCN in figures

13

national calls launched

13

national calls concluded

10,438

proposals submitted under
national calls launched in 2019

2,533

proposals recommended
for funding under the
national calls concluded
in 2019



10

international calls launched

10

international calls concluded

522

proposals submitted
under **international** calls
launched in 2019

98

international proposals
recommended
for funding

PLN
1.27
BILLION

for proposals recommended for
funding under the national calls
concluded in 2019

22%

total success rate*
of the national calls
concluded in 2019

* Success rate is the ratio of the number of the proposals recommended for funding against the number of proposals submitted, expressed as a percentage.

NCN funding schemes

We finance basic research conducted as projects, single research activities, scholarships and post-doc fellowships. The funding schemes on offer match the diverse needs of the research community, from scholars embarking on their career in research to the most accomplished researchers. The funding is granted to the best research teams, whose principal investigators and members have the required experience and facilities prerequisite to the implementation of their projects. The NCN accepts proposals from all research disciplines on the NCN panels' list.



PRELUDIUM

Call for research projects



Applicants: early stage researchers, without doctorate



Duration: 12, 24 or 36 months



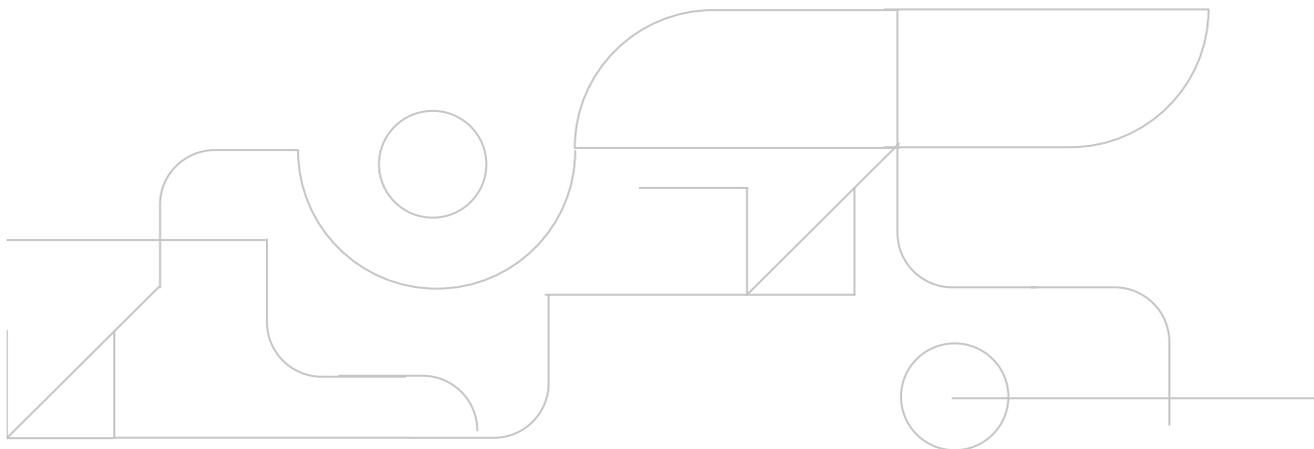
Funding: PLN 70,000, PLN 140,000 or PLN 210,000 depending on the project's duration



Requirements: carried out under mentor's supervision



Open: until 2019 – twice a year, in 2020 – once





PRELUDIUM BIS

Call for research projects carried out by PhD students at doctoral schools



Applicants: PhD supervisors at doctoral schools



Duration: 36 or 48 months



Funding: up to PLN 180,000 for a research project, whereas the principal investigator may be a beneficiary of up to PLN 40,000



Requirements:

- under the call, a PhD student is selected and enrolled in a doctoral school
- research projects are carried out by PhD students as part of their doctoral dissertations
- foreign fellowships for PhD students for a period of 3 to 6 months in a foreign research institution, the funding of which shall be requested by PhD students under programmes operated by the NAWA
- a PhD must be awarded within 12 months of project completion



Open: once a year



ETIUDA

Call for doctoral scholarship proposals



Applicants: for individuals working on their doctoral dissertations



Duration: 6 to 12 months + 3 to 6 months of fellowship at a research centre abroad



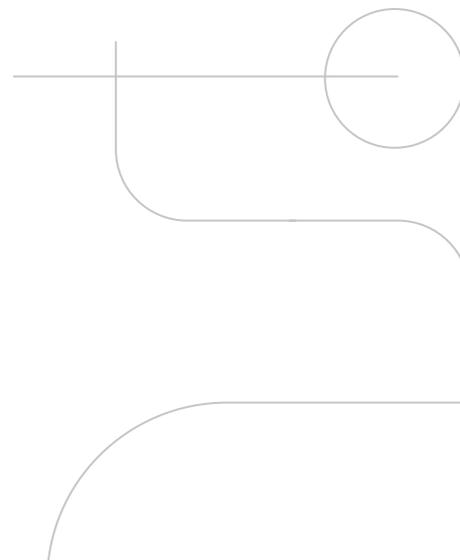
Funding: PLN 5,000 a month + travel and living allowance paid during the fellowship at a research centre abroad



Requirements: the grantee must secure the award of their doctorate within 6 to 12 months of the fellowship



Open: until 2019 – once a year, no call scheduled in 2020



SONATINA

Call for research projects: employment at research institutions, funding for research projects and fellowships abroad

 **Applicants:** researchers with a doctorate received within 3 years of submitting the proposal or those who will receive the degree by 30 June of the year of the call

 **Duration:** 24 or 36 months, fellowship at a research centre abroad of 3 to 6 months

 **Funding:** no cap on funding research projects, PLN 12,000 a month during the fellowship abroad + travel allowance

 **Open:** once a year

SONATA

Call for research projects: innovative research using state-of-the-art equipment or original methodology

 **Applicants:** researchers with a doctorate received within 2 to 7 years of submitting the proposal

 **Duration:** 12, 24 or 36 months

 **Funding:** no cap on funding research projects

 **Requirements:** researchers who have been awarded a PhD degree by the host institution for the project cannot be employed as post-docs

 **Open:** once a year

SONATA BIS

Call for research projects: establishing a new research team

 **Applicants:** researchers who have received their doctorate 5 to 12 years before submitting the proposal

 **Duration:** 36, 48 or 60 months

 **Funding:** no cap on funding research projects

 **Open:** once a year

UWERTURA

Call for proposals for fellowships in ERC-funded projects

 **Applicants:** doctoral researchers with full time employment at a research centre, who have carried out, as Principal Investigators, research projects funded by the NCN, and are not European Research Council (ERC) grantees

 **Duration:** 1 to 6 months

 **Funding:** PLN 9,000 to PLN 21,000 monthly depending on the country + travel allowance

 **Requirements:** the grantee must apply for an ERC grant within 24 months of the fellowship

 **Open:** last announced in 2019

MINIATURA

Call for single research activities instrumental in basic research

 **Applicants:** researchers with a PhD received within 12 years of submitting the proposal who have not applied for or been granted funding as Principal Investigator or Fellow in other NCN calls for proposals, doctoral scholarships and postdoctoral fellowships or under other national or international calls

 **Duration:** up to 12 months

 **Funding:** PLN 5,000 to PLN 50,000

 **Requirements:**

- funding for the following activities: preliminary research, pilot studies, library and archive searches, fellowships, exploratory visits, consultancy visits;
- applicants may not seek funding for employment costs or scholarships, with the exception of personnel costs of collective investigators who are not employees of the MINIATURA host institution
- applicants must be employed by the host institution under an employment contract

 **Open:** continuous call, fast track evaluation process

TANGO

Call for projects assuming the implementation of findings with an innovative potential, obtained as a result of basic research (basic projects funded by the National Science Centre, NCN), announced by the National Centre for Research and Development (NCBR)

 **Applicants:** researchers who have acted as Principal Investigator in a basic research project for at least one year or who have secured permission from the basic research project's Principal Investigator to develop it under the TANGO scheme

 **Duration:** up to 15 months in Track A, up to 36 months in Tracks B and C

 **Funding:** up to PLN 250,000 in Track A, up to PLN 3,000,000 in Tracks B or C

 **Open:** once a year

HARMONIA

Call for research projects carried out in direct cooperation with foreign partners, within international programmes or initiatives announced under bi- or multilateral cooperation or whereby Polish teams use large-scale international research infrastructure

 **Applicants:** researchers who want to collaborate with their colleagues from abroad

 **Duration:** 12, 24 or 36 months

 **Funding:** PLN 500,000 to PLN 1,500,000

 **Open:** until 2018 – once a year, from September 2019 – integrated with OPUS



OPUS

Call for research projects



Applicants: all researchers, regardless of academic degree



Duration: 12, 24, 36 or 48 months



Funding: no cap on funding research projects



Requirements: researchers who have been awarded a PhD degree by the host institution for the project cannot be employed as post-docs, scholarships for young researchers may be granted under the scheme



Open: twice a year



MAESTRO

Call for ground-breaking research projects, including interdisciplinary research, offering a substantial contribution to the advancement of science, seeking to go beyond that which is known, which may result in new discoveries



Applicants: advanced researchers with at least 5 publications in renowned journals in the period of 10 years before submitting the proposal, with at least 2 grants in which they acted as Principal Investigator



Duration: 36, 48 or 60 months



Funding: no cap on funding research projects



Requirements: the project team must include at least one investigator with a doctorate and at least one doctoral candidate



Open: once a year

NCN Panels



ARTS, HUMANITIES AND SOCIAL SCIENCES

- HS1** Fundamental questions of human existence and the nature of reality
- HS2** Culture and cultural production
- HS3** The study of the human past
- HS4** Individuals, institutions, markets
- HS5** Norms and governance
- HS6** Human nature and human society



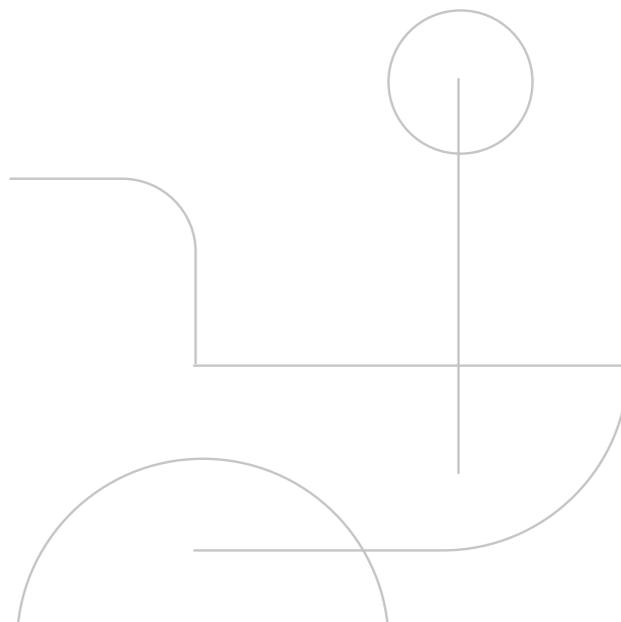
PHYSICAL SCIENCES AND ENGINEERING

- ST1** Mathematics
- ST2** Fundamental constituents of matter
- ST3** Condensed matter physics
- ST4** Chemistry
- ST5** Materials
- ST6** Computer science and informatics
- ST7** Systems and communication engineering
- ST8** Production and processes engineering
- ST9** Astronomy and space science
- ST10** Earth sciences



LIFE SCIENCES

- NZ1** Molecular biology, structural biology, biotechnology
- NZ2** Genetics, genomics
- NZ3** Cellular and developmental biology
- NZ4** Biology of tissues, organs and organisms
- NZ5** Human and animal noninfectious diseases
- NZ6** Human and animal immunology and infection
- NZ7** Diagnostic tools, therapies and public health
- NZ8** Evolutionary and environmental biology
- NZ9** Fundamentals of applied life sciences and biotechnology

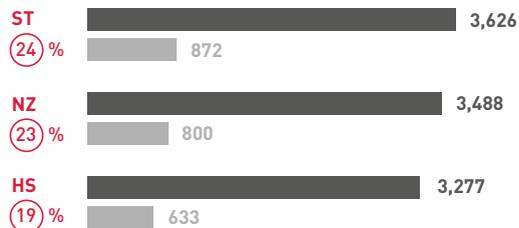


Funding of basic research

In national calls published in 2019, we received 10,438 proposals worth in total PLN 5.6 bln.

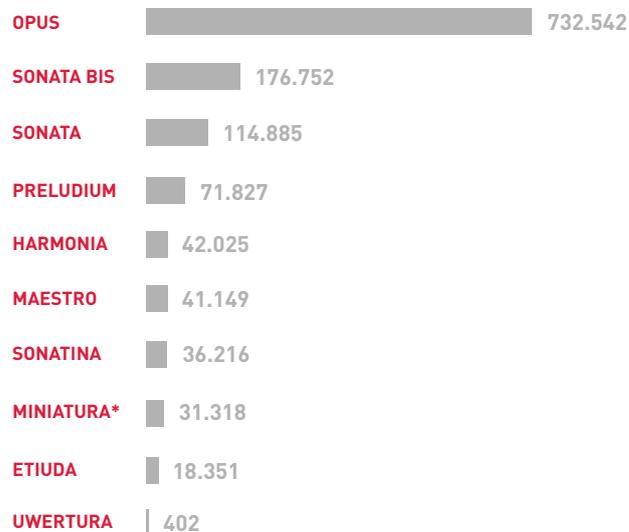
In calls concluded in 2019, funding was granted to 2,533 projects worth PLN 1.26 bln.

Number of proposals submitted and recommended for funding under the calls concluded in 2019, broken down by discipline group, alongside their respective success rates



- Proposals submitted
- Proposals recommended for funding
- Success rate

Funding awarded in calls concluded in 2019, broken down by call types

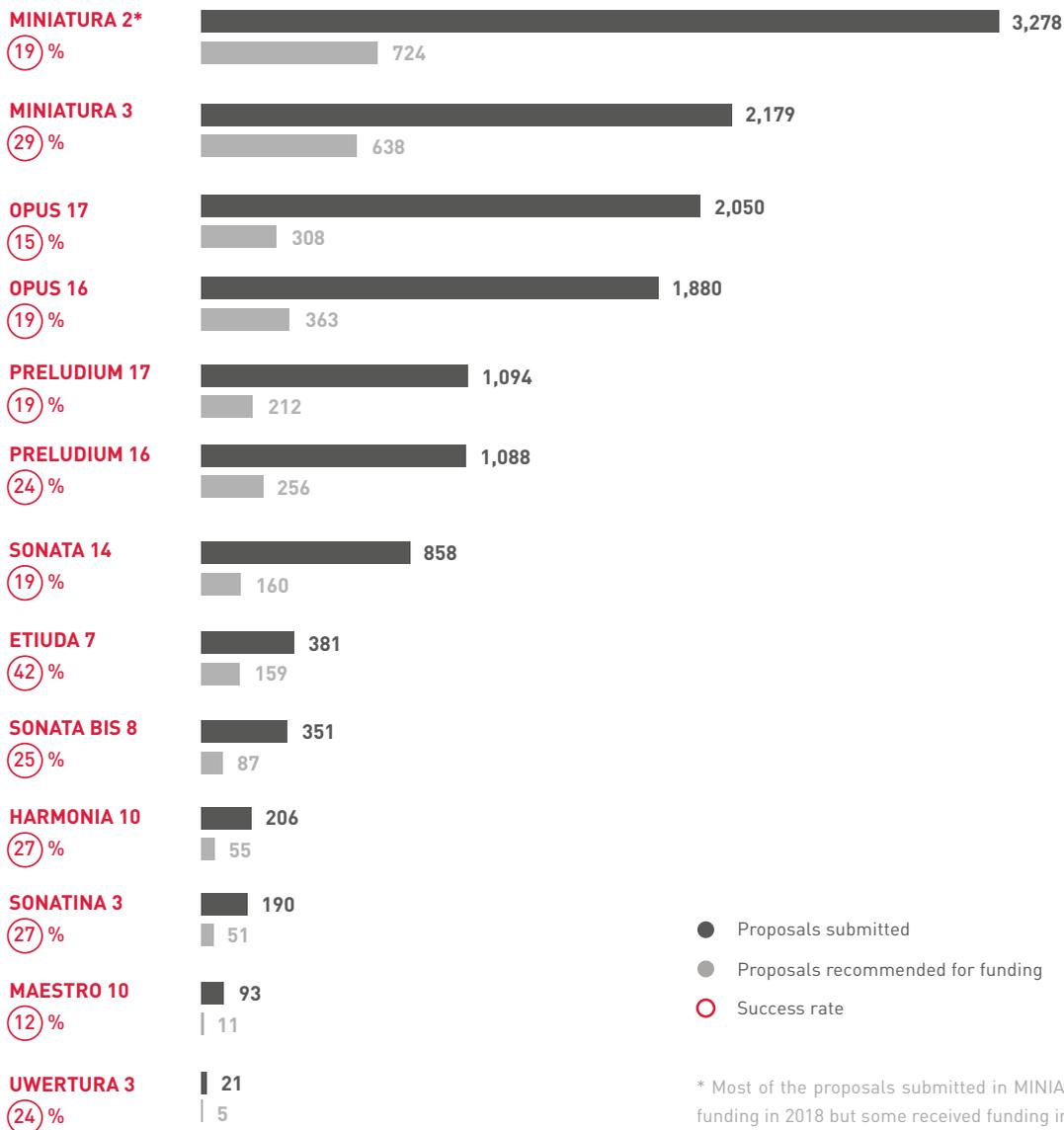


- Amount (million PLN)

* The amount includes both funding granted in MINIATURA 2, concluded partly in 2019 (PLN 7.638 million), and MINIATURA 3 (PLN 23.680 million).

