

ANNUAL REPORT

2 · 0 · 1 · 7

Edition: Communications Team

National Science Centre in Poland

ul. Królewska 57, 30-081 Krakow

tel. +48 12 341 90 03

fax: +48 12 341 90 99

e-mail: biuro@ncn.gov.pl

Design: PLEO design

Print: Drukarnia Beltrani

ISSN 2450-5994

Number of copies: 200

www.ncn.gov.pl

PERFORMING FOR
POLISH RESEARCH

#peoplenotbuildings

· BASIC RESEARCH ·
· IS THE ESSENCE ·
· OF ALL SCIENCE ·

Contents

ABOUT THE NATIONAL SCIENCE CENTRE

6

General information

7

2017 highlights

8

Structure

9

NCN PERFORMANCE IN 2017

14

NCN in numbers

15

NCN funding schemes

16

NCN Panels

20

Funding of basic research

21

Research proposals and peer review

27

Experts

30

NCN Appeal Committee

36

Projects implementation

37

International cooperation

39

Promoting our work

44

Costs of the tasks performed by the Centre

47

Summary 2017

49

RESEARCH STORIES

50

ABOUT
THE
NATIONAL
SCIENCE
CENTRE

General information

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 researchers starting their career in research
- 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

ABOUT NCN

We are a government executive agency funding basic research carried out at Polish research entities. Basic research is defined as experimental or theoretical work seeking to expand knowledge of the fundamentals of phenomena and observable facts.

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 units where the research is conducted.

Another area of our activity consists in initiating international cooperation, inspiring funding of basic research from non-state sources, and propagating information on the funding opportunities we launch. We are the coordinator of QuantERA: the first ERA-NET initiative to be managed by an agency representing one of the so-called new EU member states. We are also the operator of the "Research" area under the third edition of the EEA and Norway Grants.

Highlights 2017

13

January

launch of the QuantERA 2017 call for projects in quantum technologies

10 - 11

May

fifth edition of the NCN Open Days in Kielce

4

May

opening of the MINIATURA 1 call for single research activities

4

July

signing of memorandum of understanding with Max-Planck-Gesellschaft providing for the establishment of a network of Dioscuri Centres of Scientific Excellence in Poland

7

November

launch of the first Dioscuri call

10

October

the NCN 2017 Award ceremony; laureates: Prof. Anna Brożek (Humanities), Dr. Szymon Swieżewski (Life Sciences), Dr. hab. Adam Rycerz (Physical Sciences)

14

November

information meeting on Polish grant programmes for researchers titled „Funding opportunities for researchers in Poland,” jointly with the Foundation for Polish Science

15

September

announcement of the first DAINA call for research projects by joint Polish-Lithuanian teams

22

November

results of the first call for international research projects in quantum technology, organised by the QuantERA consortium, which is coordinated by the NCN

30

November

re-election of Prof. Zbigniew Błocki, director of the NCN, as member of the Governing Board of Science Europe

15

December

a round-table meeting debating the ways to facilitate cooperation between the NCN and the research community



NCN Director

The Director of the National Science Centre, selected within the competition by the NCN Council and appointed by the Minister of Science and Higher Education, is responsible for financial management as well as the correct and efficient completion of NCN tasks. The director is also in charge of international cooperation and acts as a legal representative on behalf of the Centre.

The NCN's governing bodies

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 Centre's representative, and is in charge of the Centre's statutory tasks and financial policy. The director acts as a legal representative on behalf of the Centre.

NCN COUNCIL

The NCN Council is a policy body consisting of 24 distinguished researchers representing different academic fields. The Council sets priority areas in basic research, decides on the type of programmes and specifies call regulations. Its range of competencies also includes electing members of the expert teams responsible for proposal evaluations.

NCN Council in 2017

Term of office: 2016-2018

Prof. Janusz Janeczek - Chair

Arts, Humanities and Social Sciences (HS)

Prof. Krystyna Bartol

Prof. Małgorzata Kossowska (chair of HS Committee)

Prof. Teresa Malecka

Dr. hab. Oktawian Nawrot

Rev. Prof. Andrzej Szostek

Prof. Jan Jacek Sztudynger

Prof. Wojciech Tygielski

Physical Sciences and Engineering (ST)

Prof. Mikołaj Bojańczyk

Prof. Grzegorz Karch

Prof. Wojciech Kuciewicz

Prof. Stanisław Lasocki

Prof. Ewa Łokas (chair of ST Committee)

Prof. Ewa Majchrzak

Prof. Ewa Mijowska

Prof. Andrzej Sobolewski

Prof. Marek Żukowski

Life Sciences (NZ)

Prof. Jerzy Chudek

Prof. Artur Jarmołowski

Prof. Krzysztof Józwiak

Prof. Jan Kotwica

Prof. Marta Międzyńska

Prof. Krzysztof Nowak (chair of NZ Committee)

Prof. Anetta Undas

NCN OFFICE

The NCN Office is an entity combining the efforts of a number of the NCN's departments and teams. 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. The Office also provides support to the applicants and answers their queries. Its major responsibilities also include administrative and financial management of grant agreements, fostering international cooperation and disseminating of information about NCN funding opportunities among researchers.

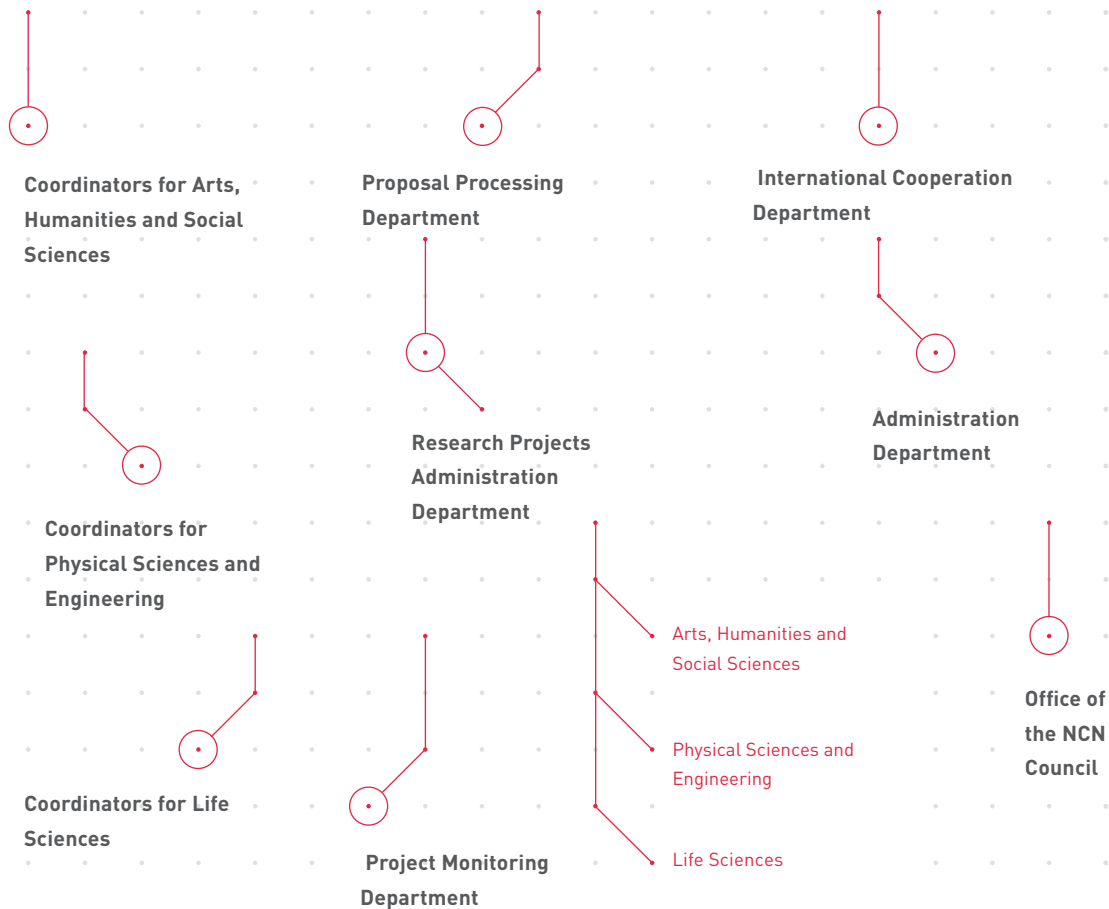
NCN COORDINATORS

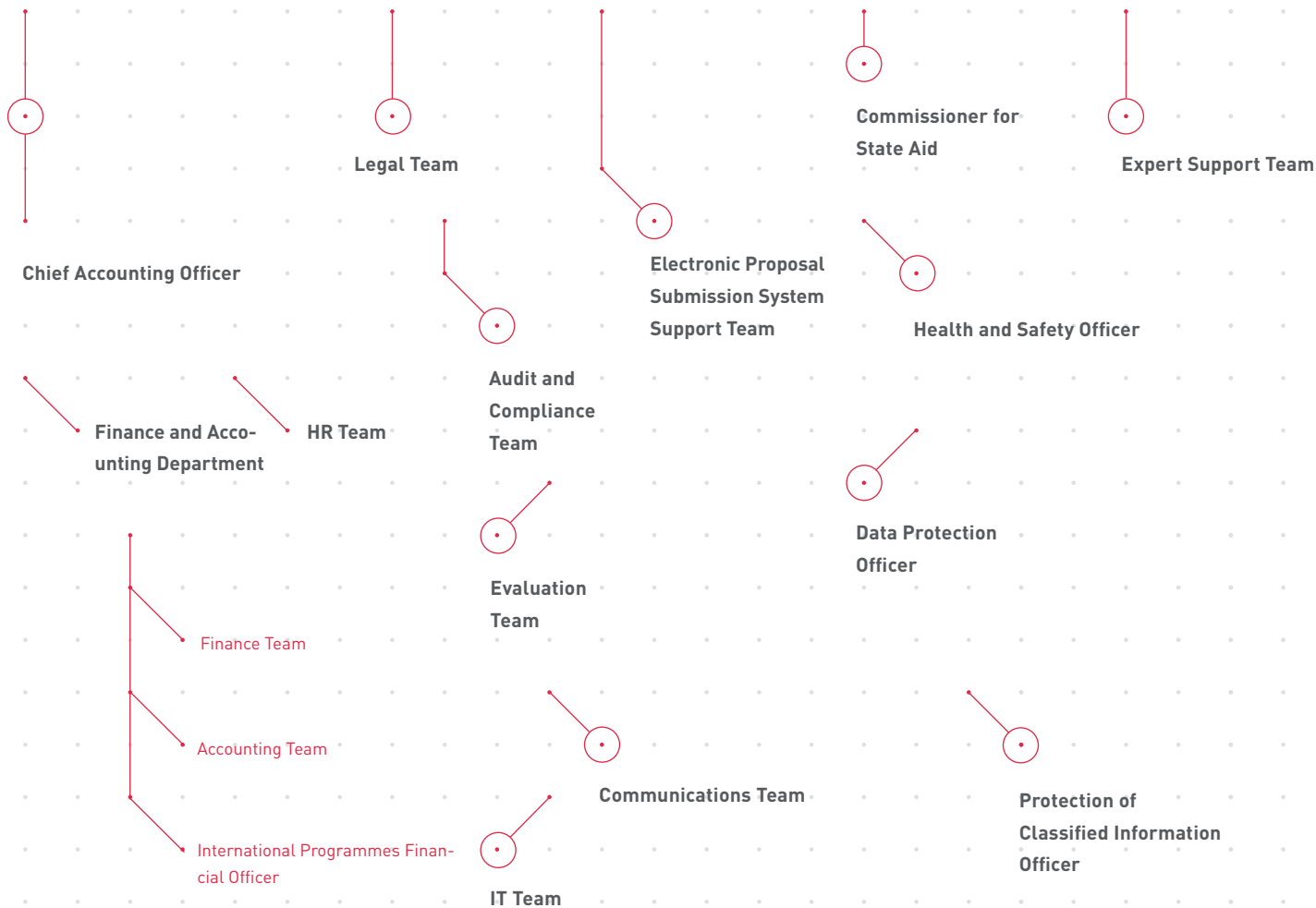
The NCN Coordinators are scientific officers responsible for organising and conducting calls for proposals for research projects. Their responsibilities also include evaluation of the impartiality of the peer review process, the eligibility check of proposals submitted within the calls, as well as the 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.