Number of proposals submitted and recommended for funding under the calls concluded in 2019, broken down by call type, alongside their respective success rate

ANNUAL REPORT 2019



- Proposals submitted
- Proposals recommended for funding
- Success rate

* Most of the proposals submitted in MINIATURA 2 were recommended for funding in 2018 but some received funding in 2019 (228 proposals).

Leaders of the national call rankings in 2019

The chief beneficiaries of the national calls concluded in 2019 were:

- public and non-public higher education institutions (80% of all beneficiaries),
- research institutes of the Polish Academy of Sciences (16%),
- research institutes (3%).

Host Institution	Funding granted (million PLN)	Proposals qualified for funding	Success rate
University of Warsaw	171.821	270	34%
Jagiellonian University in Kraków	166.973	257	31%
Adam Mickiewicz University in Poznań	71.201	121	24%
Wrocław University of Science and Technology	38.819	52	22%
University of Wrocław	34.974	71	26%
University of Gdańsk	28.638	56	24%
Nicolaus Copernicus University in Toruń	24.740	55	20%
University of Silesia in Katowice	24.544	44	16%
Warsaw University of Technology	23.896	42	18%
Nencki Institute of Experimental Biology, Polish Academy of Sciences	22.774	26	44%
University of Łódź	2.634	54	21%
AGH University of Science and Technology	22.475	57	23%
Ludwik Hirszfild Institute of Immunology and Experimental Therapy, Polish Academy of Sciences	20.056	19	28%
Institute of Biochemistry and Biophysics, Polish Academy of Sciences	19.475	19	33%
Gdańsk University of Technology	16.774	36	20%

Host Institution	Funding granted (million PLN)	Proposals qualified for funding	Success rate
Łódź University of Technology	15.935	30	28%
Institute of Bioorganic Chemistry, Polish Academy of Sciences	15.487	17	37%
Institute of Physics, Polish Academy of Sciences	15.359	13	21%
SWPS University of Social Sciences and Humanities in Warsaw	14.129	27	32%
Nicolaus Copernicus Astronomical Centre of the Polish Academy of Sciences	13.844	11	37%
Institute of Physical Chemistry, Polish Academy of Sciences	13.807	12	38%
The Henryk Niewodniczański Institute of Nuclear Physics PAN	13.263	22	33%
Maria Curie-Skłodowska University in Lublin	13.200	29	17%
Centre of Molecular and Macromolecular Studies, Polish Academy of Sciences	12.177	9	39%
Poznań University of Life Sciences	12.143	27	21%
Poznań University of Medical Sciences	12.100	21	18%
International Institute of Molecular and Cell Biology in Warsaw	12.020	9	56%

The table presents a ranking list of institutions that received more than PLN 12 million in funding from the NCN in 2019. Once again, the leaders, both in terms of funding and the number of projects and other research activities, were the University of Warsaw (270 funded projects) and the Jagiellonian University (257 projects). The success rate given in the table corresponds to the ratio of successful projects that were recommended for funding to the total number of

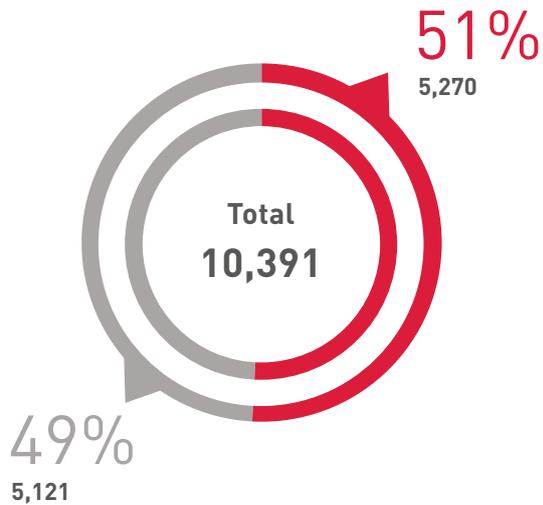
proposals. The highest success rate among those who won grants of more than PLN 12 million in 2019 was 56%, achieved by the International Institute of Molecular and Cell Biology, followed by the Nencki Institute of Experimental Biology of the Polish Academy of Sciences with 44%. Among universities, the highest rates were recorded by the University of Warsaw (34%), the SWPS University of Social Sciences and Humanities (32%), and the Jagiellonian University (31%).

Principal investigators*

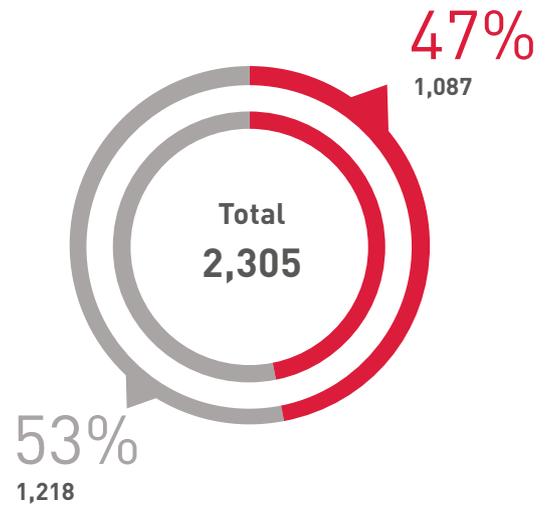
In 2019, proposals submitted by women made up 47% of all applications. They were marginally less successful in applying for funding than their male colleagues; the success rates for the two groups were 21% and 24% respectively. Of the projects awarded funding in 2019, ca 51% had a male Principal Investigator, whereas women acted as Principal Investigators to 49% of the awarded projects.

The number of proposals submitted and recommended for funding in 2019 broken down by gender of the Principal Investigator

Proposals submitted

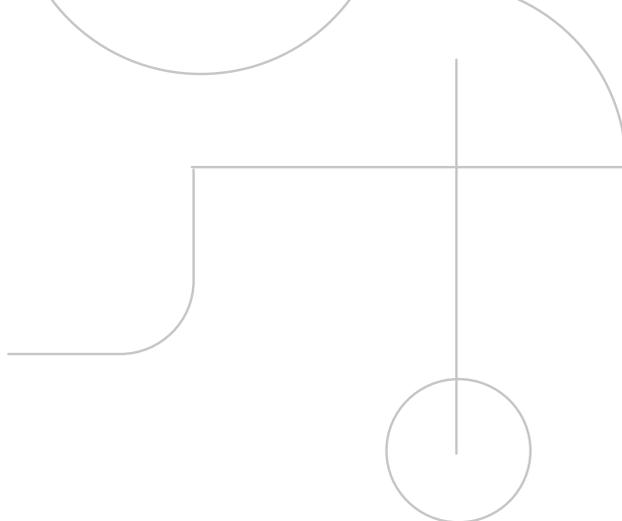


Proposals qualified for funding



● women ● men

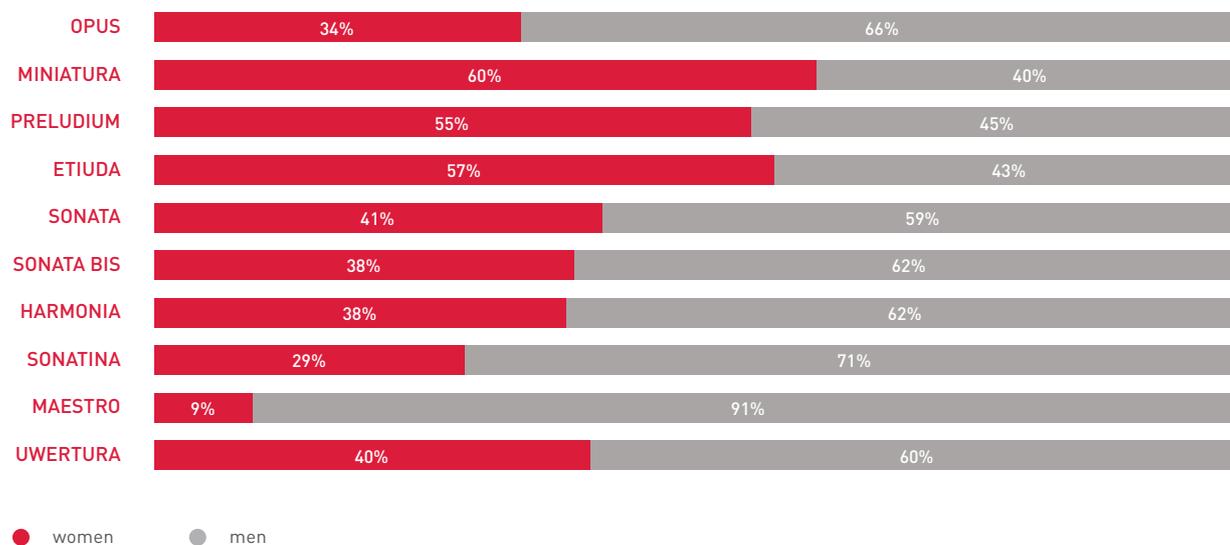
* Gender data based on the applicants' PESEL numbers. The data do not include the Principal Investigators without a PESEL (foreigners).



The largest percentage of women among the winners was recorded in the MINIATURA, ETIUDA and PRELUDIUM calls. Women accounted for 60% of the winners in the MINIATURA call, for 57% in the ETIUDA call, and for 55% of the two editions of PRELUDIUM call, held in 2019.

The lowest percentage of women for whom NCN approved grants was in the MAESTRO call. Out of 11 accepted proposals, women have been principal investigators only in 1 project.

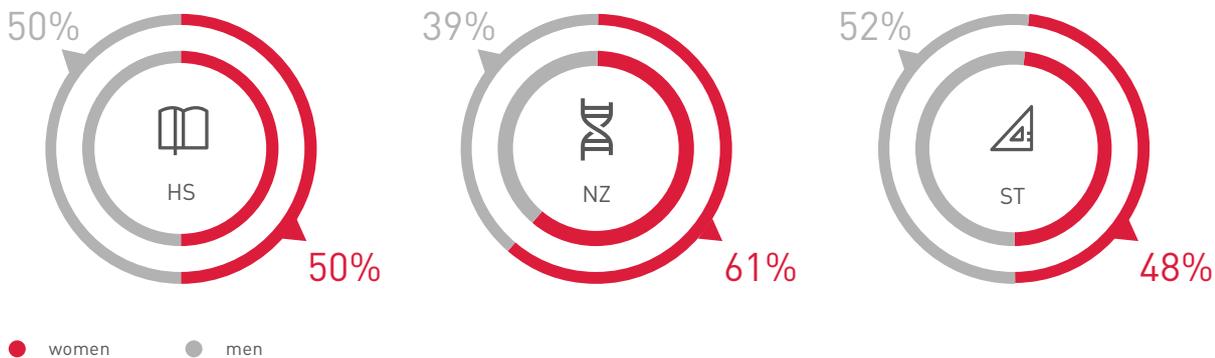
Percentage proportion of women and men among winners of NCN calls held in 2019



Reviewing women's scientific activities within the sectors of Arts, Humanities and Social Sciences (HS), Life Sciences (NZ) and Physical Sciences and Engineering (ST), the following was noted:

- the percentage share of women among the authors of proposals approved for funding was the highest in the NZ group, being 61%,
- similar to previous years, the smallest proportion of women was among winners of calls in the ST group – women were granted about 48% of the grants awarded in the group. Predominance of male grants decreased in 2019

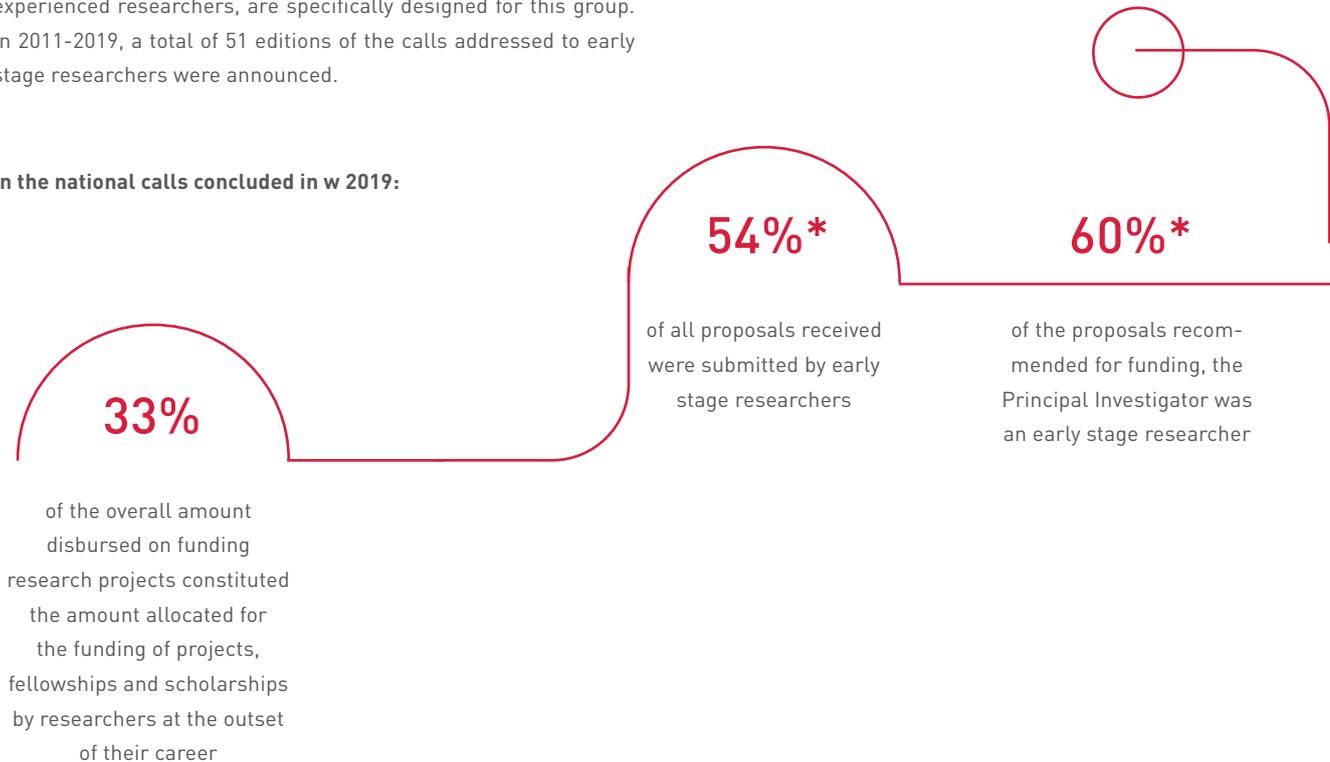
Percentage proportion of women and men in research domains among winners of NCN calls held in 2019



Early stage researchers

We are very serious about supporting early stage researchers who have not yet earned their PhD or have done so within the last 7 years. The PRELUDIUM, PRELUDIUM BIS, SONATINA, SONATA, ETIUDA and FUGA schemes, where they do not need to compete against more experienced researchers, are specifically designed for this group. In 2011-2019, a total of 51 editions of the calls addressed to early stage researchers were announced.