NCN Structure

The year 2017 saw plenty of changes to the Centre's organisational structure. In August, the former HR Department was transformed into two new units: HR Team and Expert Support Team. The changes came as a development in streamlining the processing of an ever-increasing number of expert reviewers who evaluate the research proposals submitted to the Centre. Moreover, the IT Team was re-organised, with an Electronic Submission System Team set up to coordinate the configuration and maintenance of the IT infrastructure of proposals and projects.

NATIONAL SCIENCE CENTRE'S COUNCIL





NCN

PERFORMANCE

IN

2017

1 2

domestic calls announced



1 2

domestic calls concluded

1 0

international calls announced

1 0, 0 2 3

proposals submitted under domestic calls announced in 2017

9 6

international proposals recommended for funding

4 8 0

proposals submitted under international calls

1

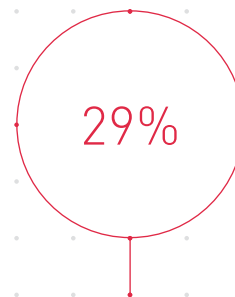


2, 9 4 0

proposals recommended for funding under the domestic calls concluded in 2017

2 6 7 M EUR

for proposals recommended for funding under the domestic calls concluded in 2017



total success rate

We finance basic research conducted as projects, single research activities, scholarships and post-doc fellowships. We publish our calls regularly, four times a year, so that researchers have three months to submit their research proposals. A different mode applies to the MINIATURA call, open once a year, where submissions are allowed on a continuous basis as long as the resources allocated for the programme have not been depleted. The funding schemes on our 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: researchers beginning their careers, without doctorate



Duration: 12, 24 or 36 months



Funding: ca. EUR 16,500, EUR 33,000 or EUR 50,000 depending on the project's duration



Requirements: implementation under the supervision of a supervisor or academic tutor



Open: twice a year

MINIATURA Call for single research activities instrumental in basic research

-  **Applicants:** researchers with a doctorate received within 12 years of submitting the proposal who have not been grantees of previous NCN calls for proposals
-  **Duration:** up to 12 months
-  **Funding:** ca. EUR 1,100 to EUR 11,000
-  **Open:** continuous call, accelerated review process

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
-  **Open:** once a year

SONATINA Call for research projects: employment at research institutions, funding to 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 outside Poland of 3 to 6 months
-  **Funding:** no cap on funding research projects, up to ca. EUR 23,000 a year in salaries for the project's Principal Investigator, ca. EUR 2,000 a month during the fellowship outside of Poland + travel allowance
-  **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

 ETIUDA
Call for doctoral scholarship proposals

-  **Applicants:** for researchers working on their doctoral dissertations
-  **Duration:** 6 to 12 months + 3 to 6 months of fellowship at a research centre outside Poland
-  **Funding:** ca. EUR 1,000 a month + travel and living allowance paid during the fellowship at a research centre outside Poland
-  **Requirements:** the grantee must secure the award of their doctorate within 6 to 12 months of the fellowship
-  **Open:** once a year

 UWERTURA
Call for proposals for fellowships at foreign research teams carrying out ERC grants

-  **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:** 3 to 6 months
-  **Funding:** ca. EUR 3,500 monthly + travel allowance
-  **Requirements:** applying for an ERC grant within 18 months of the fellowship
-  **Open:** once a year

 MAESTRO
Call for groundbreaking 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 concluded grants in which they acted as Principal Investigator
-  **Duration:** 36, 48 or 60 months
-  **Funding:** no cap on funding research projects
-  **Requirements:** the project's team must include at least one investigator with a doctorate and at least one doctoral candidate
-  **Open:** once a year



OPUS

Call for research projects, including purchase or construction of research equipment

- Applicants:** all researchers, regardless of academic degree
- Duration:** 12, 24 or 36 months
- Funding:** no cap on funding research projects
- Other info:** scholarships for young researchers may be granted under the scheme
- Open:** twice a year



HARMONIA

Call for research projects carried out as international cooperation, without co-financing from foreign funds

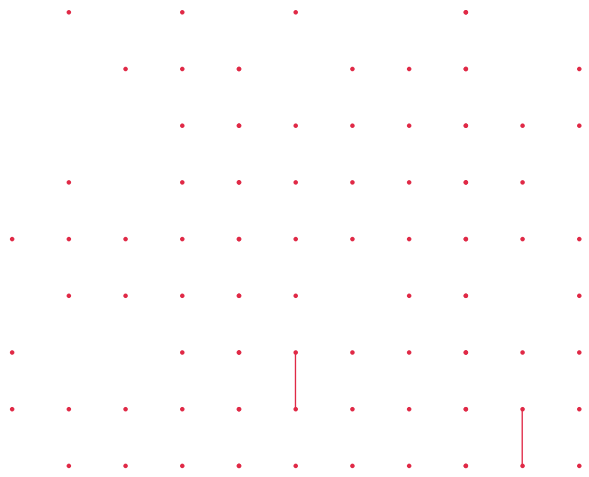
- Applicants:** researchers who want to collaborate with their colleagues from abroad
- Duration:** 12, 24 or 36 months
- Funding:** ca. EUR 115,000 to EUR 350,000 depending on the project's duration
- Open:** once a year



TANGO

Call for implementation projects drawing on results of basic research

- Applicants:** researchers who have acted as Principal Investigator to a basic research project for at least one year or who have secured written permission of the basic research project's Principal Investigator to develop it under the TANGO scheme
- Duration:** 3 to 12 months
- Funding:** ca. EUR 46,000
- Continuous call** for proposals published once a year by the National Centre for Research and Development





HS 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 and markets
- HS5** Norms and governance
- HS6** Human nature and human society



ST PHYSICAL SCIENCES AND ENGINEERING

- ST1** Mathematics
- ST2** Fundamental constituents of matter
- ST3** Condensed matter physics
- ST4** Physical and analytical chemical sciences
- ST5** Materials and synthesis
- ST6** Computer science and informatics
- ST7** Systems and communication engineering
- ST8** Products and processes engineering
- ST9** Astronomy and space research
- ST10** Earth system science



NZ 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 non-infectious 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

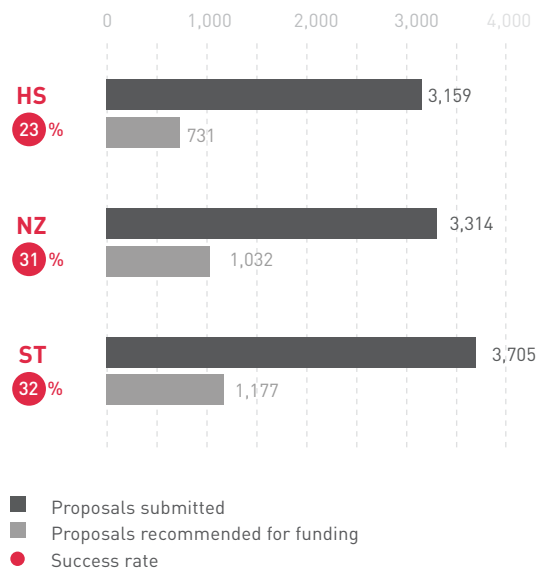
Funding of basic research

In calls published in 2017, we received 10,023 proposals worth in total ca. EUR 1.1 B.

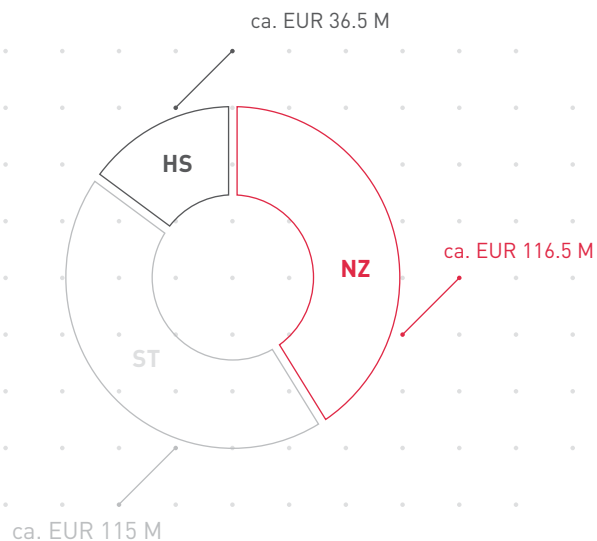
In calls concluded in 2017, funding was granted to 2,940 projects worth ca. EUR 267 M.

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

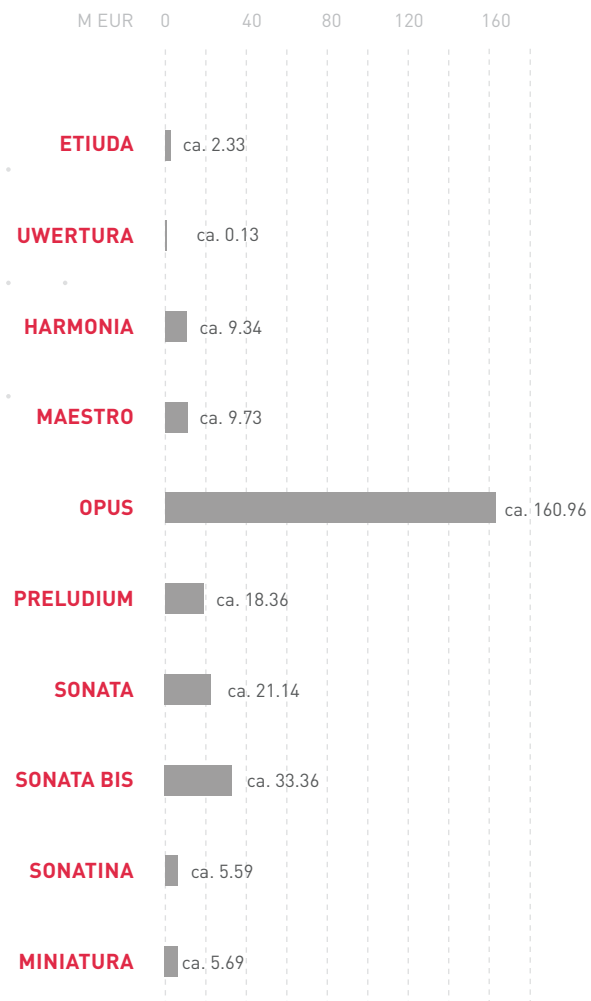
Number of proposals submitted and recommended for funding under the calls concluded in 2017, broken down by discipline group, alongside their respective success rates*



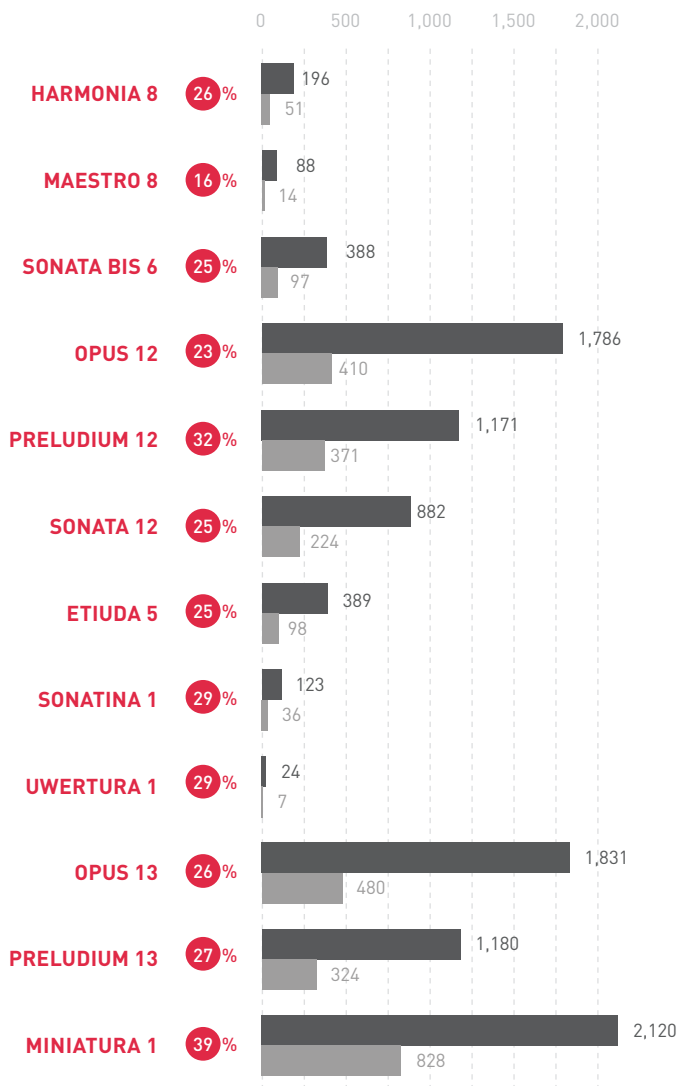
Funding awarded in 2017, broken down by research domain (groups)



Funding awarded in calls concluded in 2017, broken down by call types (M EUR)



Number of proposals submitted and recommended for funding under the calls concluded in 2017, broken down by call type, alongside their respective success rates*



TOTAL

10,178 proposals submitted
2,940 proposals recommended for funding
29% success rate

- Proposals submitted
- Proposals recommended for funding
- Success rate

*Success rate is the percentage of proposals recommended for funding; it is indicative of the ratio of the proposals recommended for funding against the number of proposals submitted.