In the national calls concluded in w 2019:

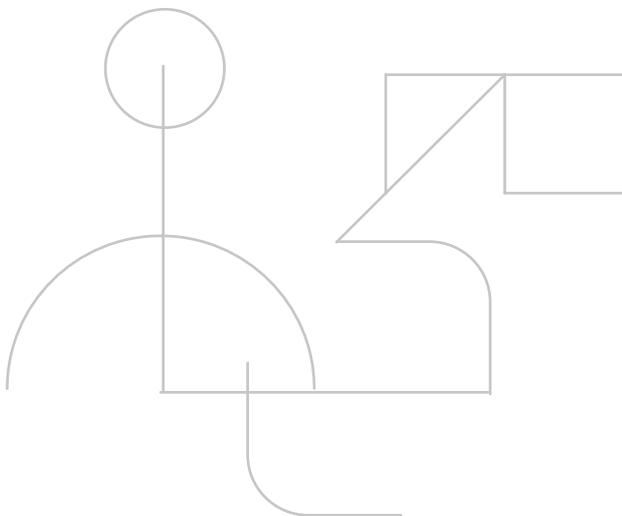


* No data were available for the TANGO call.

Evaluation process

The National Science Centre grants funding to top research projects selected through a two-stage peer review process. As a general rule, the Council of the NCN takes into account, in carefully considered proportion, both the quality of the project as such, and the achievements of the researchers involved.

The review procedure begins with a formal eligibility check performed by NCN Coordinators, which involves checking the completeness and correctness of the submission. The proposals then undergo a two-stage peer review by dedicated expert teams (groups of experts selected by the NCN Council among distinguished academics appointed by the NCN Director for the purpose of proposal evaluation).



STAGE I – QUALIFICATION CHECK

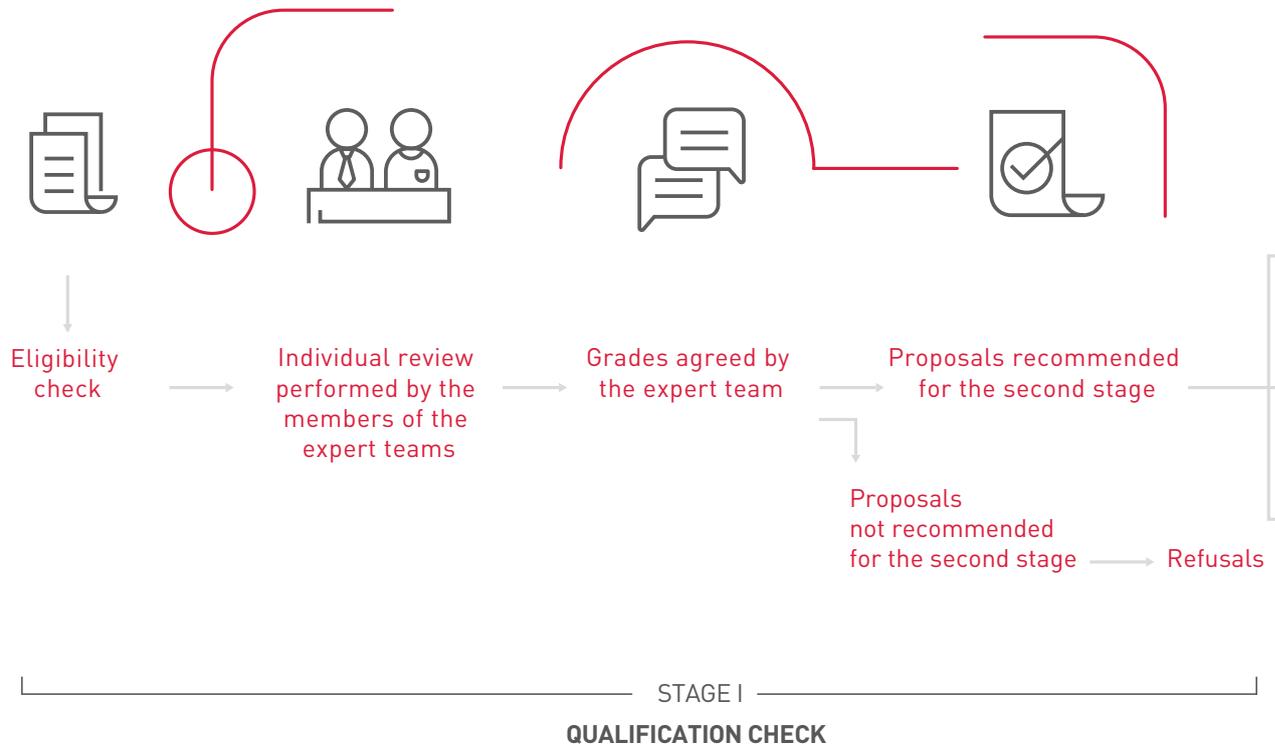
The proposals are first assessed individually by two experts working independently. Individual evaluations serve as a point of departure for debate during the first team meeting. The decision to reject or approve the proposal is taken collectively by the team as a whole. Subsequently, the members prepare a shortlist of projects admitted to stage two of the peer review process.

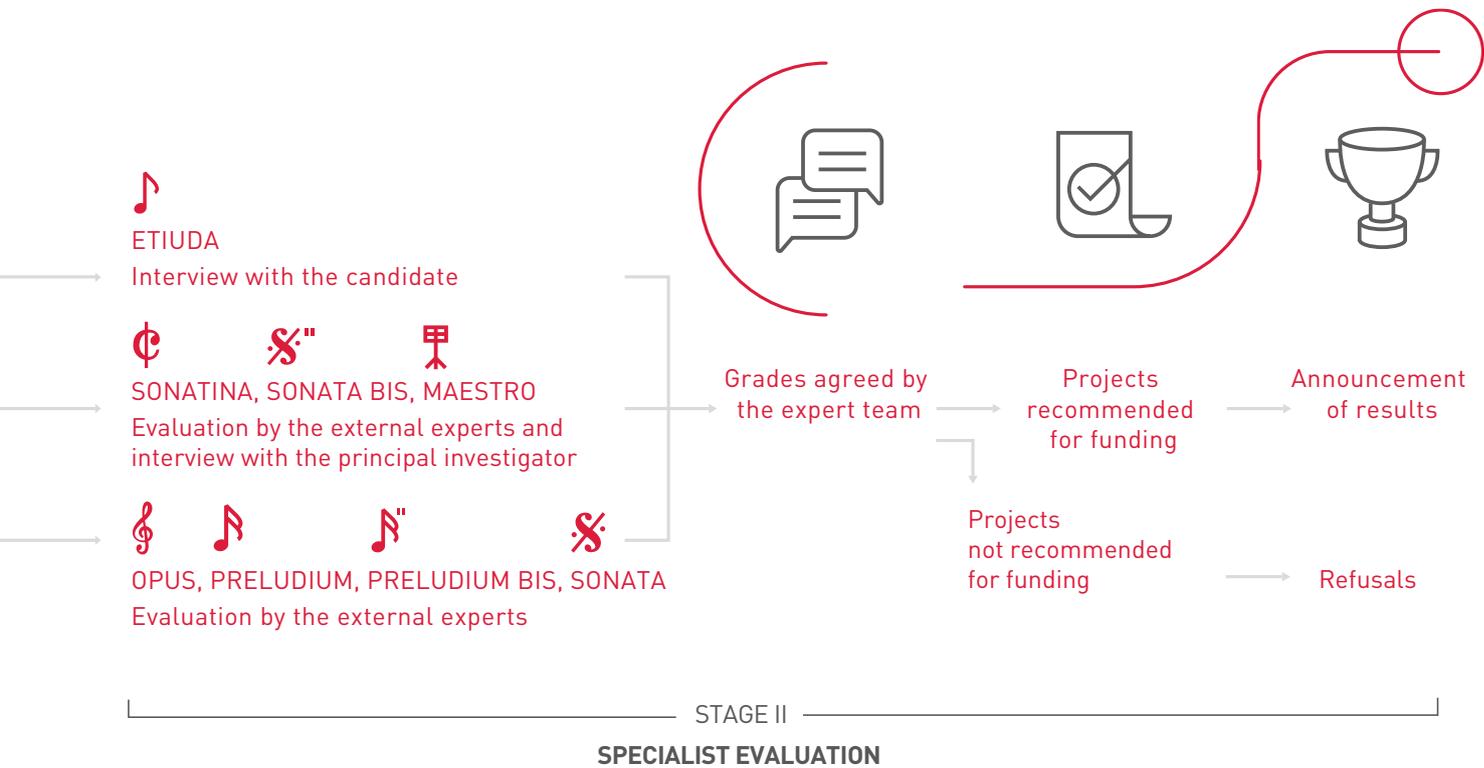
STAGE II – SPECIALIST EVALUATION

Second stage may be conducted in one of three ways, depending on the type of call. Proposals submitted in the OPUS, PRELUDIUM, PRELUDIUM BIS and SONATA calls are evaluated by at least two experts (often foreign) working independently, whose reviews are later discussed by the expert team during the second team meeting. External experts are nominated by NCN coordinators, based on the recommendations of team members. The second stage of the review process in the SONATINA, SONATA BIS and MAESTRO calls includes an interview with the principal investigator. In the ETIUDA call the specialist evaluation is based solely on an interview with the candidate.

The procedure (see diagram on p. 26-27) applies to most national calls from the current NCN portfolio, with the exception of MINIATURA, which involves a simplified, one-stage review process. Proposals submitted in the TANGO call are evaluated by NCBR. Proposals in international calls are assessed based on separate principles described in dedicated call documents.

Proposal review scheme





Experts

In 2019 as many as 1,648 reviewers were appointed, who assessed a total of 10,771 research proposals in the first stage of evaluation. Among the members of the expert teams appointed in 2019, 243 (15%) were affiliated outside Poland. Expert teams are appointed from among experts representing three research domains (ST, HS and NZ). Proposals may be evaluated by inter-domain teams (all domains represented in one team), by inter-panel teams (each

domain has its own team) or by panel teams dedicated to specific thematic panels (ST 1-10, HS 1-6, NZ 1-9). Each team may review proposals in one or more calls of a given edition (the term edition refers collectively to all calls for proposals with the same deadline of submission). This means that for a specific thematic panel, one or more expert teams may be appointed. See the table below for more details.

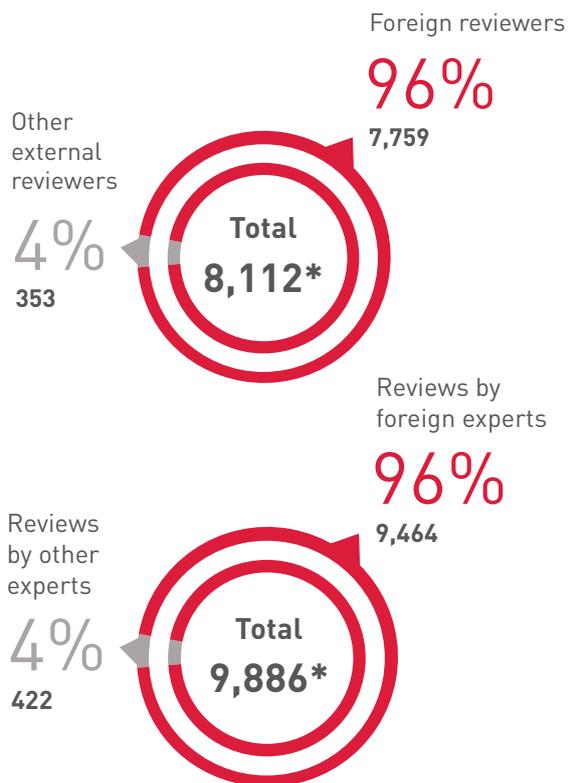
Number of expert teams and number of proposals reviewed under the calls concluded in 2019

Call publication	Number of expert teams	Reviewers in expert teams (including foreigners)	Proposals reviewed
15 June 2018	3 inter-panel teams for HARMONIA	140 (32)	900
	3 inter-panel teams for MAESTRO		
	3 inter-panel teams for SONATA BIS		
	3 inter-panel teams for SHENG		
14 September 2018	35 panel teams for OPUS, PRELUDIUM, SONATA	532 (72)	3,956
	2 teams in each panel: HS3, HS4, HS5, HS6, NZ5, NZ7, NZ9, ST5, ST8, ST10		
	2 inter-panel teams for BEETHOVEN CLASSIC		
14 December 2018	3 inter-panel teams for ETIUDA	112 (9)	592
	3 inter-panel teams for SONATINA		
	1 inter-panel team for UWERTURA		
15 March 2019	34 panel teams for OPUS i PRELUDIUM,	463 (130)	3,144
	2 teams in each panel HS2, HS4, HS5, HS6, NZ5, NZ7, NZ9, ST5, ST10		
17 June 2019	1 team for MINIATURA	401	2,179
Total	91	1,648 (243)	10,771

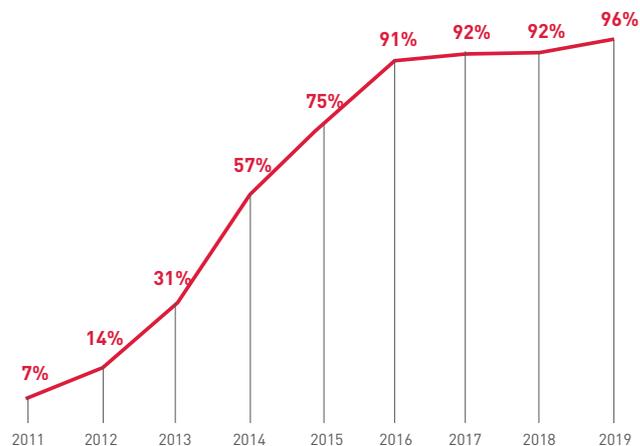
Source: NCN Coordinators, based on own data.

In the second stage of peer review, 8,112 external reviewers performed 9,886 individual evaluations. 96% of the external reviewers were experts from abroad, who performed 9,464 reviews.

Number of external reviewers and number of reviews they provided in 2019



Percentage of foreign reviews in the years 2011-2019

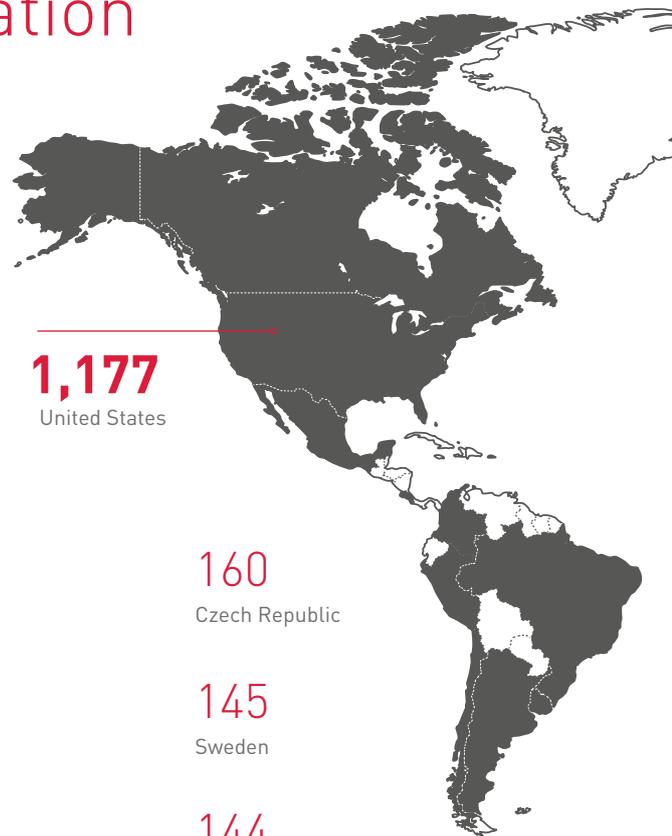


Source: NCN Coordinators, based on the data in the ZSUN/OSF system.

* Data does not include MINIATURA 3 and ETIUDA 8 due to different evaluation procedure.