Leaders of the NCN call rankings in 2017

The chief beneficiaries of the NCN calls concluded in 2017 were:

- public and non-public high schools (80% of all beneficiaries),
- research institutes of the Polish Academy of Sciences (17%),
- research institutes (2%).

HOST INSTITUTION

	Funding granted in EUR	Proposals qualified for funding	Numerical success rate
Jagiellonian University	29,553,308	291	37%
University of Warsaw	26,571,886	269	39%
Adam Mickiewicz University in Poznan	13,099,242	138	31%
University of Wrocław	10,755,850	110	35%
Nicolaus Copernicus University in Torun	8,111,882	91	33%
AGH University of Science and Technology	7,812,464	76	30%
University of Gdansk	6,491,639	78	26%
Institute of Physical Chemistry, Polish Academy of Sciences	5,683,605	25	49%
Wrocław University of Technology	5,309,971	53	32%
Institute of Biochemistry and Biophysics, Polish Academy of Sciences	5,198,646	22	39%
University of Lodz	4,997,797	86	32%
Poznan University of Medical Sciences	4,793,701	37	27%
Warsaw University of Technology	4,670,084	63	29%
University of Silesia in Katowice	4,336,341	60	23%
Medical University of Warsaw	4,306,654	30	33%
Silesian University of Technology	4,133,173	47	23%
Gdansk University of Technology	3,830,044	45	23%

Institute of Pharmacology, Polish Academy of Sciences	3,744,231	20	63%
Institute of Bioorganic Chemistry, Polish Academy of Sciences	3,496,533	18	43%
Lodz University of Technology	3,421,852	31	21%
Medical University of Gdansk	3,306,584	31	33%
Poznan University of Life Sciences	3,253,241	30	28%
Mossakowski Medical Research Centre, Polish Academy of Sciences	3,132,175	25	44%
Medical University of Lodz	3,083,239	29	32%
Nencki Institute of Experimental Biology, Polish Academy of Sciences	3,047,290	25	48%
Institute of Physics, Polish Academy of Sciences	3,018,299	21	49%
Poznan University of Technology	2,946,634	34	33%
Medical University of Lublin	2,866,155	18	23%
University of Warmia and Mazury in Olsztyn	2,683,164	63	23%
Warsaw University of Life Sciences WULS – SGGW	2,458,195	44	31%

The breakdown presents the ranking list of the research organisations which in 2017 received funding in excess of ca. EUR 2.3 M. As in previous years, its leaders are Jagiellonian University and the University of Warsaw, with 291 and 269 projects recommended for funding, respectively. In terms of funding, the leader is also Jagiellonian University, while the University of Warsaw is the runner-up in this category as well.

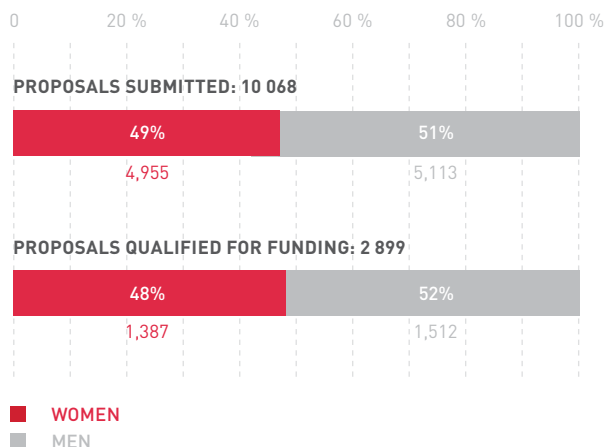
The success rate presented in the table, shows the ratio of proposals recommended for funding against the proposals submitted. Among the 2017 beneficiaries who secured more

than EUR 2.3 M in funding, the highest success rate was 63% – secured by the Institute of Pharmacology, Polish Academy of Sciences (PAS). The second best result ex aequo (49%) was achieved by: the Institute of Physical Chemistry, PAS, and the Institute of Physics, PAS; third place belonged to the Nencki Institute of Experimental Biology, PAS with a success rate of 44%. The highest ranking universities were the University of Warsaw (39%), Jagiellonian University (37%) and the University of Wrocław (35%).

Principal investigators*

In 2017, proposal submitted by women made up 49% of all applications. They were marginally less successful in applying for funding than their male colleagues; the success rates for the two groups were 28% and 30% respectively. Of the projects awarded funding in 2017, ca 52% had a man as Principal Investigator, whereas women acted as Principal Investigators to 48% of the awarded projects.

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

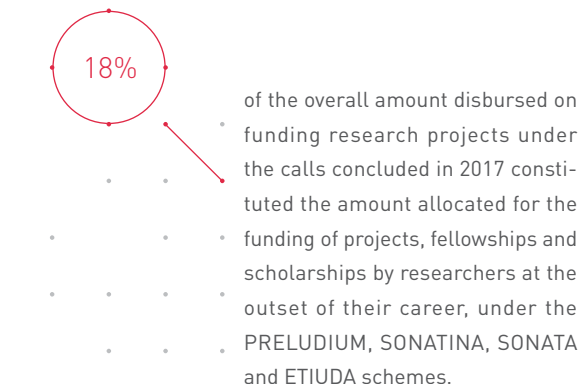


* Gender data based on the applicants' PESEL numbers. The data do not include the POLONEZ programme nor Principal Investigators without a PESEL (foreigners).

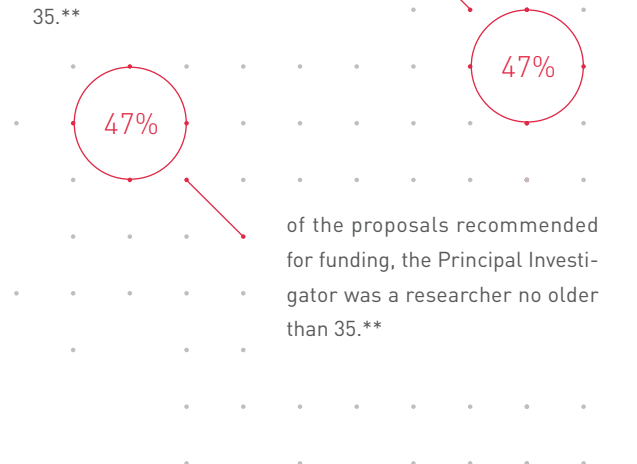
** This percentage may be slightly understated as when determining the pool of young researchers we used the applicants' PESEL ID numbers, while some foreign researchers had no such numbers. This case accounts for no more than 1% of all applicants.

Young researchers

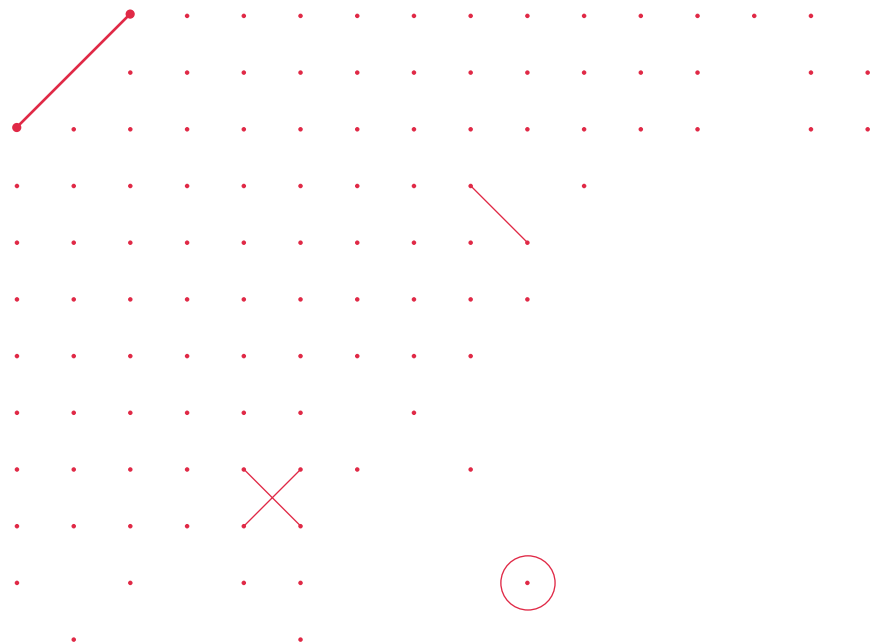
We are very serious about supporting researchers at the outset of their career. To that end, we contribute no less than 20% of the resources at our disposal. The Act on Financing Science defines young researchers as individuals up to 35 years of age. In the calls concluded in 2017, this group made up 47% of all grantees.



of all proposals received were submitted by researchers no older than 35.**



Research proposals and peer review



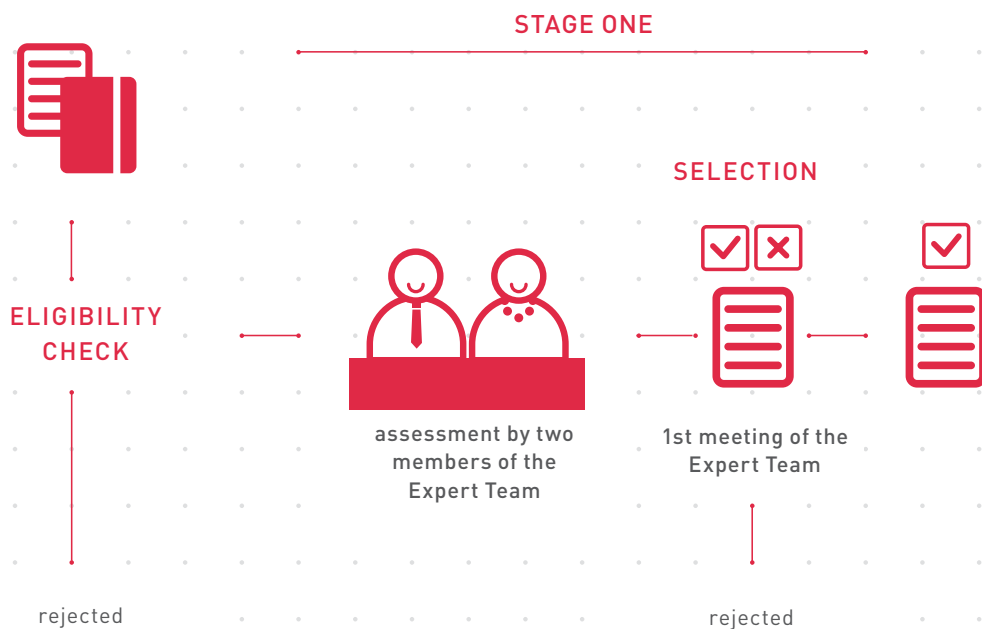
We are committed to funding the best science, and with this in mind, we subject the proposals to a two-stage peer review process. As recommended by the Council of the National Science Centre, evaluation of a proposal involves a balanced assessment of the research project itself and of the achievements of its Principal Investigator and research team.

In order to select the very best proposals, the NCN employs an evaluation procedure based on a two-stage peer review procedure. The procedure starts with an admissibility and eligibility check performed by the NCN Coordinators which covers assessing the proposal for completeness and accuracy of submission. The projects are afterwards peer reviewed by members of the NCN Expert Teams (groups of experts selected by the NCN Council among distinguished academics appointed by the NCN Director for the purpose of proposal evaluation) and consists of two stages.

STAGE ONE

The members of the Expert Teams prepare individual assessments of the proposals. Their assessments are a starting point for discussion of the proposals during the first panel session. The decision to reject or approve a proposal for stage

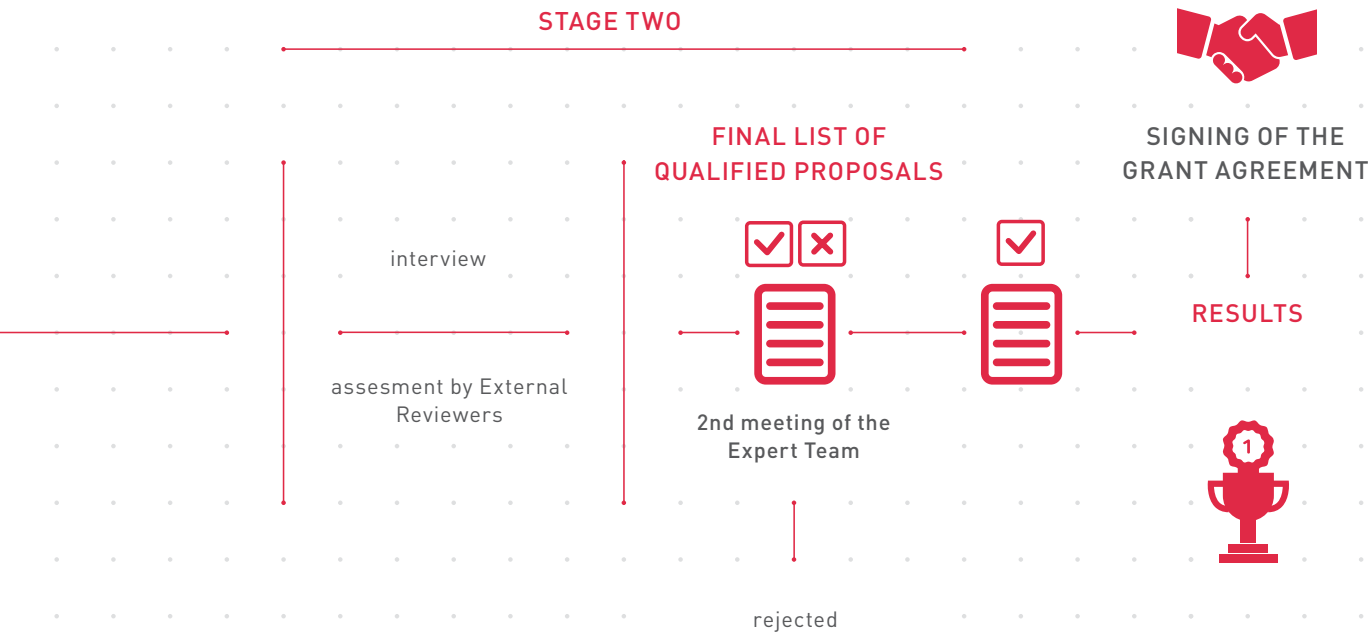
two is taken collectively by the team, preceded by a discussion. The Expert Teams prepare a shortlist of proposals to be sent to stage two of the evaluation.



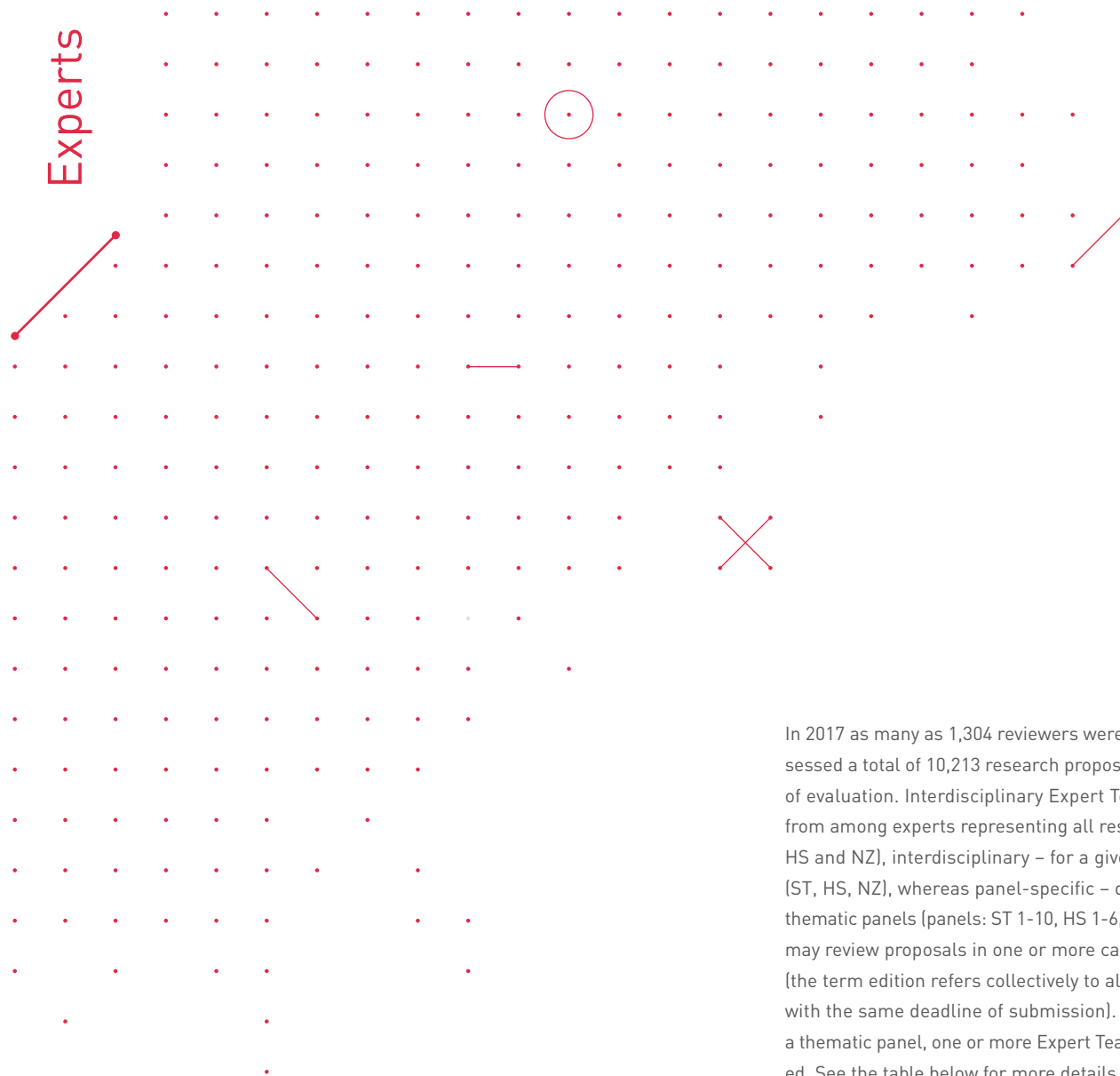
STAGE TWO

Proposals are evaluated by External Reviewers, including foreign-based ones, whose reviews are discussed by the Expert Teams during the second panel session. External Reviewers are selected by coordinators, based on the recommendations of the Expert Teams. The final evaluation score for individu-

al proposals and drawing up a final ranking list of projects approved for funding is in the hands of the Expert Teams. In some calls, an interview is organised at the second stage of evaluation.



Experts



In 2017 as many as 1,304 reviewers were appointed, who assessed a total of 10,213 research proposals in the first stage of evaluation. Interdisciplinary Expert Teams are appointed from among experts representing all research domains (ST, HS and NZ), interdisciplinary – for a given research domain (ST, HS, NZ), whereas panel-specific – dedicated to specific thematic panels (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 thematic panel, one or more Expert Teams may be appointed. See the table below for more details.

Call announcement	Number of Expert Teams.	Reviewers in Expert Teams	Proposals reviewed
15 June 2016	3 interdisciplinary teams for HARMONIA 3 interdisciplinary teams for MAESTRO 3 interdisciplinary teams for SONATA BIS	109	613
15 September 2016	34 panel-specific teams for OPUS, PRELUDIUM, SONATA, including 2 teams for panels HS4, HS5, HS6, ST5, NZ5, NZ7 i NZ9 3 teams for panel ST8 3 interdisciplinary teams for POLONEZ 2 interdisciplinary teams for BEETHOVEN	547	4,188
15 December 2016	3 interdisciplinary teams for ETIUDA 3 interdisciplinary teams for SONATINA 1 interdisciplinary team for UWERTURA	91	522
15 March 2017 r.	30 panel-specific teams for OPUS, PRELUDIUM, including 2 teams for HS3, HS4, HS6, ST8, NZ7; 3 teams for ST8	361	2,886
Continuous call	3 teams for MINIATURA	196	2,004
TOTAL	91	1,304	10,213

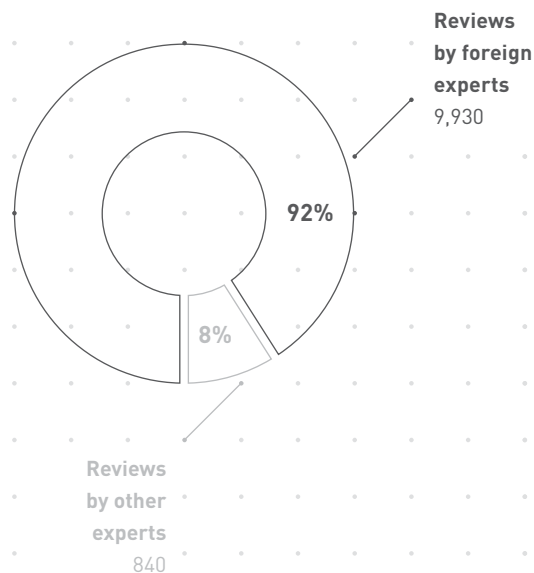
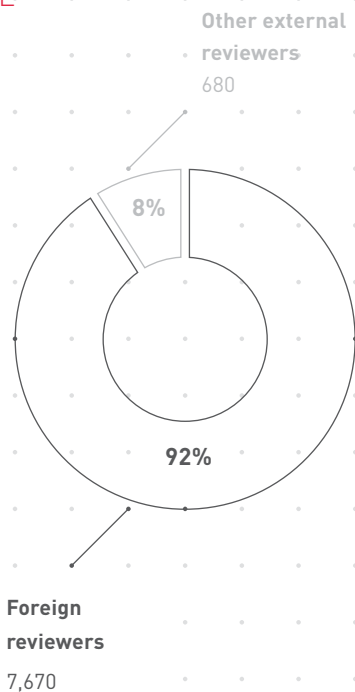
Source: NCN Coordinators, based on own data

In the second stage of peer review, 8,350 external reviewers evaluated proposals, contributing 10,770 reviews. 92% of the external reviewers were experts from outside Poland, who performed 9,930 reviews, i.e. 92% of all reviews done.