NCN foreign reviewers in 2019 by country of affiliation

33	Croatia	3	Iceland
33	Hong Kong	3	Nigeria
33	Slovakia	3	Oman
30	New Zealand	2	Jordan
28	Estonia	2	Qatar
27	South Africa	2	Tunisia
24	Ukraine	1	Albania
23	Chile	1	Armenia
21	Lithuania	1	Bangladesh
19	Malaysia	1	Bosnia and Herzegovina
17	Latvia	1	Botswana
16	Bulgaria	1	Ghana
14	Luxembourg	1	Grenada
13	Thailand	1	Cameroon
10	Saudi Arabia	1	Costa Rica
8	Columbia	1	Kuwait
7	Cyprus	1	Lebanon
5	Kazakhstan	1	Malta
4	Belarus	1	Mauritius
4	Egypt	1	Somalia
4	Iran	1	Sri Lanka
4	Macau	1	Vietnam
4	Morocco		
4	Pakistan		
4	Uruguay		
4	United Arab Emirates		
3	Indonesia		



1,177
United States

289
China

209
Canada

201
Netherlands

192
India

191
Australia

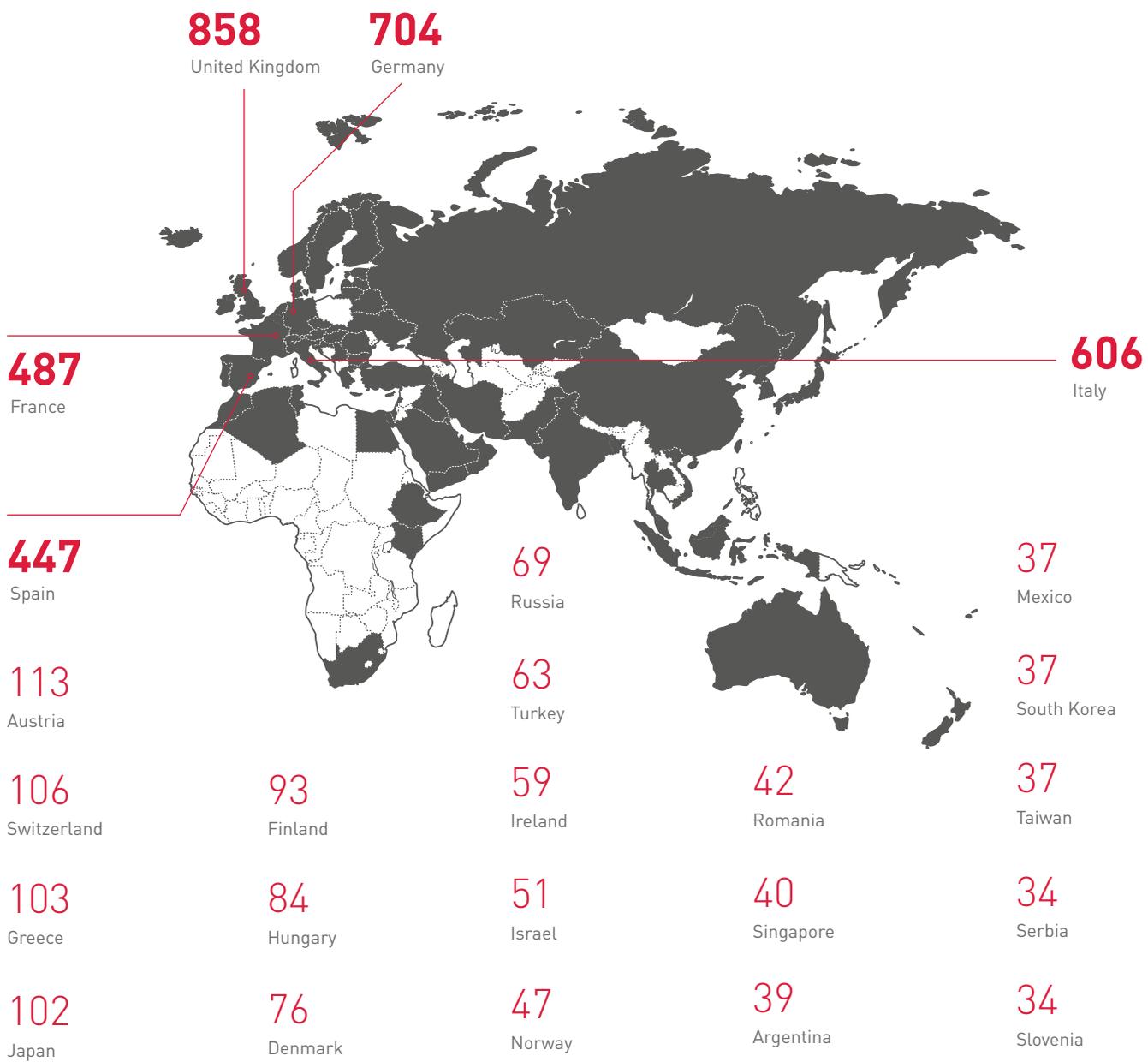
160
Czech Republic

145
Sweden

144
Belgium

138
Portugal

118
Brazil



NCN Appeal Committee

Applicants (institutions or natural persons) may appeal against decisions of the NCN Director which refuse funding within 14 days of the date of receiving the decision. The appeals are considered by the Appeal Committee, appointed by the Council of the NCN.

In 2019 the Committee:

considered
176
appeals

additionally
2
applications

for reinstatement of the deadline for submitting an appeal and 3 applications for annulment of the decision of the NCN Director were considered

34
cases
required
additional inquiries

in **22**
cases

the director's decision was annulled and the proposals were submitted for re-evaluation

granted funding of almost
PLN 11,3 million
to
23
projects

Supervising the research

Our tasks include supervising the implementation of research projects, fellowships, scholarships and research activities and the disbursement of the awarded funding. This consists in evaluating interim, annual and final reports on the completion of research projects, on-site audits at grantees' host institutions, and in the director's power to suspend or discontinue funding of an improperly implemented project. The procedure of evaluating and verifying the reports consists in examining the implementation of the project for formal and financial correctness, as well as the scientific evaluation of the project's results.

Reports on the projects' completion

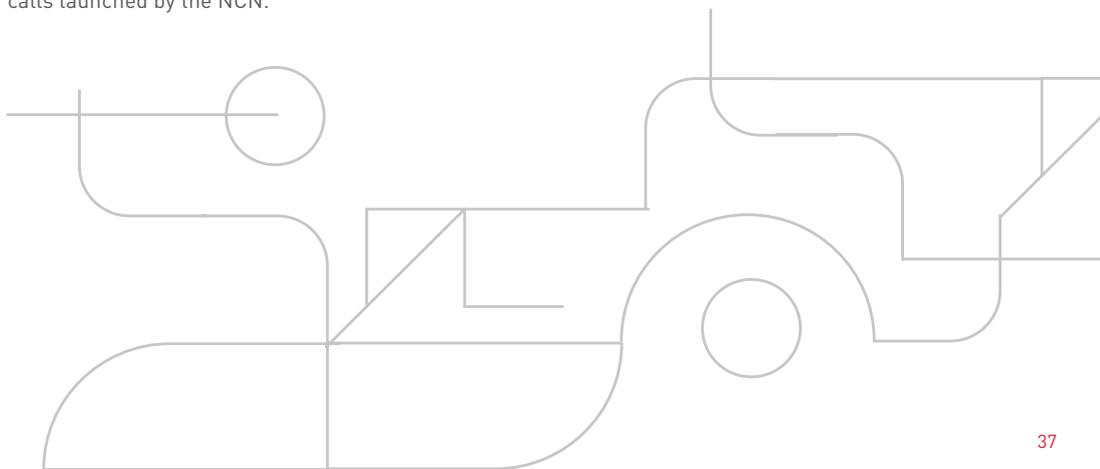
In 2019 the NCN's expert reviewers evaluated:

- final reports on the implementation of NCN and international research projects without co-financing from foreign funds taken over by the NCN from the Ministry of Science and Higher Education (MNiSW),
- annual and final reports on the implementation of research projects granted funding under calls launched by the NCN.

Reports evaluated in 2019

Type of report	Number of evaluated reports
Annual report submitted in 2019 – NCN calls	5,288
Annual report submitted before 2019 – NCN calls	21
Final report submitted in 2019 – NCN calls	23
Final report submitted before 2019 – NCN calls	1,953
Final report submitted before 2019 – MNiSW projects	32
TOTAL	7,317

Source: Research Projects Administration Department, International Cooperation Department and Project Monitoring Department.



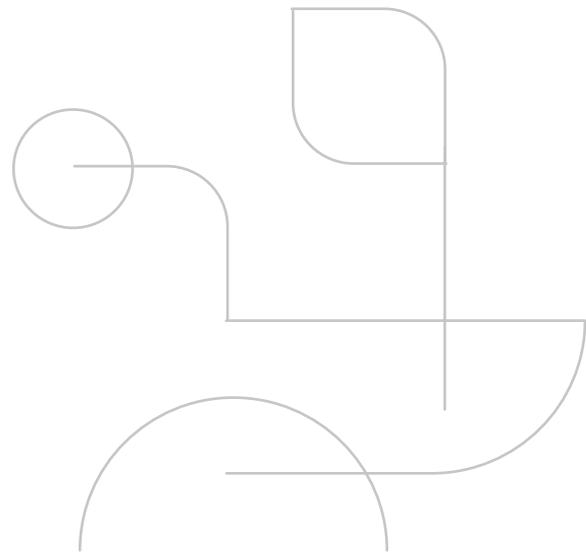
On-site audits

As another tool serving a supervisory function, the NCN may conduct on-site audits to verify the compliance of the project with the funding agreement. The audits are carried out by the Audit and Compliance Team in accordance with an annual audit plan. Our selection of the grants to be examined follows an analysis of risk factors involved in their implementation. Information on possible risks and alarming signals regarding the projects funded is collected and shared by the personnel of the Research Projects Administration Department, Finance and Accounting Department and NCN Coordinators.

The audit plan may, however, be extended to projects selected at random. Audits of such projects may be conducted in an ad hoc manner. Normally we take this measure when a project is reported to be carried out inappropriately, and such audit is usually limited in scope. The auditing team always comprises an officer of the Audit and Compliance Team and, depending on the programme and scope of the audit, may also include an NCN financial officer and an NC Coordinator.

According to the 2019 plan, the auditing procedure was initiated and completed for 18 research projects funded under our calls.

Furthermore, in 2019, an audit of one project that had been started in the previous year, which required obtaining additional explanations and expert opinions was completed. The Audit and Compliance Team completed also four ad hoc audits of research projects not included in the plan of audits for 2019, the implementation of which began towards the end of 2018. Additionally, in 2019 we started four *ad hoc* audits of research projects not included in the plan of audits for 2019 (one from PRELUDIUM call, one from SONATA call and two from OPUS call). Three of them were completed during the period, while other one will be continued 2020. In 2019, as regards the irregularities found, the NCN demanded that entities return a total of almost PLN 441,000.



International cooperation

In 2019, we announced five multilateral and two bilateral calls. Our portfolio of bilateral calls was expanded to include MOZART, organised in partnership with Austria, and the Polish-Swiss ALPHORN call. We also joined a group of agencies from the Central European Science Partnership (CEUS), including agencies from Austria, Slovenia and the Czech Republic, which plan to open their national calls to international projects in 2020. In the autumn of 2019, we submitted a funding application for the next edition of the POLONEZ programme, called POLONEZ BIS. Given its positive review, in 2021 we will be able to launch calls for proposals to bring 120 foreign researchers to work in Poland.

Bilateral cooperation

We regularly announce bilateral calls in cooperation with foreign research-funding agencies. The best joint research projects prepared by Polish and foreign teams are selected based on criteria established by the two partner agencies. Each agency funds the part of the research project carried out by its national team.

SHENG

In April 2019, we announced the results of the first SHENG call, launched in cooperation with the National Natural Science Foundation of China (NSFC). Together, we are now funding 30 Polish-Chinese research projects in all research disciplines. Polish teams have been awarded a total of PLN 36 million.

BEETHOVEN CLASSIC and BEETHOVEN LIFE

In the autumn of 2019, we announced the results of two calls organised in cooperation with the Deutsche Forschungsgemeinschaft (DFG). Under the BEETHOVEN LIFE call, in which projects carried out in partnership with Polish teams underwent merit-based evaluation at the DFG within the framework of a regular national call announced by the agency, ten Polish-German life sciences projects were selected for funding. 34 more projects were successful in the third edition of the joint call for proposals in other disciplines (known as BEETHOVEN CLASSIC). In the two calls, Polish research teams went away with a total of PLN 41 million in funding.

DAINA

In 2019, we started to prepare the second DAINA call for Polish-Lithuanian research projects in all research disciplines, organised in cooperation with the Research Council of Lithuania (RCL). The call will be announced in June 2020.

MOZART

In March 2019, we launched MOZART, the first call for Polish-Austrian research projects, organised together with the Austrian Science Fund (FWF). The merit-based evaluation of the projects will be conducted at the FWF. The first results were announced in June 2020.

ALPHORN

In July 2019, we announced the first call for Polish-Swiss research projects. The ALPHORN call is organised in cooperation with the Swiss National Science Foundation (SNSF) and provides funding for joint projects selected in the process of merit-based evaluation at the SNSF. The results were announced in March 2020.

DIOSCURI

DIOSCURI is an initiative by the Max Planck Society (MPG), intended to establish Centres of Scientific Excellence in Poland, headed by eminent foreign researchers and leaders, with the involvement and support of German research organisations. Each new Dioscuri Centre will receive funding of EUR 1.5 million over a period of five years. On 17 September 2019, the Max Planck Society and the National Science Centre opened the first two Dioscuri Centres of Scientific Excellence at the Nenecki Institute of Experimental Biology of the Polish Academy of Sciences, headed by Dr Aleksandra Pekowska and Dr Grzegorz Sumara. In December 2019, the DIOSCURI 2 call selected researchers who will lead three more Dioscuri Centres: Dr Gracjan Michlewski (International Institute of Molecular and Cell Biology), Dr Bartłomiej Wactaw (Institute of Physical Chemistry, Polish Academy of Sciences) and Dr Paweł Dłotko (Institute of Mathematics, Polish Academy of Sciences).

A new call, DIOSCURI 3, for the next three Centres of Scientific Excellence was announced on 7 December 2019, and its results will be announced in the autumn of 2020.

Multilateral cooperation

Every year, we also announce multilateral calls organised in partnership with foreign research-funding agencies within the framework of international networks that support specific disciplines. In ERA-NET Cofund programmes, for instance, the budget consists of national funds and sources provided under the EU Horizon 2020 Framework Programme. Other initiatives are funded exclusively from the national sources of individual agencies.



Projects funded under the "Horizon 2020" EU Framework Programme for Research and Innovation:

CHIST-ERA III – grant agreement no 768977; CHIST-ERA IV – grant agreement no 857925; JPCofuND2 – grant agreement no 825664; JPI-EC-AMR – grant agreement no 681055; M-ERA.NET 2 – grant agreement no 685451; NORFACE Governance – grant agreement no 822166; QuantERA – grant agreement no 731473; BiodivERSA III – grant agreement no 649307; Biodiv-Clim – grant agreement no 869237; EN-UAC – grant agreement no 875022; POLONEZ – Marie Skłodowska-Curie Actions grant agreement no 665778.

International networks in which the NCN participates

Name	Number of organisations	Number of countries	Network supports:
BiodivERsA	35	23	research into environmental protection and sustainable management of biodiversity
CHIST-ERA	25	23	research in the scope of information and communication technologies
EqUIP	8	7 (Europe) + India	European-Indian collaboration in the scope of humanities and social sciences
ERA-CAPS	20	18	research into healthy, safe and sufficient food, plant-based products and sustainable agriculture, forestry and landscape
ForestValue	31	19	research in the scope of forest management; promoting increased innovation and competitiveness of the forest-based sector in Europe
HERA	26	25	research in the area of humanities responding to the social, cultural and political challenges of modern Europe
JPI AMR	30	28	research into antimicrobial resistance
JPI Urban Europe	25	18	interdisciplinary research projects that respond to the challenges of modern cities and urban areas
JPND	29	24	research aimed at identifying causes of neurodegenerative diseases, early detection of their symptoms and appropriate forms of therapy
M-ERA.NET	43	32	research in the area of material science and material engineering
NORFACE	25	19	research in the area of social sciences (until now devoted, among others, to migration, future of the welfare state and social inequalities)
QuantERA	32	27	research in quantum technologies
Solar-Driven Chemistry	5	5	research in the scope of photochemical processes in solar light



QuantERA (ERA-NET Cofund in Quantum Technologies) – international network co-ordinated by the NCN

QuantERA is the largest network of research-funding agencies in the field of quantum technology, which has funded 38 international research projects with a total budget of nearly EUR 45 million in the past three years.