Number of external reviewers and number of reviews they provided in 2017

8,350

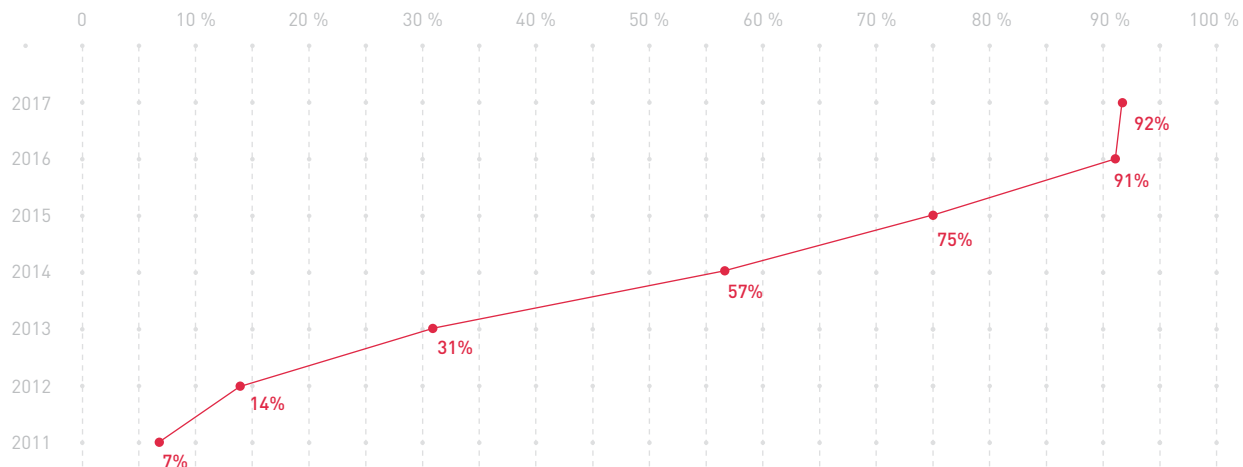
EXTERNAL
REVIEWERS IN
TOTAL



10,770

INDIVIDUAL
REVIEWS IN TOTAL

Percentage of foreign reviews in the years 2011-2017



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

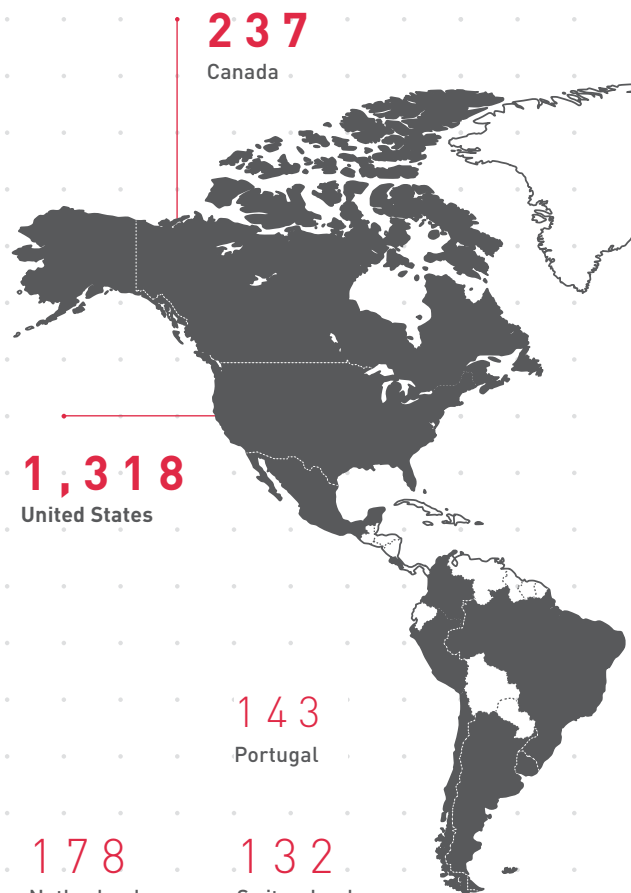
Reviewers by country

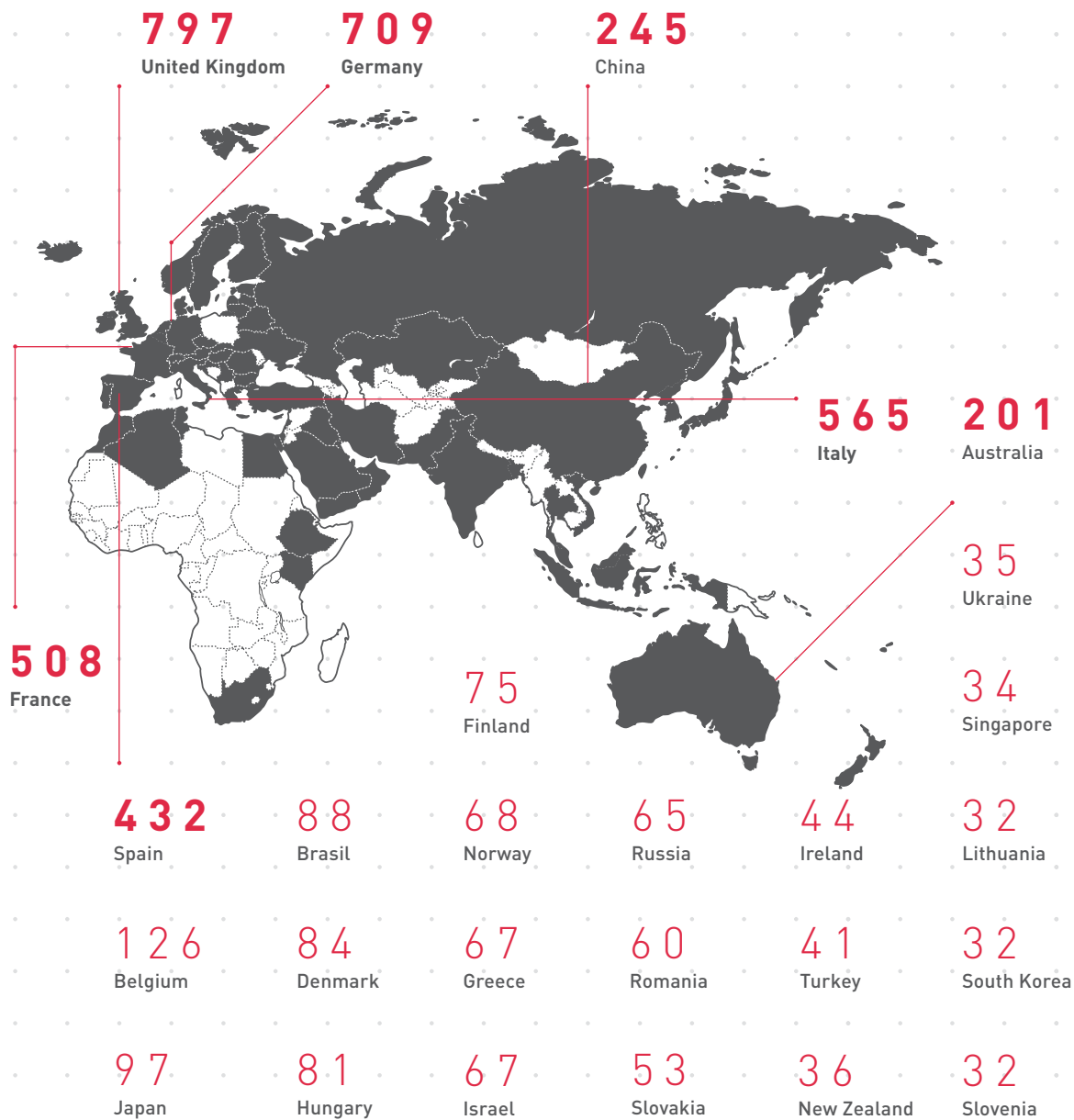
Number of reviewers

29 Argentina
 29 Serbia
 29 Taiwan
 28 Mexico
 25 Croatia
 24 Bulgaria
 24 Estonia
 24 Hong Kong
 24 South Africa
 21 Malaysia
 18 Chile
 16 Latvia
 10 Luxembourg
 9 Egypt
 9 Pakistan
 9 Thailand
 7 Iran
 6 Vietnam
 6 Belarus
 5 Saudi Arabia
 5 Iceland
 5 Colombia
 4 Kenya
 4 Tunisia
 3 Cyprus
 3 Qatar
 3 Malta

Reviewer's country of affiliation

3 Uruguay
 2 Algeria
 2 Armenia
 2 Indonesia
 2 Lebanon
 2 Nigeria
 2 Trinidad and Tobago
 2 United Arab Emirates
 1 Albania
 1 Bahrain
 1 Barbados
 1 Montenegro
 1 Guatemala
 1 Lesotho
 1 Macedonia
 1 Macau
 1 Mauritius
 1 Moldova
 1 Oman
 1 Peru
 1 Reunion
 1 Sri Lanka
 1 Uzbekistan





NCN Appeal Committee

Applicants (institutions or natural persons) may appeal against decisions of the director of the NCN 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 2017 THE COMMITTEE



considered 181 appeals



granted funding of ca. EUR 648,346 to 8 projects



in 23 cases required additional inquiries



in 8 cases annulled the director's decision and submitted the proposals for re-evaluation

Supervising the research

Our tasks include supervising the implementation of research projects, fellowships, and scholarships 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 grants' 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 2017 the NCN's expert reviewers evaluated:

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

Reports evaluated in 2017:

Type of report	Number of evaluated reports
Interim report	42
Annual report – NCN calls	4,369
Annual report – MNiSW projects	5
Annual report – bi- and multilateral international calls	18
Final report submitted in 2017 – NCN calls	0
Final report submitted before 2017 – NCN calls	3,670
Final report submitted in 2017 – MNiSW projects	7
Final report submitted before 2017 – MNiSW projects	602
TOTAL	8,713

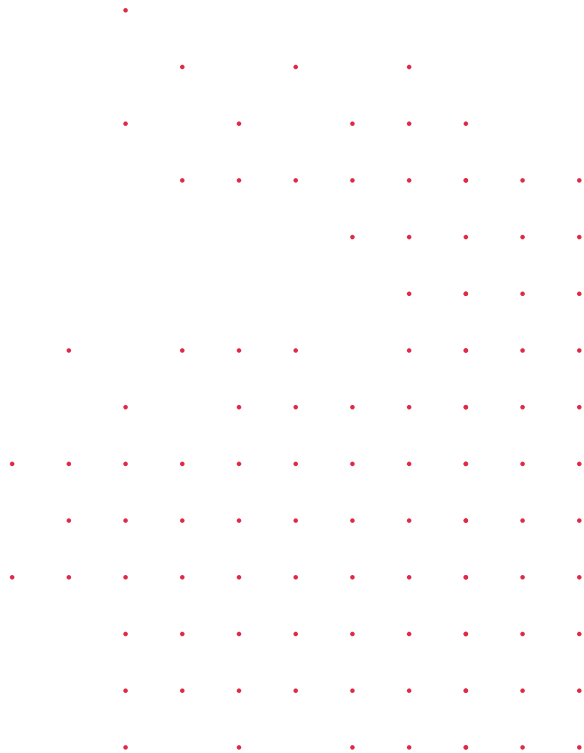
On-site audits

As another tool serving a supervisory function, the Centre 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, in addition to an officer of the Finance and Accounting Department and an NCN Coordinator.

According to the 2017 plan, the auditing procedure was initiated for 17 research projects funded under our calls and completed for 16 of them. One audit will be continued in 2018. Moreover, in 2017, we concluded 2 audits initiated in the previous year in accordance with the annual 2016 plan. The Audit and Compliance Team carried out 6 ad-hoc audits, of which 3 were concluded in 2017, while the remaining ones will be continued into 2018.

Additionally, in 2017 we verified 33 reports from remote audits, provided by the projects' host institutions.



In 2017, we published nine international calls launched as part of multilateral cooperation. We expanded our offer of bilateral calls by initiating a joint funding initiative with Lithuania, called DAINA, for Polish-Lithuanian research projects. Its first edition opened on 15 September 2017. In November, we launched the first call for establishing Dioscuri Centres of Scientific Excellence in cooperation with Germany's Max Planck Society (MPG).

Multilateral cooperation

Researchers applying for grants under multilateral calls submit projects to be carried out by consortia of teams from at least three countries participating in the initiative. In the ERA-NET Cofund programmes, i.e. HERA, NORFACE, ENSUF, SUGI, BiodivERsA and M-ERA.NET, the funding for researchers was co-financed from the EU framework programme Horizon 2020.



HS Arts, Humanities and Social Sciences

HERA is a network of European institutions supporting research in the area of the Humanities. Since 2009, the consortium has conducted a programme with the objective of inspiring collaboration between scholars from Europe's many research centres and bringing home social, cultural and political challenges of contemporary Europe.

Current call: Public spaces: culture and integration in Europe

End date: end 2018



This project has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement No 649307.