The QuantERA 2019 call for proposals closed in 2019. Based on a ranking list drafted by the review panel and the limits set by the call budget, the QuantERA consortium selected the best 12 of the 85 proposals submitted, with a total budget of more than EUR 12.5 million. 5 out of the 12 successful proposals included a Polish partner. In 2019, the consortium also reviewed the progress of 26 projects funded under the QuantERA Call 2017, which included the *QuantERA Mid-Term Strategic Conference* held in Granada, Spain. As suggested by the review, the projects generated many interesting and promising research results, which warrants the statement that QuantERA has now become a very important instrument of support for European quantum technology research. In 2019, the NCN also carried out communication tasks, took measures to increase the international visibility of the project and coordinated additional activities, such as drafting guidelines on responsible research or identifying policies and state programmes that fund quantum technology research in Europe.

In the fourth quarter of 2019, following the approval of the partners, the consortium began its strategic work designed to ensure the con-

tinuing operation of the network. The objective is to prepare a funding application for the second edition of the QuantERA programme and submit it to the European Commission in May 2020.

WWW

www.quantera.eu

TWITTER

[@QuantERA_EU](https://twitter.com/QuantERA_EU)

FACEBOOK

[@QuanteraCoFund](https://www.facebook.com/QuanteraCoFund)

Calls announced under multilateral co-operation

Polish scientists in multilateral calls are awarded grants to carry out research projects in collaboration with foreign research teams. Institutions announcing a call jointly evaluate proposals and then provide funding to teams from their countries. Such projects are distinguished not only by their high scientific level, but also by collaboration in international consortia which often paves the way for yet further joint projects.

Apart from continuing previous programmes, 2019 also saw the launch of a new initiative by the JPI Urban Europe network, the EN-UAC Urban Accessibility and Connectivity programme in the area of urban development, BiodivClim in the area of biodiversity and climate change and, last but not least, CHIST-ERA IV in the area of information and communication technology.

Calls for proposals concluded in 2019

Area	Network	Subject	Projects cofinanced by the NCN	Partner countries in projects with the participation of Polish researchers
INTERDISCIPLINARY	BiodivERsA III	<i>Biodiversity and its influence on animal, human and plant health</i>	6	Austria, Belgium, Germany, France, Great Britain, United States, Ireland, Switzerland
NZ – Life Sciences	JPI-EC-AMR	<i>Diagnostics and Surveillance of Antimicrobial Resistance: Development of tools, technologies and methods for global use</i>	2	France, Canada, Thailand, Norway, Sweden
	JPcofuND 2	<i>Multinational research projects on Personalised Medicine for Neurodegenerative Diseases</i>	3	France, Germany, Israel, Italy, Denmark, Latvia, Czech Republic, Great Britain, Norway
ST - Physical Sciences and Engineering	CHIST-ERA III (Call 2018)	<i>Analog Computing for Artificial Intelligence (ACAI); Smart Distribution of Computing in Dynamic Networks (SDCDN).</i>	2	Finland, France, Canada, Switzerland
	M-ERA.NET 2 (Call 2018)	<i>Integrated computational materials engineering; Innovative surfaces, coatings and interfaces for extreme conditions; High performance composites; Multifunctional materials; New strategies for health applications; Materials for additive manufacturing industry</i>	4	Austria, Estonia, Spain, Latvia, Norway, Slovenia
	QuantERA (Call 2019)	<i>Quantum communication; Quantum simulation; Quantum computation; Quantum information sciences; Quantum metrology sensing and imaging</i>	4	Czech Republic, France, Spain, Germany, Denmark, Israel, Sweden, Great Britain, Austria, Italy

Calls for proposals already launched or pre-announced

Area	Programme	Topic	Call for proposals	Application deadline (preproposals)	Application deadline (full proposals)
INTERDISCIPLINARY	BiodivClim (Biodiversa network)	<i>BiodivClim – Biodiversity and Climate Change</i>	2 September 2019	5 November 2019	21 April 2020
	EN-UAC (JPI Urban Europe network)	<i>Urban Accessibility and Connectivity</i>	17 December 2019	17 March 2020	22 September 2020
NZ – Life Sciences	JPco-fuND2 (Call 2020) (JPND network)	<i>Novel imaging and brain stimulation methods and technologies related to Neurodegenerative Diseases</i>	7 January 2020	3 March 2020	30 June 2020
ST- Physical Sciences and Engineering	CHIST-ERA IV (Call 2019)	<i>Explainable Machine Learning-based Artificial Intelligence (XAI) Novel Computational Approaches for Environmental Sustainability (CES)</i>	3 December 2019	14 February 2020	23 June 2020
	M-ERA.NET 2 (Call 2019)	<i>Integrated computational materials engineering; Innovative surfaces, coatings and interfaces for extreme conditions; High performance composites; Multifunctional materials; New strategies for health applications; Materials for additive manufacturing industry</i>	19 March 2019	18 June 2019	19 November 2019

Multilateral co-operation based on the Lead Agency Procedure

Central European Science Partnership – CEUS

In June 2019, we signed a cooperation agreement with research funding agencies from Austria (Fonds zur Förderung der wissenschaftlichen Forschung – FWF), Czech Republic (Grantová agentura České republiky – GAČR) and Slovenia (Javna agencija za raziskovalno dejavnost Republike Slovenije – ARRS), pursuant to which the multilateral CEUS programme, based on the so-called “multilateral lead agency procedure”, prepared intensively in 2019, was finally launched in February 2020. Under the calls announced by the participating agencies, research teams from Poland, Austria, the Czech Republic and Slovenia may be awarded funding for bilateral or trilateral research projects. The winning projects will be recommended for funding based on the results of merit-based evaluation performed by one of the partner institutions involved in the programme (the so-called “lead agency”), under its national call for proposals. In February 2020, we announced the CEUS-UNISONO call for proposals open to Polish research teams involved in projects that are subject to merit-based evaluation performed by one of the partner agencies. In September 2020, we will open an OPUS call for proposals for research projects to be carried out by research teams from Poland, Austria, the Czech Republic and Slovenia, whose merit-based evaluation will be performed by the National Science Centre acting as the lead agency.

Multilateral Lead Agency Science Europe Task Force

In 2019, preparations were also underway for launching a multilateral programme in cooperation between several agencies – members of the Science Europe association. The programme will be aimed at creating a scheme for joint funding of international research projects pursuant to the Multilateral Lead Agency Procedure, which relies on mutual trust as regards the quality of peer-review among organisations undertaking such cooperation. Not unlike in the case of the CEUS programme, the merit-based evaluation of bilateral or multilateral research projects will be carried out by the so-called “lead agency” under its national call for proposals. Other funders will ensure funding of research projects recommended for funding based on the results of merit-based evaluation performed by the lead agency. We are planning to sign the cooperation agreement with the agencies participating in the programme in 2020.

POLONEZ Programme

In 2019, we continued the MSCA POLONEZ Cofund programme, designed to support the mobility and professional growth of experienced researchers through research projects they carry out at Polish academic or research institutions. The development of soft skills of the POLONEZ fellows and their cross-sectoral activities are other important components of the programme. The EC supported the programme with EUR 5.8 million (out of a total budget of nearly 21 million).

In 2019, more than sixty fellows from all over the world led research projects at Polish host institutions and took part in training sessions conducted in Warsaw by trainers from the British company CRAC/Vitae. As in previous years, the POLONEZ fellows also got the chance to meet experts, representatives of the NCN and other research-related institutions (e.g. the Marie-Curie Alumni Association, NCBR, FNP), as well as representatives of the non-academic sector to forge and cement links of cooperation during special *networking meetings*.

The POLONEZ programme has received a clean bill of health from the European Commission. Lessons learned during the four years of the programme implementation and the feedback form POLONEZ fellows contributed to the success of our proposal for a five-year continuation of the MSCA Cofund. The first round of recruitment of experienced researchers for two-year research fellowships at selected Polish institutions within the framework of the POLONEZ BIS programme will start in 2021.

Calls for proposals funded under The EEA and Norway Grants

In 2019, we continued work on the implementation of the Mechanism of the European Economic Area and the Norwegian Financial Mechanism 2014-2021 under the agreement signed in December 2017 between Poland and Iceland, Liechtenstein and Norway. Under the 3rd edition of the Basic Research Programme within the framework of the EEA and Norway Grants, three calls for proposals have been planned:



GRIEG – call for research projects carried out by Polish-Norwegian teams, with a budget of EUR 37.34 million,



IdeaLab – call for innovative, interdisciplinary research projects that are a response to important social challenges and which are carried out by teams from Poland, Norway, Iceland and Liechtenstein, with a budget of EUR 4.43 million



POLS – call for proposals supporting researcher mobility with small grants, targeting foreign researchers wishing to carry out research in Poland, with a budget of EUR 7 million.

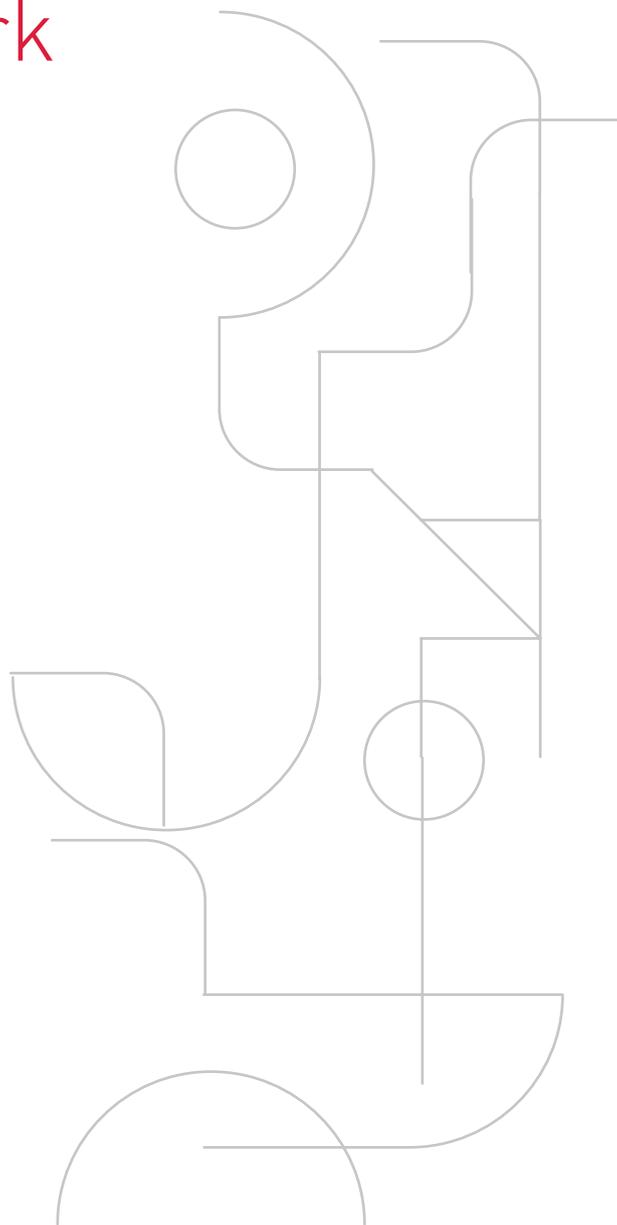
Two calls for proposals (GRIEG and IdeaLab) were announced in June 2019, while the third one (POLS) was announced in March 2020.

Promoting our work

An important section of our efforts is oriented towards disseminating information on our funding opportunities in the research community. In 2019 we worked on that objective through a number of actions at home and abroad. We spread the news of the announced and concluded calls and NCN's initiatives both online and by means of traditional media; we organised and actively participated in a variety of initiatives for improving the publicity reach of science.

The NCN Open Days 2019

In 2019, we organised the seventh National Science Centre Days. This time, the event was held on 15-16 May in Łódź, hosted by the University of Łódź, and co-organised by other local schools: the Łódź University of Technology, the Medical University of Łódź, the Łódź Film School, The Grazyna and Kiejstut Bacewicz University of Music in Łódź and the Academy of Fine Arts Władysław Strzemiński in Łódź. Other partners included the Institute of Medical Biology and the Centre of Molecular and Macromolecular Research of the Polish Academy of Sciences. During a series of panels, workshops and meetings, the participants discussed research integrity, open access to research results and the new elements of the NCN portfolio. The National Science Centre also presented a new call aimed at supporting doctoral schools that started their activities at Polish universities in the new academic year. The first PRELUDIUM BIS call was launched in September 2019.



NCN 2019 Award

On 9 October 2019, for the seventh time, the NCN named the laureates of its award for young researchers, conferred in three categories: Arts, Humanities and Social Sciences (HS), Life Sciences (NZ) and Physical Sciences and Engineering (ST). Each laureate received PLN 50,000 in recognition of their special research achievements. The award has been established to promote young researchers and advance the science done in Poland. The initiative of the NCN Award seeks cooperation with entrepreneurs who are not indifferent to the question of the growth of science in Poland, and who see that an innovative economy begins with innovative steps in basic research.

In the field of Arts, Humanities and Social Sciences, the 2019 Award was granted to Dr hab. Michał Wierzchoń of the Institute of Psychology, Jagiellonian University for interdisciplinary research into the consciousness and proposing an original theoretical model of consciousness. In the domain of Life Sciences, the Award was conferred on Dr Roman Szczyński of the Institute of Biochemistry and Biophysics, Polish Academy of Sciences. His nomination for the Award came in recognition of discovering the mechanism of mitochondrial RNA degradation in human cells indicating the role of mitochondria in the regulation of innate immune response. The third laureate, awarded in the field of Physical Sciences and Engineering, was Dr hab. Dawid Pinkowicz of the Faculty of Chemistry, Jagiellonian University. He received the 2019 Award for his research into multifunctional molecular magnet and quantum nanomagnets.

The award gala took place at the Gallery of 19th-century Polish Art, the Sukiennice (a branch of the National Museum). Some 200 guests were invited to the ceremony, including a representative of the Ministry of Science and Higher Education, local authorities, the research community and entrepreneurs. The gala was hosted by Grażyna Torbicka. The businesses that funded the award in 2019 were: Astor, Grupa Adamed and Fundacja KGHM Polska Miedź.

Fundatorzy Nagrody NCN 2019





Dr hab.
Michał Wierzchoń



Dr Roman Szczęsny



Dr hab.
Dawid Pinkowicz

Informing the public about the NCN

The mainstay of our public communication is our website (www.ncn.gov.pl), featuring comprehensive information on programmes and all key data concerning the NCN and our activities. The service has versions in Polish and English, with data presented in several sections, organised for easy access to content dedicated to applicants, principal investigators and reviewers alike. We also publish additional information, such as: call statistics, job offers, results of analyses, descriptions of projects funded by the NCN and of actions in cooperation with foreign and international bodies, a newsroom compiling materials on the NCN published in the media. On our website we publish, as PDF files, all directives of the Council of the NCN, reports, lists and other documents. In 2019, the number of website views reached over 1.2 million.

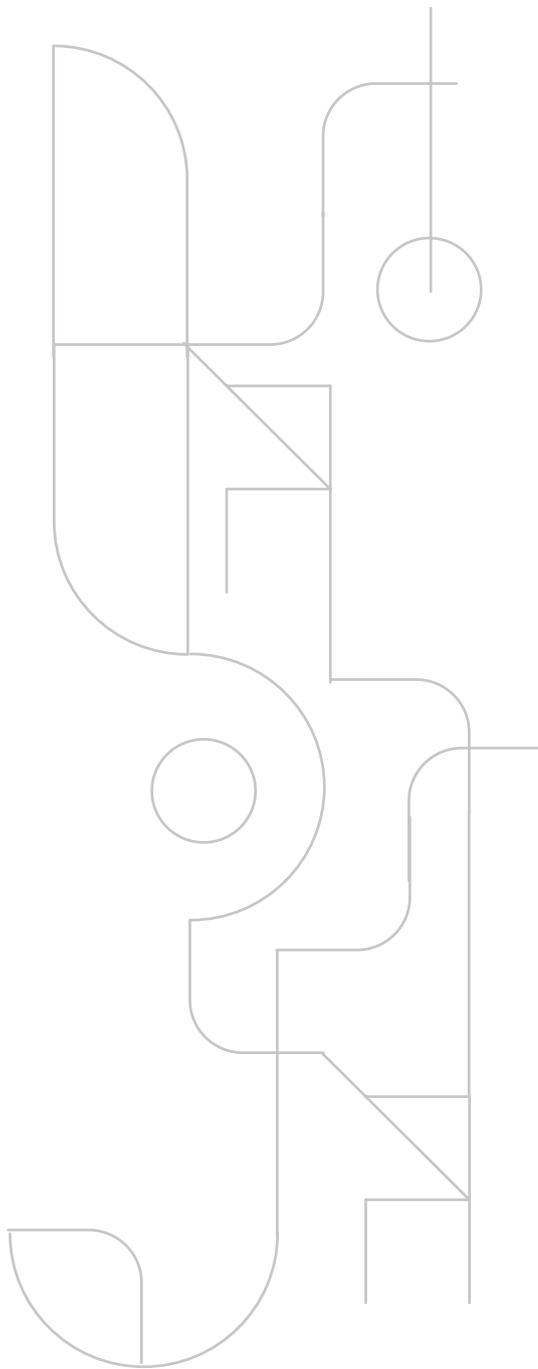
On the NCN's Facebook profile, we posted information on the calls and actions of the NCN, information on research projects and scientific news from Poland and abroad. At the end of 2019, the NCN profile had 11,440 followers (fans), which meant that 1,492 were added against the 2018 December figure (9,948 fans). We published 125 posts during the year. We also continued running our profile on YouTube where we placed promotional videos and success stories. Furthermore, in 2019 we continued publishing photographs on an NCN Instagram profile. During the year we published photographs related to activities pursued by the NCN, presenting researchers carrying out research funded by the NCN and documenting events organised by the NCN. Event reports were also conducted using the instastories tool.

Apart from actively promoting our work online, we printed official publications: brochures and flyer-postcards, the *Annual Report 2018* summarising the NCN's activity in 2018, and *Call Statistics 2018* presenting data on numbers of proposals submitted and recommended for funding, broken down by research domains and types of national calls. All publications, except *Call Statistics 2018*, were issued in a Polish and an English version.

We made a series of films documenting the activities of the National Science Centre. During the NCN Open Days, we made a documentary on the event, while the gala of the 2019 NCN Award also had a film devoted to it and three videos presenting the laureates' profiles.

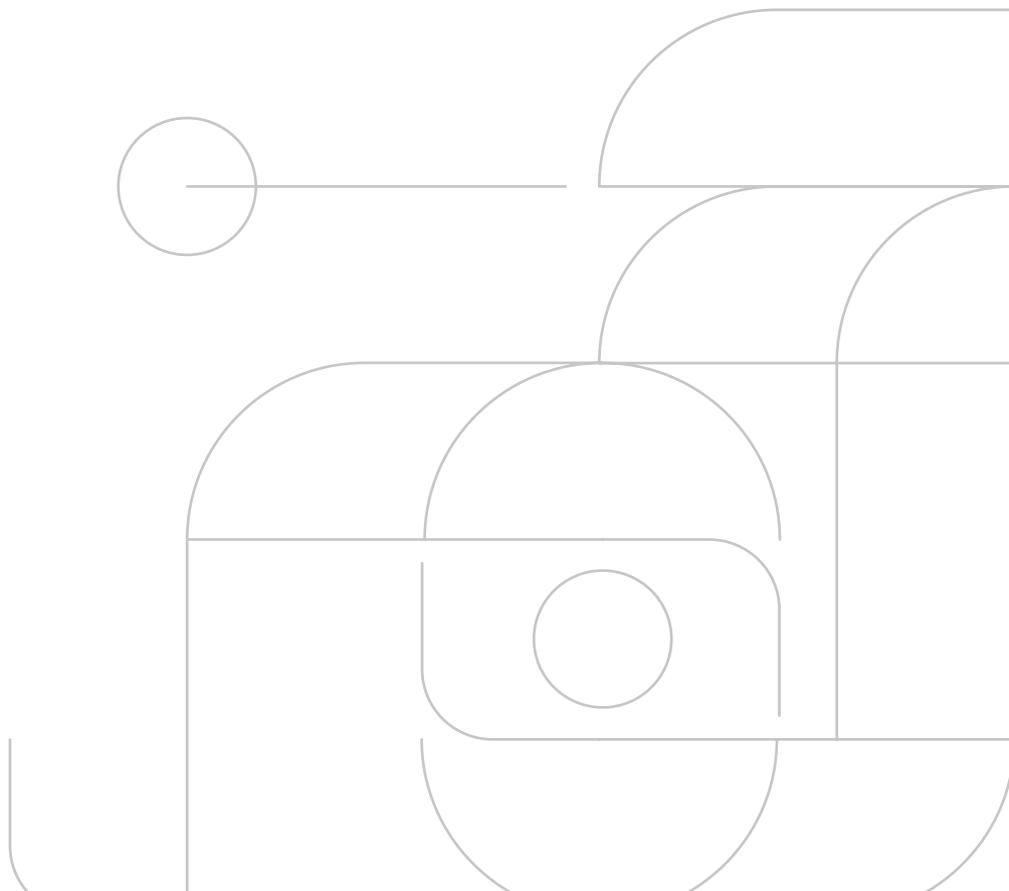
NCN in the media

In 2019, we disseminated 24 press releases in national, local, academic and research-related media outlets. Throughout the year, the press published repeatedly about the NCN, releasing pieces written both by media staff and the staff of the NCN. In total, all types of media published 1986 features that covered or mentioned the activities of the NCN, including 658 public posts or shares on social media. In addition, the NCN Director, Prof. Zbigniew Błocki, gave three long interviews (on the need to invest in human resources in Polish science, the goal of attracting foreign researchers and the potential of Polish mathematicians) and answered media queries on an ongoing basis.



Budget

Our budget in 2019 amounted to PLN 1.27 billion including PLN 1.23 billion of specific grant for funding research projects. A specific grant for management and operations amounted to PLN 33.8 million. We disbursed 99.8 % of the funds received in the specific grant for funding research projects. In covering the costs of management and operations of the NCN, we used 83.53% of the aid received to that end.





RESEARCH
STORIES

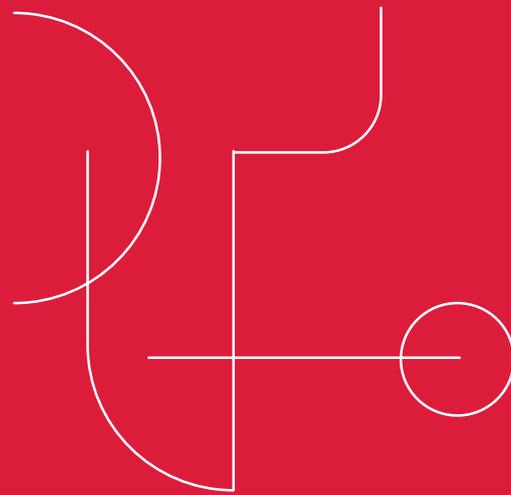




Photo by Michał Łepekki

How are the little ones coping – Arctic meiofauna in the face of climate change

Principal Investigator:

Dr Katarzyna Grzelak
University of Łódź

Project title:

Nematode community structure under different ice regime conditions in the European Arctic: structural, functional and genetic aspect

NCN panel:

NZ 8

Funding scheme:

FUGA 5, announced on 15 December 2015

The Arctic is one of the regions most vulnerable to climate change and at the same time the area where the rate of observed change is the greatest. Due to the increased heat transfer with Atlantic waters and rising average air temperatures, the surface of the ice cap, as well as the thickness and total volume of ice in the Arctic, have shrunk dramatically in recent years. Considering that sea ice is an essential factor that affects all the biotic and abiotic components of Arctic marine ecosystems, these changes can be expected to have a major impact on the functioning of many marine organisms, including benthic fauna (i.e. the various organisms that live on the Arctic seabed). The purpose of the project was to characterize meiofauna communities, i.e. groups of small invertebrates living on the surface of deposits or in interstitial spaces, with bodies smaller than 500 µm, with a special emphasis on Nematodes as a dominant taxon, as well as to assess the impact of ongoing climate change (especially changes in the type and thickness of the ice cap and primary production in the surface layers of the water column) on their functioning in the European Arctic. The research project was conducted in the Svalbard archipelago, to which more and more warm water is transported every year from the Atlantic. The smallest marine organisms, such as the meiofauna, play an important role in marine ecosystems, representing one of the most numerous groups of primary consumers; they contribute to the biomineralization and bioturbation of deposits and reintroduce biogenic particles from sea deposits back into the food chain. This is why it is so essential to include these extremely interesting organisms in ecological studies.

The project provided a detailed description of the communities of meiofauna and Nematodes along the ice gradient, in the region to the north of Svalbard and in the area of the Barents Sea. We established that the period of ice retention, as well as late and low-intensity algal blooms, have a negative impact on the population, biomass and taxonomic diversity of Nematodes. In areas where the period of ice retention is shorter and which receive more Atlantic waters, which accelerate the growth of phytoplankton, Nematodes show greater population numbers, as well as greater total biomass, species diversity and food diversity. Organisms living in regions under the strong influence of Arctic waters typically have a smaller body size than those found in areas with a greater advection

of Atlantic waters. The project also looked into the feeding strategies of Nematodes. The organisms were shown to be non-selective in their food choices and ready to tap any available food sources in the environment, which attests to their high ecological flexibility and ability to adapt to changing environmental conditions.

We are obtaining more and more data on the broader impact of climate change on ecosystem diversity and functioning, but the information is often fragmentary and our knowledge of many animal groups in the Arctic region and the scale of their response remain incomplete. The results obtained in the framework of this project will shed more light on the reactions of the smallest, microscopic inhabitants of the Arctic ecosystem. This will help draw up potential scenarios for the behaviour of the entire benthic fauna in the face of rising temperatures, receding ice caps and shorter ice retention in the European Arctic.

Dr Katarzyna Grzelak

Assistant Professor at the Marine Ecology Unit of the Institute of Oceanology at the Polish Academy of Sciences in Sopot. She completed a post-doctoral fellowship at the Laboratory of Polar Biology and Oceanobiology at the University of Łódź within the framework of a research grant awarded under the FUGA funding scheme, as well as research fellowships in the US, Denmark and Germany. She specializes in the ecology of meiofauna, a minuscule, yet very numerous, group of organisms with body size smaller than 0.5 mm. Her research interests centre on free-living marine Nematodes and Kinorhyncha in the Arctic region. She has won scholarships awarded by the Ministry of Science and Higher Education, the Kościuszko Foundation, and the Fulbright Program.



Photo by Michał Łepek

Anammox bacteria will facilitate waste treatment and reduce the greenhouse effect

Principal Investigator:

Dr hab. Aleksandra Ziemińska-Buczyńska, Prof. at the SUT, Silesian University of Technology (SUT)

Project title:

Physiological and ecological features of bacteria capable of anaerobic ammonium oxidation (Anammox)

NCN panel:

NZ 9

Funding scheme:

SONATA 5, announced on 15 March 2013

Until the 1970s, scientists believed they had already discovered and described all the elements of the biogeochemical nitrogen cycle. Nitrifying bacteria was believed to oxidize ammonium to nitrate (V), while denitrifying bacteria was believed to form the only microbiological link in the cycle that restored the pool of free nitrogen in nature. Scientists, however, were in for a great surprise. In 1977, based on thermodynamic studies, Engelbert Broda concluded that there exists or once existed yet another link, capable of oxidizing ammonium under anoxic conditions, with nitrate (III) or (V) as the electron acceptor. His hypothesis was confirmed in the 1990s by the discovery of such bacteria in a denitrifying bioreactor. These organisms were dubbed anammox (anaerobic ammonium oxidation) bacteria and the discovery ushered in a new era of research on the microbiology of the nitrogen cycle.

Anammox bacteria are an extremely interesting link in this cycle, both for technological and microbiological reasons. They build complex communities with other nitrogen-cycle bacteria. Because these microorganisms have not yet been isolated in the form of pure cultures, they are currently studied using the methods of molecular biology, where the analysis does not depend on culturing methods. The qualitative and quantitative results of our research project indicate that the organization of the bacterial community is largely independent of technological parameters; all groups of nitrogen-cycle bacteria are present in the technological system in varying proportions, and the anammox bacteria predominate. The addition of real waste, i.e. landfill leachate, alters the genotypic structure of the community, reducing the share of anammox bacteria, but the equilibrium is quickly restored once it is returned to a synthetic medium. Next-generation sequencing studies have shown that besides anammox bacteria (largely unidentified Planctomycetes), the bioreactor community is also dominated by the Nitrospirae, recently recognized as capable of complete nitrification (comammox). Microbiological studies have allowed us to identify factors that have a negative impact on the process, which allows us to set up the technological conditions in such a way as to make sure the ecological equilibrium of the community will not be disrupted and thus allow for cheap and effective waste treatment. These analyses also expand our knowledge of the ecology of nitrogen-cycle microorganisms.

In technological terms, the anammox process is very effective; in a waste management facility, it would result in important savings on aeration, indispensable for nitrifying bacteria, as well as external sources of organic carbon necessary for denitrifying bacteria. However, the optimum temperature for the growth of anammox communities is over 30°C. In municipal waste treatment plants with a much lower ambient temperature, the process would need to be supplied with extra heat, which would reduce its cost-effectiveness. Accordingly, our project looked into the possibilities of conducting it at much lower temperatures and studied the impact of pH on its performance, since at low temperatures the process is more sensitive to pH fluctuations. The research was accompanied by microbiological analysis. Adding catalysts, such as, e.g. reduced graphene oxide, was shown to stimulate the anammox process at low temperatures. Research on the role of heavy metals indicated that zinc is largely toxic to the process, while no such impact was demonstrated for cadmium, chromium and lead. Anammox bacteria grow at a much slower rate than most bacteria, which means that the process takes longer to start. Our studies showed that it can be considerably reduced (from c. 250 to 85 days) by implanting the reactor with a deposit dominated by anammox bacteria. Technological research on the anammox process is of great importance for effective waste treatment, but because it is autotrophic, it may also allow to reduce greenhouse gases in the atmosphere and thus considerably affect climate change.

Dr hab. Aleksandra Ziemińska-Buczyńska, Prof. at the SUT
Microbiologist, academic teacher and science populariser. Since 2004, she has worked at the Department of Environmental Biotechnology at the Faculty of Energy and Environmental Engineering of the Silesian University of Technology. She applies the methods of molecular biology and classical microbiology to the study of bacterial communities in the natural and the technological environment. Her research focuses on the ecology of nitrogen-cycle microorganisms in waste treatment systems.