NORFACE is a network of European research funding institutions acting on behalf of Social Sciences. To date, NORFACE has published five calls for international research projects on subjects such as migration, welfare state futures, and social inequalities.

Concluded call: Dynamics of Inequality Across the Life-course: structures and processes

Awarded projects featuring contributions from Polish researchers: 13



NORFACE DIAL has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement No 724363.

ENSUF, SUGI and **EXPAND** are all initiatives of the JPI Urban Europe network, which brings together 25 organisations from 18 European countries. JPI Urban Europe provides funding to interdisciplinary international research projects responding to the challenges created by modern cities and urbanised areas. The network supports efforts by researchers as well as civil society actors, NGOs, local governments and public utility companies.

Under the JPI Urban Europe an expert workshop and a meeting of funding agencies interested in launching a pilot joint call took place in Hangzhou (China) in 2017. The prospective call would be dealing with climate and economic change. Later during the year, a framework for cooperation was developed and documentation was drafted for the call Sustainable Urbanisation in the Context of Economic Transformation and Climate Change: Sustainable and Liveable Cities and Urban Areas, which was announced in February 2018. In November 2017, representatives of JPI UE and the National Science Foundation of China signed an official document of partnership.

ENSUF

2017 saw the launch of a project by Dr. hab. Szymon Marcińczak of the University of Łódź titled 3S RECIPE: Smart Shrinkage Solutions – Fostering Resilient Cities in Inner Peripheries of Europe awarded in the ENSUF call, concluded in 2016.

SUGI

Concluded call: Sustainable Urbanisation Global Initiative/ Food-Water-Energy Nexus

Awarded projects featuring contributions from Polish researchers: 3

EXPAND

EXPAND is a Coordination and Support Actions initiative funded from the EU framework programme Horizon 2020. Its objective is to promote sustainable development of cities and urban areas through a common political and research strategy and inspiring cooperation in this respect between researchers, civil society actors, local governments, NGOs and enterprises. The NCN's contribution to the programme includes the agency's participation in the development of effective tools for the monitoring and evaluation of the JPI Urban Europe network's actions. On 19-20 October 2017, the EXPAND network consortium's annual meeting took place in Krakow, and was hosted by the NCN. Present at the meeting was a representative of the European Committee. A side event was also held concerning the subject Widening Participation dealing with the JPI UE's outreach towards countries whose representatives have so far been less successful in calls under the Horizon 2020 programme.



JPI URBAN EUROPE has received funding from European Union's Horizon 2020 research and innovation programme under grant agreements No 693443 and 730254.

EqUIP – an initiative aimed at fostering cooperation with India in the area of Humanities and Social Sciences. EqUIP's objectives include providing an overview of the current European-Indian initiatives in those fields, and inspiring new joint research endeavours by researchers from Europe and India.

Current call: Sustainability, equity, wellbeing and cultural connections

End date: July 2018



This project has received funding from European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 613236.

NZ Life Sciences

BiodivERsA is a network of research funding organisations, designed to promote pan-European research in conservation and sustainable management of biodiversity. To effect its mission, the network launches funding opportunities addressed to international research teams, published as calls for proposals. In 2017, 4 projects featuring contributions from Polish researchers were initiated as a result of an open call, concluded in 2016, dedicated to the concept of biodiversity.

Current call: BiodivScen – Scenarios of Biodiversity and Ecosystem Services

End date: July 2018



This project has received funding from European Union's Horizon 2020 research and innovation programme under grant agreements No 642420 and 776617.

ERA-CAPS is a network of institutions funding research on molecular plant science. ERA-CAPS responds to the following major challenges:

healthy, safe and sufficient food,
plant-based products – chemicals and energy,
sustainable agriculture, forestry and landscape.

Concluded call: Molecular plant science

Awarded projects featuring contributions from Polish researchers: 1



This project has received funding from European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 291864.

ForestValue is an enterprise by 31 institutions from 19 countries. The programme's overall objective is to support research on forest policy.

Current call: Transforming the global economy from a dependence on fossil and non-renewable raw materials to a sustainable

“bio-based economy”.

End date: October 2018



This project has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement No 773324

JPI-EC-AMR is a programme carried out by JPI AMR (Joint Programming Initiative on Antimicrobial Resistance), offering assistance to research on antimicrobial resistance carried out by international research teams.

Concluded call: Comparison of prevention, control, and intervention strategies for AMR infections through multidisciplinary studies, including One Health approaches

Awarded projects featuring contributions from Polish researchers: 2



JPI AMR has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement No 681055.



ST Physical Sciences and Engineering

CHIST-ERA is an ERA-NET-type network consortium comprising research funding agencies. Every year CHIST-ERA publishes a call for international research projects on Information and Communication Science and Technologies.

Concluded call: Lifelong Learning for Intelligent Systems; Visual Analytics for Decision Making under Uncertainty

Awarded projects featuring contributions from Polish researchers: 1



CHIST ERA III has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement No 768977.

M-ERA.NET is a network of 38 organisations from 25 European countries, supporting research in the area of material

science and engineering. The consortium publishes EU-funded calls for research projects to be carried out by international teams. Topics of the 2017 call:

- 1) Integrated computational materials engineering (ICME);
- 2) Innovative surfaces, coatings and interfaces for extreme conditions;
- 3) High performance composites;
- 4) Multifunctional materials;
- 5) New strategies for health applications;
- 6) Materials for additive manufacturing.

Awarded projects featuring contributions from Polish researchers: 6

End date: February 2018



M-ERA NET 2 has received funding from European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 685451.

QuantERA (ERA-NET Cofund on Quantum Technologies)

On 13 January 2017, the international network QuantERA, coordinated by the National Science Centre, announced the QuantERA Call 2017 for international research projects in the field of quantum technologies. The response amounted to 221 submissions, including 46 with participation from members applying for funding to the NCN, worth EUR 11 million in total. The consortium awarded financing to 26 of the highest ranking proposals with an aggregate budget of EUR 32 million. Polish research institutions were partners in 9 of the 26 winning projects (8 applied for funding to the NCN, 1 to the NCBR).

Polish laureates of the QuantERA Call 2017, whose projects will receive funding from the NCN:

- 1) **Dr. hab. Michał Matuszewski** of the Institute of Physics, Polish Academy of Sciences, project: InterPol: Polariton lattices:

a solid-state platform for quantum simulations of correlated and topological states;

- 2) **Prof. Jacek Dziarmaga** of Jagiellonian University in Krakow, project: NAQUAS: Non-equilibrium dynamics in Atomic systems for Quantum Simulation;

- 3) **Prof. Bolesław Kozankiewicz** of the Institute of Physics, Polish Academy of Sciences, project: RouTe: Towards Room Temperature Quantum Technologies;

- 4) **Dr. hab. Michał Zawada** of the Institute of Physics, Nicolaus Copernicus University in Toruń, project: Q-Clocks: Cavity-Enhanced Quantum Optical Clocks;

- 5) **Prof. Jakub Zakrzewski** of Jagiellonian University in Krakow, project: QTFLAG: Quantum Technologies For Lattice Gauge theories;

- 6) **Dr. hab. Łukasz Cywiński** of the Institute of Physics, Polish Academy of Sciences, project: Si QuBus: Long-range quantum bus for electron spin qubits in silicon;

- 7) **Dr. hab. Jan Chwedeńczuk** of the Faculty of Physics, University of Warsaw, project: TAIOL: Trapped Atom Interferometers in Optical Lattices;

- 8) **Prof. Krzysztof Sacha** of Jagiellonian University in Krakow, project: TheBlinQC: Theory Blind Quantum Control. Warszawskiego, projekt pt. TAIOL: Trapped Atom Interferometers in Optical Lattices;

The total funding granted to the Polish partners will amount to EUR 1.5 million. The implementation of the international research projects in the QuantERA programme will begin in 2018.



This project has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement No. 731473.

BILATERAL COOPERATION

BEETHOVEN

5 October 2017 was the day of announcing ranking lists in the BEETHOVEN 2 funding opportunity for projects run jointly by Polish-German research teams. The sum awarded to the laureates of the programme amounted to ca. EUR 6.5 M. In the fourth quarter of 2017, work began on the call's third edition. In October 2017, at the office of Deutsche Forschungsgemeinschaft, (DFG) representatives of the DFG and NCN responsible for the launch of the BEETHOVEN call met in Bonn. They decided to extend the next edition of the call to all disciplines of Life Sciences. It will be announced in 2018.

DAINA

On 15 September 2017, the first edition of the DAINA call for Polish-Lithuanian research projects in all fields of research started. The deadline for submissions was set for 15 December. 253 proposals were sent in, including 109 in Arts, Humanities and Social Sciences, 91 in Physical Sciences and Engineering and 53 Life Sciences. The end date is scheduled for 2018.

POLONEZ (Marie Skłodowska-Curie Actions Cofund)

A funding opportunity for incoming researchers who want to carry out projects at Polish research centres. In May 2017 the results of the POLONEZ 3 call were published. Of the 380 submitted proposals, 38 were recommended for funding.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 665778.

DIOSCURI

Dioscuri is an initiative by the Max Planck Society (MPG), an independent German research institution; the programme seeks to establish Dioscuri Centres of Scientific Excellence in Central and Eastern Europe. On 4 July 2017, at Wawel Royal Castle in Krakow, an agreement was signed with the MPG providing for the establishment of ten Dioscuri Centres at Polish research units. The initiative will bring to Poland excellent leader-researchers, who will set up their teams. It will thus offer an opportunity for researchers from all around the world to conduct study in some of the best international ensembles. On 7 November, the first Dioscuri call was announced, providing for the establishment of three Centres of Excellence, while one week later at Paris a meeting was held to promote the call among eminent scholars. Results are scheduled for September 2018.



MAX-PLANCK-GESELLSCHAFT



An important section of our efforts is oriented towards disseminating information on our funding opportunities in the research community. In 2017 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 initiatives joined by the Centre 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 2017

On 10-11 May, this time at Kielce and in collaboration with Jan Kochanowski University, we held the fifth edition of the NCN Open Days. The event featured: a press conference, a session of the Council of the NCN and two series of workshops (for administrative operators of NCN-financed projects and for prospective applicants). A special item on the agenda was a conference titled The Role of the Grant System in Improving Research in Poland, attended by the Minister of Science and Higher Education Jarostaw Gowin. The conference's first part revolved around the respective chances and limitations of the grant system for large and small research centres. In the second part, three laureates of NCN calls – Dr. Magdalena Kulma of the Institute of Biophysics and Biochemistry, Polish Academy of Sciences, Dr. hab. Jakub Szlachetko of Jan Kochanowski University in Kielce, and Dr. Magdalena Woźniak of the Institute of Mediterranean and Oriental Cultures, PAS – presented their research.

NCN 2017 Award

On 10 October 2017, for the fifth time, the Centre 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 2017 Award was granted to Prof. Anna Brożek of the Institute of Philosophy, University of Warsaw, for her original theory on the function of interrogative and imperative sentences and her contribution to the studies on the history of the Lwów-Warsaw school of logic, preceded by meticulous archival research. In the domain of Life Sciences, the Award was conferred on Dr. Szymon Świeżewski of the Institute of Biochemistry and Biophysics, Polish Academy of Sciences. His nomination for the Award came in recognition of his work on functions of lncRNA in regulating the key stages of plant growth: sprouting and flowering. The third laureate, awarded in the field of Physical Sciences and Engineering, was Dr. hab. Adam Rycerz of the Institute of Physics, Jagiellonian University. The physicist from Krakow received the 2017 Award for theoretical analysis of quantum charge transport in grapheme nanoparticle systems.



The award gala took place on 10 October 2017 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 2017 were: Jastrzębska Spółka Węglowa, Grupa Adamed, ORLEN S.A., Grupa Azoty S.A. Nagrody ufundowały firmy: Jastrzębska Spółka Węglowa, Grupa Adamed, ORLEN S.A., Grupa Azoty S.A.

Info day “Funding opportunities for researchers in Poland”

On 14 November in Paris, in cooperation with the Foundation for Polish Science and the Research Centre of the Polish Academy of Sciences in Paris, we held an information meeting titled “Funding opportunities for researchers in Poland,” at which we presented, among other things, the key premises of the Dioscuri programme. Speakers at the meeting included representatives of research funding institutions and foreign researchers working in Poland. The meeting attracted around 30 participants.