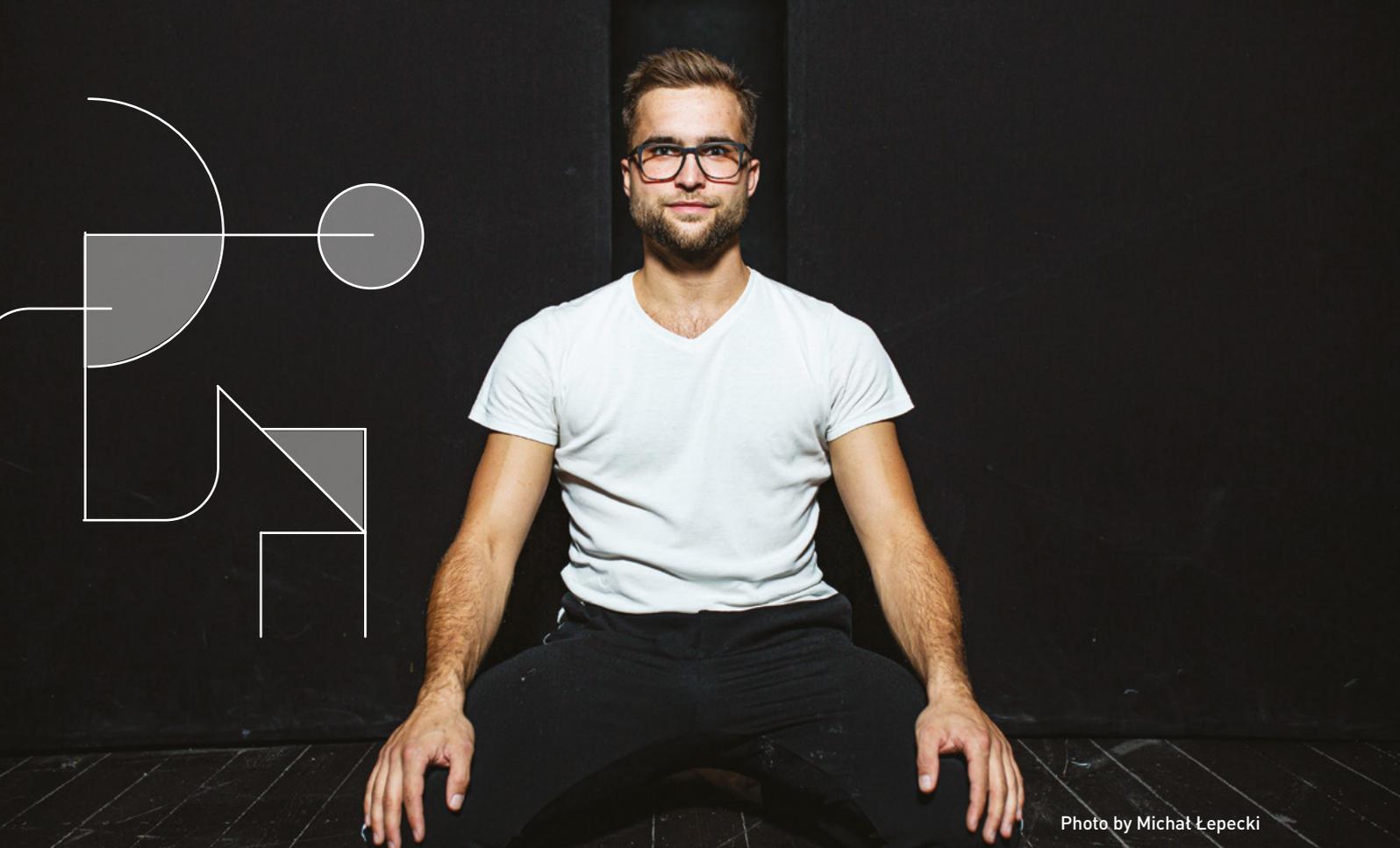


Photo by Michał Łepecki

Cognitive processes in the aesthetic experience of dance

Principal Investigator:

Tomasz Ciesielski
University of Łódź

Project title:

Functions and methods of attention distribution
in contemporary dance theatre

NCN panel:

HS 2

Funding scheme:

PRELUDIUM 11, announced on 15 March 2016

The original intuition behind the project was rooted in the experience of dancers and choreographers, who work with movement and often stumble into a creative block. The performer may know the choreography inside out, have all the skills and knowledge necessary to perform it on stage. And yet, sometimes it just doesn't "click"; the spectator is not moved or convinced. When this happens, choreographers will often tell performers to focus their attention on something else than the movement as such, for instance, on their relationship with their partner, the musical accents, the weight of their hands or the use of space. More often than not, several such attempts are enough to conjure up the desired aesthetic effect. But what has changed? After all, it is not that the dancers have suddenly learned how to raise their legs higher, nor has their speed or motor coordination improved. It seems, rather, that the shift of attention to a different aspect of the experience, i.e. changing the mind, rather than the body, has allowed them to reinterpret the choreography. Understanding the causes and mechanisms that underlie these subtle transformations is the objective of this project.

The project is an attempt to look at the experience of dance not through the lens of context, technique and history, but of the cognitive processes that enable us to dance and feel enraptured when others do so. The analysis is based on the latest findings in the science of cognition. Technological advancement, coupled with an interdisciplinary perspective, allows us to discern ever subtler aspects of human perception, including the processes of attention. The subject is as fascinating as it is dangerous, however, because the still limited advances of contemporary science in the field of perception and consciousness may lead to overly simplistic and shallow conclusions. Despite the risk, strengthening the links between cultural studies and theatre studies on the one hand, and cognitive science and phenomenology on the other, gives hope for the advent of new approaches to performative phenomena that would satisfy both theorists and practitioners.

The first research findings on the attention of professional dancers have already allowed us to confirm that intense dance training causes considerable changes in cognitive function. The purpose of subsequent tests will be to identify specific activities that affect the attention of dancers,

as well as to determine how they influence their behaviour on stage. The project also involves detailed library searches and practice-based research, as well as consultations with top-class foreign experts. All these methods are intended to promote the main research objective and deepen our understanding of the cognitive processes related to the aesthetic experience of dance.

Tomasz Ciesielski

Performer, choreographer and dance scholar. Teacher at the Academy of Music in Łódź and PhD student at the University of Łódź. His research straddles the boundary between art and science, combining choreographic strategies with the methods of cognitive science and cultural studies. He has created performances such as *Sense-action*, *Koszty kwalifikowane/Taniec, moja miłość* [*Eligible Costs/Dance, My Love*], *Idylluzja* [*Idyllusion*], and *Karaoke*. He has published a book entitled *Taneczny umysł. Teatr ruchu i tańca w perspektywie neurokognitywistycznej* [*A Dancing Mind. Dance and Movement Theatre from a Neurocognitive Perspective*] and co-edited an anthology devoted to *Strategie choreograficzne. Nowe perspektywy* [*Choreographic Strategies. New Vistas*]. He is the secretary of the editorial board of the *Polish Słownik tańca XX i XXI wieku* [*Dictionary of 20th- and 21st-century Dance*].



Photo by Michał Łepecki

Investigation the Sources and Uses of Obsidian During the Neolithic in Poland

Principal Investigator:

Dr Dagmara H. Werra,
The Institute of Archaeology
and Ethnology PAS

Project title:

Investigation the Sources and Uses
of Obsidian During the Neolithic in Poland

NCN panel:

HS 3

Funding scheme:

OPUS 15, announced on 15 March 2018

Obsidian, or volcanic glass, was one of the best silica rocks used by prehistoric communities for tool-making purposes. Because of its unique geochemical composition, it is possible, based on various instrumental methods, to study the characteristic features of its geological source and thus determine the most probable origin of materials used to make a given archaeological artefact. This, subsequently, sheds further light on the life of prehistoric communities.

This research project will carry out a number of analyses to paint a more detailed picture of issues such as access to obsidian deposits, as well as resource specialization and use. At the same time, we will be able to track the distribution of obsidian artefacts, study their acquisition, exchange and contacts between prehistoric communities.

The earliest traces of the use of obsidian in prehistoric communities in what is now Poland date back to the Middle Palaeolithic. In the Palaeolithic and the Mesolithic, there is some evidence of isolated artefacts in archaeological inventories, with very rare instances of more numerous obsidian products (e.g. in Rydno's ochre mine). The use of obsidian considerably increases with the arrival in Poland of the first Neolithic communities.

The research project will catalogue Neolithic obsidian artefacts known from archaeological sites across Poland. This will permit us to recreate their distribution network and study the issues related to their mining, processing and trade in prehistoric Neolithic communities.

Neolithic obsidians will undergo a technological and morphological analysis, accompanied by the refitting and weight analysis method, in order to determine the way in which the resource was used in Neolithic communities. The study will also allow us to find out whether different splinting methods were employed for different resources. We will analyse the form in which obsidian arrived at the site, i.e. whether it was delivered in the form of natural concretions or as ready-made tools, and if the latter is shown to have been the case, to determine what kind of tools were given preference. The purpose of selected obsidian artefacts will also be investigated using trace evidence analysis.

Their origin and chronology will also be established with the aid of energy dispersive X-ray fluorescence–EDXRF, a non-destructive method that allows even small artefacts to be tested. The technique allows us to chart the characteristic composition of the artefact and determine its origin. We are also planning to carry out the first obsidian hydration dating (OHD) analyses for a variety of materials excavated in Poland.

The tasks and analyses planned within the framework of the project will shed ample light on the distribution and use of obsidian in the Neolithic in Poland and allow us to draw broad comparisons to arrive at a more dynamic picture of the contacts between prehistoric communities and their obsidian trade. The project will also address issues related to obsidian use technology and specialization in order to determine to what extent the resource was mined from specific deposits and how access to these sites changed over time. The project will contribute to expanding our knowledge of prehistoric communities, particularly in terms of their use of imported resources.

Dr Dagmara H. Werra

Archaeologist, ethnologist. She graduated in archaeology and ethnology from the Nicolaus Copernicus University in Toruń, and in 2013 earned a PhD degree in archaeology. She is currently employed as Assistant Professor at the Institute of Archaeology and Ethnology of the Polish Academy of Sciences in Warsaw. Her research interests centre on flint mining and the identification and use of silica rocks by prehistoric communities. Since 2017, she has served as an editor for *Archaeologia Polona*, and since 2018 as the Vice-President of the UISPP Flint Minings in Pre- and Protohistoric Times Commission.



Photo by Michał Łepekki

Finding evidence of extreme glacial phenomena

Principal Investigator:

Dr hab. Piotr Weckwerth,
Nicolaus Copernicus University
in Toruń

Project title:

Geomorphological evidence and paleogeographic implications of catastrophic glacial floods and surges in the southern sector of the Scandinavian ice sheet in the Late Vistulian (MEASSIS)

NCN panel:

ST 10

Funding scheme:

OPUS 16, announced on 14 September 2018

The primary objective of the research project is to look at landforms in order to identify, describe and analyse hitherto unknown in Europe, unequivocal evidence for extreme glacial phenomena such as rapid outbursts of meltwater and glacial surges in the marginal section of the ice sheet during the last glaciation. The project is designed to describe the morphological features of the indicator landforms of extreme glacial events and the processes leading to their development, which to this day remain rather enigmatic in the case of the Scandinavian ice sheet. The purpose is to reconstruct the processes that spurred the formation of glacial landforms and the accumulation of deposits under the surging ice sheet (the rapid advance of the glacial foot) as it slid on the glacier bed. Studying the morphology, geological structure and origin of landforms created in the wake of catastrophic glacial floods in North-Eastern Poland will enable us to understand the processes of deposit transport and accumulation, their energy and flow regime, as well as the hydraulic parameters of the latter (depth, speed, water table drop, etc.). The preliminary estimates of the flow rate of glacial water mega floods in North-Eastern Poland (1.5-2 mln m³/s) allow us to rank them among the top five largest phenomena of this kind in the world in the Quaternary Period. These data, along with the presence of similar landforms only in North America and Asia, account for the global importance of our research. In addition, mega-scale glacial events during the Vistulian Glaciation were of fundamental importance for the evolution of the valley system in the European Plain and have not yet been studied in detail.

The research project involves creating a database of geomorphological and geological data from North-Eastern Poland, which will collect information on marginal zones with landforms suggestive of extreme glacial events (glacial surges, mega floods). With the aid of specialist computer software, we will also conduct high-resolution morphometry analyses of the diagnostic landforms. The main stage of the project involves intense (geological, geomorphological and geophysical) fieldwork, aimed at studying the structure of the formations in question and taking deposit samples for further lab analysis. This will allow us to investigate the properties of the deposits and the processes that accompany extreme glacial phenomena.

The research project will allow us to reconstruct hitherto unknown processes related to the catastrophic glacial events that took place during the last glaciation on the European Plain. The findings will enable their spatial and temporal correlation with changes in the advancement of the foot of the last ice sheet. Timing these catastrophic glacial floods will demonstrate their connection to the main stages of land formation on the European Plain and determine the recession phases of the glacier. Project findings will also further our understanding of the consequences of erosion and accumulation caused by the catastrophic surges of glacial waters, their flow volume and time in North-Eastern Poland, and the sources of flood waters. Importantly, we will develop qualitative and semi-quantitative models to represent the relationship between the landforms and the deposits that make them up on the one hand, and geological processes caused by extreme glacial events on the other. Our findings will allow us to determine the importance of glacial mega floods for the development of the valley system in Europe, the impact of the sudden supply of large volumes of meltwater to the Atlantic on changes in its water circulation patterns, as well as the dynamics of global climate change during the last glaciation.

Dr hab. Piotr Weckwerth

Born in 1971. Geomorphologist and geographer, Head of the Department of Geomorphology and Quaternary Paleogeography at the Faculty of Earth Science and Spatial Management of the Nicolaus Copernicus University in Toruń. His research centres on glacial and fluvial geomorphology in the Polish Plain and contemporary glacial regions. He is particularly interested in glacial surges and floods, fluvial sedimentology and the estimation of past river flows in paleoenvironmental reconstructions.

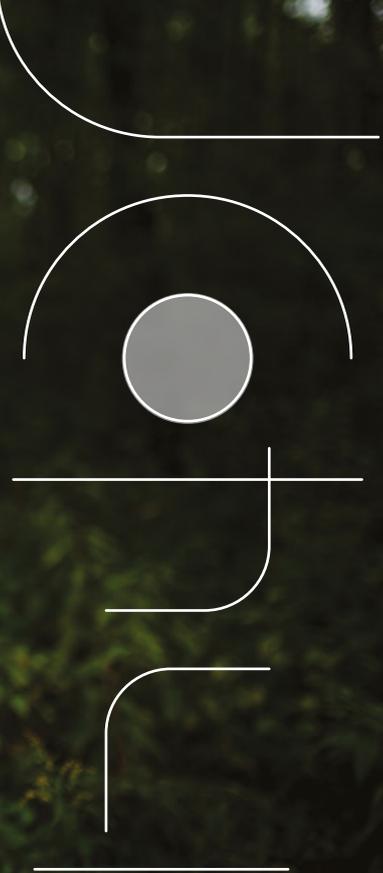


Photo by Michał Łepecki

Dangerous consequences of catastrophic deforestations

Principal Investigator:

Dr hab. Michał Słowiński, Stanisław Leszczycki Institute of Geography and Spatial Organization PAS

Project title:

Impact of catastrophic deforestations on the ecosystem of the lakes and peatlands of Bory Tucholskie

NCN panel:

ST 10

Funding scheme:

OPUS 9, announced on 16 March 2015

Forests are one of the main components of the European Plain and have always played an important role in human life, providing shelter, food and building material. For this reason, it is extremely important and instructive to study the history of deforestations and their impact on the natural environment. Deforestation should be approached from many angles, with an emphasis either on natural or anthropogenic processes. In the former case, deforestation is the result of fires, floods or strong winds. In the latter, it is caused by the logging activities of man, designed to collect building material or reclaim land for agricultural purposes. These mechanisms have alternated in the long post-glacial history of vegetation on the European Plain. They are interesting not only because they have led to the disappearance of large swathes of forests, but also because new processes are underway today, such as physical and chemical denudation, i.e. intensified hillslope processes, changes in meso- and microclimate conditions, and surface runoff modifications.

A key role in the research project was played by high-resolution analyses of biogenic core samples (of peat and lake deposits), which constitute true archives of the natural environment, archives that allow us to track how ecosystems reacted to changes in vegetation, deforestation and dehydration in the past, find out how long these changes lasted, and determine whether they were related to natural processes or human activities, such as land reclamation. Our findings have put us in a position to contribute to the debate on the consequences of planting pine or spruce tree monocultures in Poland. Our study has lent independent evidence to support the view that the introduction of the clear-cut harvest system in the Prussian partition at the end of the 18th century, followed by the artificial planting of single-age forest monocultures, dramatically affected the biodiversity of the forest, with consequences that rippled out to all related ecosystems, including lakes and peatlands. We are still paying the price for these changes to date. Generation after generation, these ecosystems show weaker resilience against extreme events, including insect epidemics, several outbreaks of which were recorded in the previous century, or violent weather phenomena, such as those we experienced in 2012 and 2017 in the north of Poland. Besides disrupting ecosystems, these events also entail important costs for the state budget.

Our project allowed us to outline the history of natural and anthropogenic deforestation. The findings shed new light on the history of deforestation, fires and the resilience of ecosystems that have emerged as a result of human activities. Our results have been published in renowned academic journals and presented at international conferences, which has allowed us to join in the ongoing debate on the impact of increasing anthropoppression and climate change on the natural environment. We also proposed a comprehensive forest planning model, which taps paleoecological sources to account for the history of land use and determine the reference conditions for various ecosystems.

Dr hab. Michał Stowiński

Paleoecologist, geographer and naturalist working at the Institute of Geography and Spatial Organization, Polish Academy of Sciences (IGSO PAS). Graduate of geography at the Kazimierz Wielki University (2007). During his PhD studies, he was awarded a scholarship by DAAD German Academic Exchange Service at the GFZ German Research Centre for Geosciences in Potsdam. In 2012 he earned his PhD and returned to Potsdam, where he joined the team headed by Prof. Achim Brauer and focused on analysing laminate deposits from Lake Czechowskie (Northern Poland). In 2018, he obtained the title of habilitated doctor at IGSO PAS, where he currently heads the Past Landscape Dynamic Laboratory. He takes an active part in international conferences and has won many calls and grants. Within the framework of his research, he hopes to uncover mutual relations between human activities and the natural environment. He is interested in the processes and factors that influence ecosystems particularly affected by climate change, as well as the impact of landscape evolution on community life. A member of the Society of Wetland Scientists and International Paleolimnology Association.



Photo by Michał Łepecki

Biomaterials for regenerative medicine

Principal Investigator:

Prof. dr hab. inż. Aleksandra Czyska-Filemonowicz, AGH University of Science and Technology in Kraków

Project title:

Design, processing and characterization of micro/nanostructure and selected properties of biomaterials for regenerative medicine (OPTYMED)

NCN panel:

ST 8

Funding scheme:

HARMONIA 4, announced on 15 December 2012

Degenerative joint diseases, such as osteoarthritis, represent an increasingly serious problem for society, not only in elderly patients. Damage to tissue and its progressive degradation are a natural result of the ageing process, but other risk factors for the disease include lack of exercise, sedentary lifestyle, unhealthy diet and obesity. Because of its special structure, cartilage can regenerate only to a small extent. Despite significant advances in medicine, still the gold standard in severe osteoarthritis remains the total joint replacement with implant.

The primary objective of the research project was to develop innovative biomaterials (such as bioactive composite coatings and polymer nanofibre scaffolds) designed to significantly improve the treatment of bone loss and degenerative bone and cartilage lesions. This was achieved through interdisciplinary research in cutting-edge materials science and stem cell-based tissue engineering. Detailed project objectives included producing of novel biomaterials followed by detailed qualitative and quantitative characterization of their micro- and nanostructure as well as their micromechanical properties. Additionally coatings adhesion strength and surface topography were examined; finally their biocompatibility was studied. The project postulated that a microporous composite coating, like PEEK/Bioglass (fabricated through electrophoretic deposition), or TiO₂/Ca-P and TiO₂/HAp (produced by plasma electrolytic oxidation), would improve the quality of the interface between titanium alloys and bone tissue. To test this hypothesis, basic research was conducted to determine the impact of the micro- and nanostructure, phase composition and porosity of surface-modified biomaterials on their bioactivity and biocompatibility.

Titanium alloys are the most frequently used materials in implant elements that come into direct contact with bone tissue, because of their high corrosion resistance, excellent mechanical properties, as well as low density. In addition, titanium alloys often undergo surface modification in order to facilitate post-surgery implant stabilization. The very first results of our research on surface-modified titanium implants showed a pressing need to expand the scope of the project, which found its reflection in a PhD dissertation prepared by Dr inż. Joanna Karbowniczek. Its goal was to design, produce and comprehensively characterize coatings used

to improve the bioactivity and biocompatibility of titanium alloys. The coatings were produced through micro-arc oxidation (MAO) and electrophoretic deposition; different parameters of these two processes were tested. Optimization of the MAO process parameters allowed to obtain coatings with high surface roughness, porosity, good adhesion strength and outer layer composed of crystalline hydroxyapatite. During in vitro tests good bioactivity and biocompatibility of the coatings was confirmed. Their properties were studied using advanced techniques of microscopy, spectroscopy, and electron tomography. The use of the latest-generation analytical electron microscope (S)TEM FEI Titan Cubed 60-300 and its unique equipment, available at the International Centre of Electron Microscopy for Materials Science (IC-EM), allowed the cutting-edge methods of electron microscopy to be harnessed for the study of the micro- and nanostructure of biomaterials down to the hitherto inaccessible atomic scale. In addition, the project conducted a pioneering 3D visualisation study of the interface between the cells and the coating with the use of a focused-ion beam (FIB) scanning electron microscope.

Interdisciplinary research, combined with the latest achievements in various disciplines (such as materials science, biotechnology, tissue engineering), cutting-edge technologies (fabrication of coatings and cell scaffolds) and advanced research methods allowed objectives and the tasks of the project to be successfully completed. Its results were presented at international scientific congresses and conferences, and published in JCR-listed journals. Another tangible outcome of the project is the doctoral dissertation by Dr inż. Joanna Karbowniczek. entitled "Microstructure, cellular response and selected properties of titanium based biomaterials applied in regenerative medicine of bone tissue and joints" (currently in its final elaboration).

Funded within the framework of the HARMONIA 3 programme, the project served as an excellent platform to establish new or deepen already existing international research co-operation. It was conducted in co-operation with Professor F. Rustichelli from Università Politecnica delle Marche (Ancona, Italy), Professor Aldo R. Boccaccini from Friedrich-Alexander-Universität Erlangen-Nürnberg (Erlangen, Germany), and Professor E. Amler from the Institute of Experimental Medicine of the

Czech Academy of Sciences (Prague, Czech Republic), as well as Professor H. Cimenoglu from the Istanbul Technical University (Istanbul, Turkey). An important factor that contributed to the successful accomplishment of project objectives was the vast research experience of project partners and the opportunity to use equipment available at foreign research institutions. The international experience gained by our research team made it possible to finally open a new Biomaterials Laboratory, which expanded the research and teaching offer of the Microscopy Centre and the Faculty of Metals Engineering and Industrial Computer Science of the AGH University of Science and Technology.

Prof. dr hab. inż. Aleksandra Czyrska-Filemonowicz

Full professor at the International Centre of Electron Microscopy for Materials Science (IC-EM) at AGH University of Science and Technology as well as Professor Emeritus of the Faculty of Metals Engineering and Industrial Computer Science at AGH-UST from 2017. Her main research interests focus on metallic biomaterials, materials for the energy systems and aeronautics, nanomaterials, materials for high-temperature and extreme environment, theory and application of electron microscopy.

She has published over 500 scientific papers including 4 monographs. She participated in more than 150 projects as a coordinator or principal investigator. She has won grants from the State Committee for Scientific Research, the National Science Centre, the National Centre for Research and Development, EU FP6 and FP7 as well as EIT KIC InnoEnergy and Innovative Economy Programme 2007-2013.

She has acted in more than 40 congress programme committees and often chaired sessions during global and European congresses on electron microscopy and materials science. She has initiated and headed European Schools on electron microscopy regularly organized at the AGH University of Science and Technology since 2003.

She has held several foreign fellowships, including eight-year scientific stay at Forschungszentrum Jülich (FZJ), Germany. Thanks to her efforts, the International Centre of Electron Microscopy for Materials Science was opened, which she headed up until 2016. She has also held important

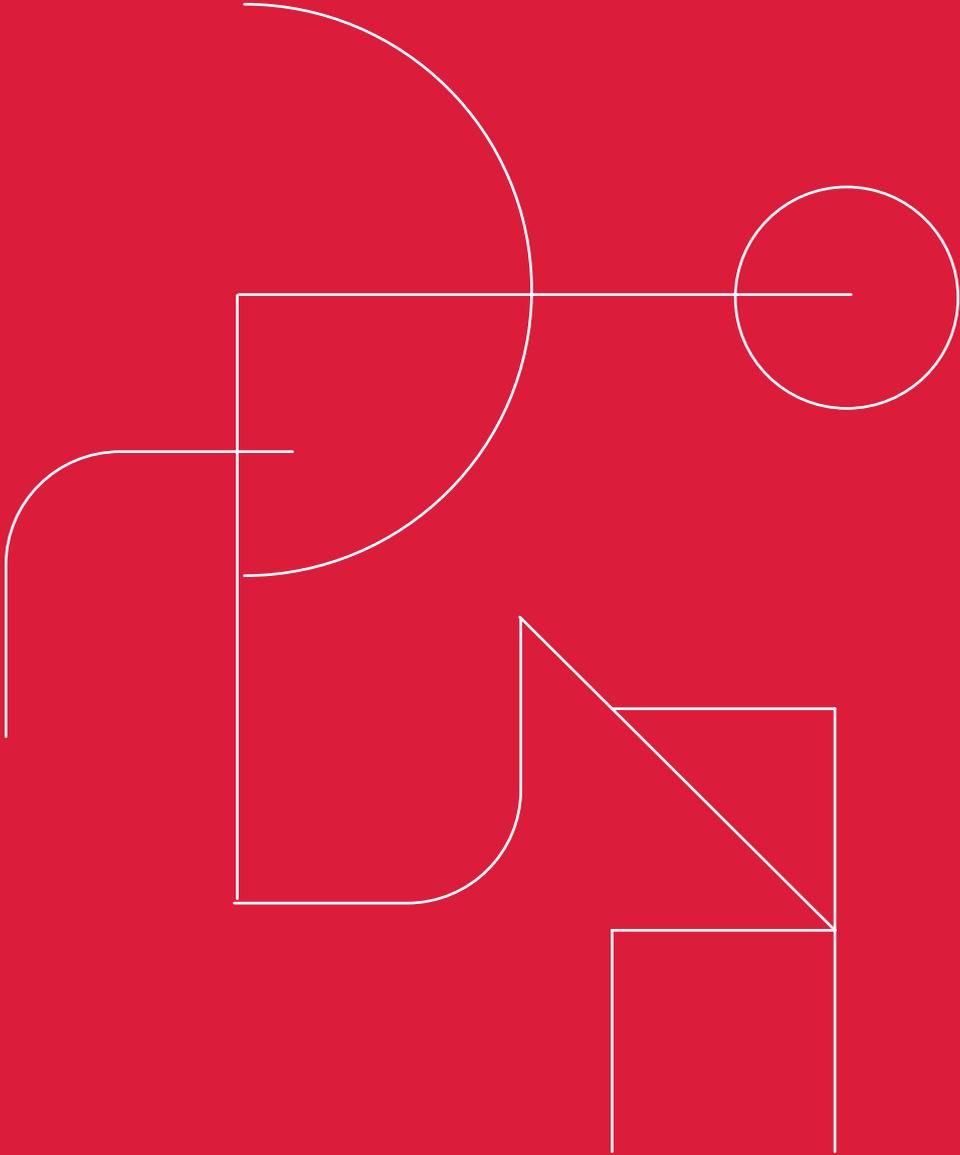
functions in various European organizations. She has been a member of many national organizations, including the Materials Science Committee of the Polish Academy of Sciences, and headed the National Committee for Cooperation with IFSEM and the National Committee for Cooperation with ICSU at the Polish Academy of Sciences. She is a member of several European science associations (DGE and DGM in Germany and the Royal Microscopy Society, UK), a founding member of the Polish Society of Materials Science, as well as initiator and first president of the Polish Society of Microscopy.

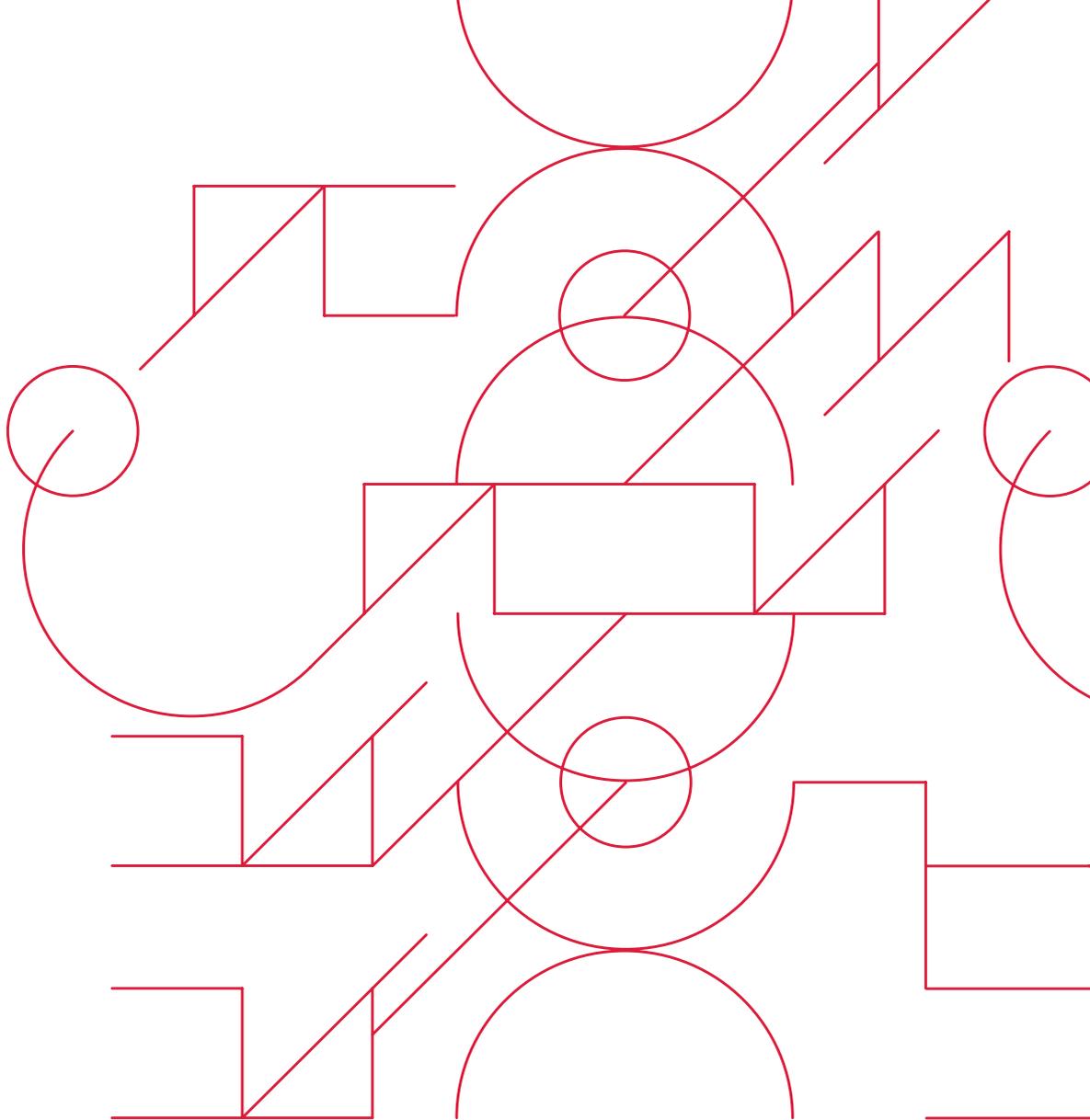
She has received e.g. the Gold Cross of Merit of the Republic of Poland, the award of the Minister of Higher Education and Technology, the Medal of National Education and several awards of the Rector of AGH-UST for research and teaching, including the 1st prize for career overall achievement (2016). She was awarded with *Pratt Whitney Award for Outstanding Effort in Supporting the GMS Program* (USA, 2009) and the *Helmholtz International Fellow Award for scientific achievements* (Germany, 2013).

Dr inż. Joanna Karbowniczek

Graduated in biotechnology from the University of Agriculture in Kraków and completed a PhD programme at the Faculty of Metals Engineering and Industrial Computer Science of the AGH University of Science and Technology in Kraków. She defended her PhD dissertation entitled "Microstructure, cellular response and selected properties of titanium based biomaterials applied in regenerative medicine of bone tissue and joints" under the supervision of Prof. dr hab. inż. Aleksandra Czyrska-Filemonowicz. Between 2013 and 2017, she completed 5 foreign research internships, e.g. joining Professor A.R. Boccaccini's team at the Institute of Biomaterials (Erlangen, Germany). Since 2015, she has been employed as teaching assistant at the Faculty of Metals Engineering and Industrial Computer Science. Her main scientific interest are within biomaterials field including metallic implant materials and polymer scaffolds used in tissue engineering applications.

The photo on p. 62 was taken at the International Centre of Electron Microscopy for Materials Science (IC-EM) with microscope Titan Cubed G2 60-300.





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