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 Centre and our activities. The service has its Polish and English version, with data presented in several sections, organised for easy access to content dedicated to applicants 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 Centre 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 2017, the number of the website's views reached 1.2 million. As our offer of calls was extended, we created a new subpage dedicated to the call for the establishment of Dioscuri Centres of Scientific Excellence in Poland, operated jointly with the Max Planck Society. We updated the NCN project database (<https://projekty.ncn.gov.pl>) and added new search criteria. We also launched the website of the NCN-coordinated QuantERA network.

On the Centre'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. In 2017 the National Science Centre's profile had 8,622 fans, and we published 160 posts. We also continued launching materials on our YouTube profile.

Apart from actively promoting our work in cyberspace, we printed official publications: brochures and flyer-postcards, the Annual report 2016 summarising the Centre's activity in 2016, and Call Statistics 2016 presenting data on numbers of proposals submitted and recommended for funding, broken

down by research domains and types of NCN calls. All publications were issued in a Polish and an English version.

We made a series of films documenting the activities of the National Science Centre. The first one of these was a video explaining how the Office and Council of the NCN work and presenting select projects funded by the institution. During the NCN Open Days, we made a documentary on the event, while the gala of the 2017 NCN Award also had a film devoted to it and three videos presenting the laureates' profiles.

NCN in the media

Representatives of the Centre were interviewed by the press, television and radio, and they spoke of the goals and mission of the NCN and the opportunities of funding it provides. They also encouraged researchers to submit their ideas under calls for proposals. Representatives of the NCN also wrote 6 articles for the press. We, for our part, sent 21 different press releases. In 2017, the media saw 1,295 contributions dealing with the Centre's activities or referencing it, including 320 posts on social media.

Budget

Our budget in 2017 amounted to ca. EUR 269 M including ca. EUR 257.7 M of specific grant for funding research projects. A specific grant for management and operations amounted to ca. EUR 8.6 M, while the planned specific grant for investment and purchase – ca. EUR 327,500. We disbursed 99.73% of the funds received in the specific grant for funding research projects. In covering the costs of management and operations of the Centre, we used 84.21% of the aid received to that end. The subsidy for investment and purchase was disbursed to the amount of 37.88%.

NCN Budget in 2017

Financial plan 2017

Disbursed funds

269,005,497		99,05%
Total		266,451,748
8,599,160		84,21%
Grant for management and operations		7,240,995
257,659,624		99,73%
Grant for funding research		256,964,306
327,481		37,88%
Grant for investment and purchase		124,080
2,409,027		88,09%
Funds from the European Commission		2,122,133
10,204		0,82%
Funds from other sources		232

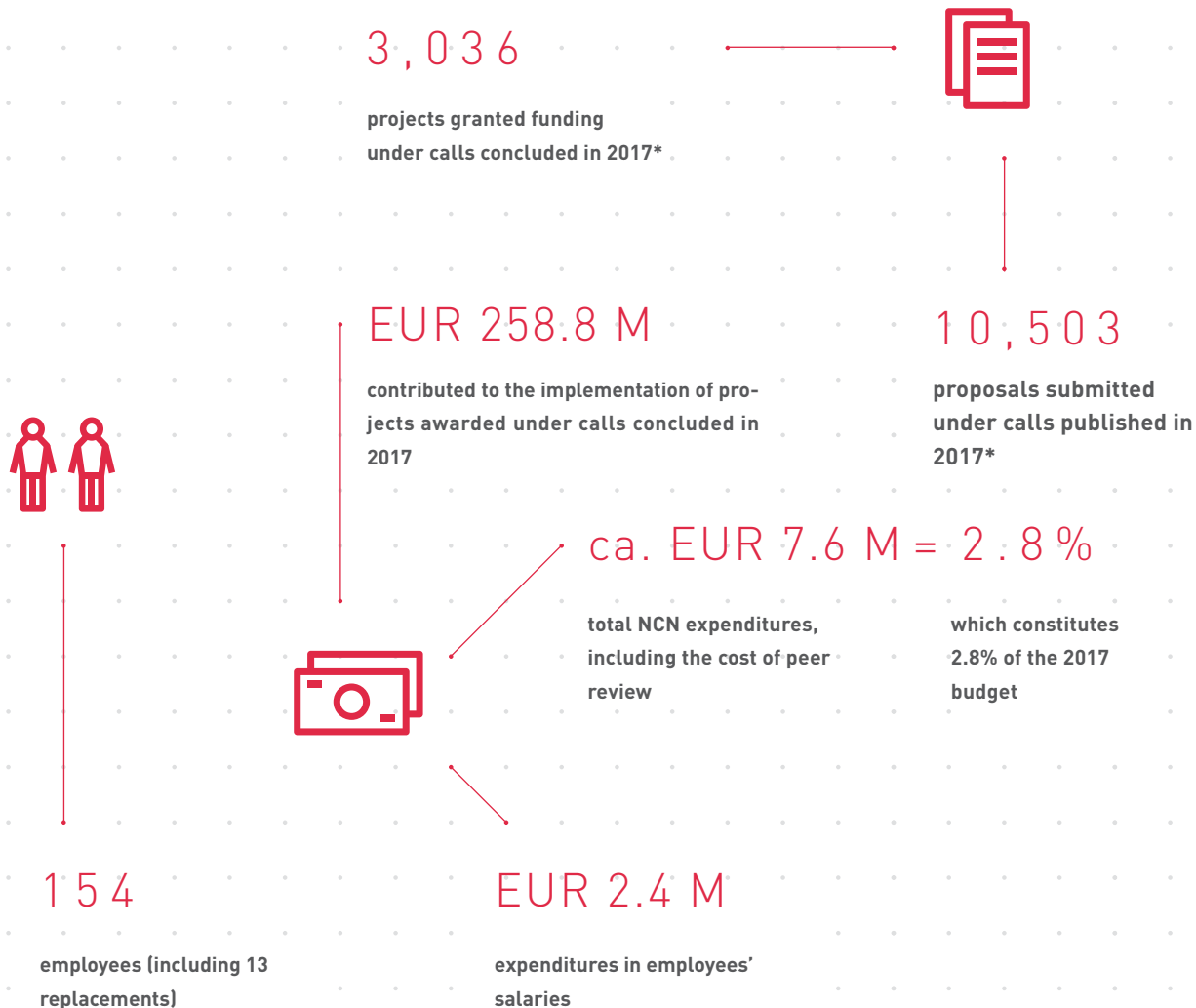
Resources expended from the subsidy for the performance of the Centre's tasks in 2017 [EUR]

Grant subsidy in 2017. Execution of finances broken down into types of funding schemes

OPUS	131,740,381	CHIST-ERA	136,373
PRELUDIUM	15,484,844	BIODIVERSA	424,427
SONATA	31,387,620	BEETHOVEN	889,904
SONATA BIS	22,478,605	JPI AMR	107,846
SONATINA	5,192,847	ENSUF	35,485
HARMONIA	10,230,072	M-ERA	476,378
MAESTRO	14,695,596	HERA JRP	116,427
FUGA	5,484,612	Membership fees	26,440
ETIUDA	2,319,039		
UWERTURA	129,415		
SYMFONIA	4,837,535		
MINIATURA	5,659,253		
POLONEZ	6,797,551		
POLONEZ training programme	1,160		
NORFACE	48,937		
JPND II	31,310		
JPI HDHL	19,946		

In 2017 we contributed the sum of ca. EUR 258,752,000 towards funding basic research, including ca. EUR 1,787,634 received from the European Union. We paid ca. EUR 9,112,183 in contributions to international programmes and in membership as part of international initiatives.

Summary 2017



* Proposals submitted under domestic and international calls

RESEARCH

STORIES



3D printing and
electrospinning at
the service of tissue
engineering

NCN Panel: **ST 5**



SONATA BIS 5

Call announced on: **15th June 2015**

Principal Investigator:

Dr. hab. Eng. Izabella Rajzer, University of Bielsko-Biała

Project title:

**Layered scaffolds for nasal cartilages reconstruction fabricated
by 3D printing and electrospinning**

Damage to the cartilaginous tissues of the nose poses a serious problem not just for the patient, but also the laryngologist and the plastic surgeon. The nose gives personality to the face and may make it ugly or beautiful; it is made up of bone and cartilage covered with skin. Due to its specific structure, cartilage has limited regenerative ability. The search for new materials that could facilitate the reconstruction of the damaged tissue has led to the development of a promising new interdisciplinary field known as tissue engineering, which aims to reconstruct and restore the function of damaged or removed tissues and organs. In broad strokes, cell samples are taken from the patient and cultured on a special substrate in the lab. The material serves as scaffolding for the new cartilage and is dissolved once the latter has acquired the desired mechanical properties. The tissue is then transplanted into the damaged area of the patient's body.

The substrate-scaffolding should have a spatial, porous structure that would allow cells to build their own matrix, enable penetration of the forming tissue, and facilitate the delivery of nutrients. The pore size should be adjusted to the growth of specific tissue cells. In addition, the physical, chemical, and mechanical properties of the biomaterial, which will not change once the tissue has healed, should likewise mirror those of the cells in question. The scaffolding must be able to biodegrade once it has played its role, and the products of its degradation should not be harmful or induce inflammation. Many laboratories around the world have been investigating the possibility of using composite substrates for tissue reconstruction, but their products still fail to meet the above requirements and adequately stimulate tissue growth.

The objective of the project is to develop layered, spatial substrates for the reconstruction of the cartilaginous tissue of the nose. It uses two different methods (3D printing – the FDM technique, and electrospinning) to produce hybrid substrates that, on one hand, ensure the mechanical stability of the porous construct,

and, on the other, stimulate the chondrocytes to grow and build the tissue thanks to their nanofibre structure and modification with active agents. The hybrid biomaterials thus produced combine two or three different polymers (polyesters and hydrogels), growth factors and drugs. Owing to the modification of the 3D (FDM) printer purchased in the framework of the project, we will be able to print out spatial, three-dimensional substrates with the use of composite filaments created in our laboratory and modified with various active agents. Printing with polymer filaments (as compared to the traditional methods) will also allow us ensuring the appropriate composition of the substrate by giving us the chance to select and combine filaments while printing. Modifying the scaffolding by adding nanofibres with growth factors and drugs will help create an auspicious environment to stimulate the growth of cells and promote the process of cartilage formation.

Dr. hab. Eng. Izabella Rajzer

Graduate of the Faculty of Materials Science and Ceramics at the AGH University of Science and Technology in Kraków. In 2006, she successfully defended a doctoral thesis in the field of materials engineering. In 2007-2008, she completed an internship at the Institute for Bioengineering of Catalonia (Barcelona, Spain) in the group of Prof. J.A. Planell. In 2016, she defended a habilitation thesis devoted to polymer-ceramic biomaterials designed to assist the regeneration and mineralisation of bone tissue. She manages six research projects financed by the Ministry of Science and Higher Education and the National Science Centre. She currently works as Associate Professor at the Faculty of Mechanical Engineering and Computer Science at the University of Bielsko-Biata.





Technological aspects of beer wort clarification including the modified method of the hot trub separation using the whirlpool vat

NCN Panel: **NZ 9**



ETIUDA 3

Call announced on: **15th December 2014**

Principal Investigator:

Dr. Eng. Monika Sterczyńska, Koszalin University of Technology

Project title:

Technological aspects of beer wort clarification including the modified method of the hot trub separation using the whirlpool vat

Brewing is one of the oldest biotechnological food processing methods in the world. On account of the popularity of beer as a product, the brewing industry ranks among the most vibrant branches of the food sector. As science advances and consumer awareness grows, the issue of using new raw materials and optimising individual processes becomes increasingly important.

The efficiency of breweries depends primarily on the selection of raw materials and technological parameters. To ensure the highest possible quality of the final product, it is necessary to develop new technologies and devices, and to employ new raw materials or accessories. In particular, this applies to new recipes for obtaining wort. Technological trials conducted on a larger scale should be preceded by lab experiments, which allow comparing and contrasting of many variants, while keeping the conditions of wort production stable and constant. As the market is increasingly saturated with beer products, craft beers and sophisticated recipes progressively increase their market share. Not only craft breweries, but also large industrial breweries are now interested in innovative raw materials and technologies. Introducing malt substitutes or unique raw materials into recipes often involves changing the basic physico-chemical properties of wort (such as pH, extract, colour, turbidity or mineral content). Experiments have also been carried out to completely replace barley malt with non-malted substitutes (e.g. barley, spelt, wheat, corn). Such modifications are introduced for economic reasons (cheaper resources) and/or questions of taste and health (achieving new, better features of the final product).

Innovative lautering solutions aim to improve current methods of separating hot precipitates. Most breweries in the world are equipped with a special tank, usually referred to as a whirlpool. A commonly used solution, whirlpools are energy-saving and efficient. Hence the attempts to further increase their efficien-

cy by slightly tweaking their structure. Wort is poured into the tank through a hole tangential to its wall, which makes a cone of hot precipitate form at the bottom, a process assisted by whirling. The phenomenon occurs naturally and spontaneously, and is known as the tea cup effect, first described in 1926 by Albert Einstein. Cutting-edge computer image simulation and analysis methods allow us to understand it better.

More recently, experimental studies of liquid flow in whirlpools have been conducted on a broader scale, using state-of-the-art measurement methods, such as particle image velocimetry (PIV). PIV is especially useful for the analysis of the flow velocity field where a measurement sensor cannot be inserted into the tank. Measurement relies on particles that disperse laser light, which allows detecting the motion of individual particles.

The idea to analyse the technological aspects of lautering and introduce constructional changes was born out of projects conducted with entrepreneurs, research centres (in Poland and abroad) and breweries (craft and industrial). Considering the current state of knowledge in the field, the research topic is highly innovative and its solutions and conclusions will facilitate the production of clear wort, regardless of the raw materials employed.

Dr. Eng. Monika Sterczyńska

Graduate of the Faculty of Mechanical Engineering of the Koszalin University of Technology. Since 2011, she has conducted research at the Department of Food Industry Devices and Processes at the Koszalin University of Technology and the Department of Fermentation Technology and Technical Microbiology at the University of Agriculture in Kraków. In 2013, she completed a postgraduate course in Environmental Analysis at the Faculty of Chemistry of the Nicolaus Copernicus University in Toruń. She has participated in many scientific internships (including six abroad). In 2016, in

the framework of a grant obtained through the ETIUDA 3 funding scheme, she completed an internship at the Department of Plant Products Storage and Processing at the Slovak University of Agriculture in Nitra. Her research interests centre on the technology and processes of brewing and winemaking. She has also been honing her skills in food analysis. Her findings have been presented at several dozen conferences, including those with an international reach. She has co-authored 24 scientific papers published in indexed journals and a patent entitled "Whirlpool vat, used especially in brewing".





Planets of other suns

NCN Panel: **ST 9**

OPUS 4

Call announced on: **September 15th 2012**

Principal Investigator:

Prof. Andrzej Niedzielski, Nicolaus Copernicus University in Toruń

Project title:

The PennState-Toruń Planet Search for planets around evolved stars



What is the future of the Solar System? How long can we stay on our planet and where should we move to when it turns out that move we must? Answers to questions of this kind, once belonging mostly in the domain of science fiction, nowadays are offered by research projects committed to the search and study of other stars' planets.

Since the discovery of the first extrasolar planetary system by A. Wolszczan & D.A. Frail in 1992, more than two thousand planets orbiting other stars have been found. The Penn-State-Toruń Planet Search (PTPS) started in 2007, an initiative of Pennsylvania State University's Prof. Aleksander Wolszczan, who collaborated with Prof. Andrzej Niedzielski of Nicolaus Copernicus University. Initially the project was based solely on observations of stars carried out with the 9.2 m Hobby-Eberly Telescope in Texas. Currently the project also uses other telescopes, which allow for exact measurements of changes in the speed of about one thousand stars. PTPS is one of the largest projects of searching for planets in the proximity of stars older or larger than the Sun.

The aim of PTPS is to observe and study a number of new planetary systems that already show the impact of their hosting star's evolutionary changes. This research will help explain how a star's evolution affects its orbiting planets. The project draws on state-of-the-art observations using some of the world's largest telescopes, such as the Hobby-Eberly Telescope in Texas and the Telescopio Nazionale Galileo on the Canaries. The material collected through the observations – high-definition stellar spectra – is used for detection of new extrasolar planets and for detailed analysis of their hosting stars.

Apart from describing new planets and their orbits, particularly interesting are all kinds of anomalies in the stars under investigation that might point to past disturbances of a planetary system in the wake of changes inside an aging star. Such singularities may take

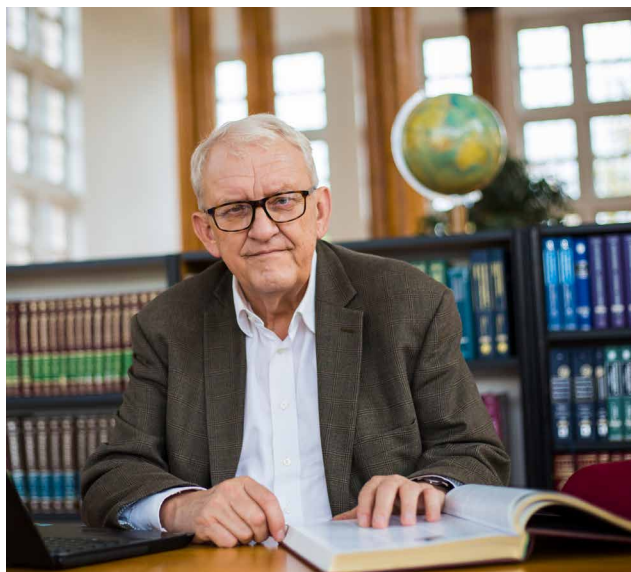
place in the chemical make-up of stars, their rotation periods, and they can also manifest as planets' odd orbits. It was in the BD+48 740 star's planetary system that for the first time traces were found of a past catastrophe where one of the planets was engulfed by a star. Next to HD 219415 and BD+49 828, planets similar to Jupiter were located, with very distant orbits of 5.7 and 7.1 year periods. In the planetary system of the TYC 3667-1280-1 star – its mass almost twice and its bulk six times that of the Sun – an extremely rare Jupiter-like planet was found, on an orbit twice that of Mercury's. Since PTPS's inception, over 20 planetary systems have been discovered, including 3 comprising two planets.

The research has its continuation in the project titled Planets of other suns (OPUS 10). Using a number of European telescopes, thorough examination will be given to planet candidates as well as very rare brown dwarfs ("failed stars"). An analysis will be presented of about a dozen stars overabundant in lithium, an element which should not be present in these stars; the relation of this chemical singularity with planets will also be investigated.

Prof. Andrzej Niedzielski

Astrophysicist, director of the Chair of Astronomy and Astrophysics, Toruń Centre for Astronomy, Nicolaus Copernicus University. Since his doctoral dissertation (NCU, 1992), his research interests have been focused on stellar spectroscopy. Since 2007 he has been the principal investigator of PTPS, a project which, apart from discovering dozens of planetary systems, has resulted in a number of doctorate dissertations and scholarly papers describing the specific qualities of the stars from the project's sample.





Instability of employment in Polish and German realities

NCN Panel: **HS 4**

BEETHOVEN 1

Call announced on: **15th September 2014**

Principal Investigator:

Prof. Juliusz Gardawski, Warsaw School of Economics

Project title:

Young precarious workers in Poland and Germany: a comparative sociological study on working and living conditions, social consciousness and civic engagement

In 2016, an international, interdisciplinary research team was established to investigate the manner in which the unstable, precarious conditions of life and employment influence the development and dynamics of social, political and class consciousness, and also individual life strategies and collective civic involvement among young employees in Poland and Germany. The Polish side of the project was represented by the staff of the University of Wrocław, headed by Dr. Adam Mrozowski, Professor of the University of Wrocław, and the Warsaw School of Economics, headed by Dr. Jan Czarzasty; the German side included several academic centres, such as the Freie Universität Berlin, supervised by Prof. Vera Trappmann. The project is managed by Prof. Juliusz Gardawski from the Warsaw School of Economics.

The study comprises two modules. The first involves a biographical study of two matching samples of young employees in Poland and Germany (60 individuals from each country), based on a narrative biographical interview method designed by Fritz Schütze, which enables an insightful reconstruction of various aspects of the social outlook and life strategies adopted by the respondents. The second module relies on questionnaires and consists of two parts: a series of telephone interviews with two samples of Polish and German youth (1,000 people each), followed by a study of the random sample of 1,000 young people from the Masovian Voivodeship, based on a long questionnaire that allows the interpretation of the initial phone survey to be expanded upon.

The project aims to develop a relational, historical, and interpretative approach to precarity by grasping the nature of the specific national and institutional varieties of capitalism, the cultural and political understanding of “normal employment” and “normal professional biography”, and also the attitudes and life strategies adopted by the young in the two countries. In this sense, the project follows up on the biographical studies of Polish blue-collar workers conducted by Adam Mrozowski. It attempts to capture

the similar experiences of youth affected by unstable employment in the shared ideological context of late capitalist, post-Fordian society and the post-socialist transformation. In this context, we propose analysing the processes by which the strategies of coping with unstable employment are shaped in both countries, with reference to class determinants and the legitimization of the political and socioeconomic order, and also the existing normative visions of the economy (the subject of many years of research by Juliusz Gardawski at the Warsaw School of Economics). An important frame of reference for our team is furnished by the German studies of precarity conducted by scholars such as Klaus Dörre; these will allow us to develop our own indicators that go beyond the classical theory of Guy Standing.

Prof. Juliusz Gardawski

He specialises in economic sociology and heads the Department of Philosophy, Sociology and Economic Sociology at the Warsaw School of Economics. He has published some 200 academic papers and serves as an editor of the Warsaw Forum of Economic Sociology. His main research interests include economic ideas, especially economic ideologies and normative visions, the situation of employers and the working class, employment relationships, institutions of employees' self-governance and employee stock ownership plans, the activities of labour unions, and the broader issues of social dialogue.





“Homo ludens” in a medieval town - archaeological evidence of an amusement

NCN Panel: **HS 3**

PRELUDIUM 1

Call announced on: **15th March 2011**

Principal Investigator:

Dr. Paulina Romanowicz, University of Szczecin

Project title:

“Homo ludens” in a medieval town - archaeological evidence of an amusement

The project entitled “Homo ludens” in a medieval town - archaeological evidence of an amusement was carried out in 2011-2013 with the objective of collecting archaeological data necessary to describe the forms of entertainment observed in the towns of the southern Baltic coast in the Late Middle Ages. In order to do so, it was necessary to conduct archival research in institutions that had organised excavations in the region. Within the framework of the project, the team visited Vilnius, Klaipeda, Riga and Tallin, which allowed us to build an extensive database of artefacts kept at local museums and historical institutes. The image that emerged was of a unified nature of entertainment in the towns of the southern Baltic coast. The frequently repeated thesis about the cultural unity of the region in the late Middle Ages was thus shown to be corroborated also by evidence related to play.

Since play and toys are inextricably linked to children, the next stage of the project was designed to involve archaeological experiments with their participation. Three such events were organised in the summer of 2012: one in Szczecin (Szczecin Incubator for Culture), one in Wolin during the Experimental Archaeology Workshops, and one in Police-Jasienica during the Augustinian Fair. Altogether, more than a hundred children aged 2 to 12 took part and their role was to play with replicas of medieval toys. Owing to the observations carried out during these experiments, the team was able to confirm or debunk several hypotheses concerning the use of individual objects in play found in literature.

The results of archival research and experimental observations were presented and discussed during the Workshop of Childhood Archaeology organised in November 2012 in Matkocin (in the commune of Stargard Szczeciński) and attended by participants from Poland, Czech Republic, Slovakia, Lithuania and Latvia. During the two-day meeting, young researchers and experienced scholars exchanged their insights on the way children lived in the past.

A tangible product of the meeting was a book published in 2013, entitled *Child and Childhood in the Light of Archaeology*, entirely devoted to the subject of children, with chapters written by workshop participants.

All these steps were intended to bring the principal investigator closer to the primary objective of the project, i.e. using the results of archival research, experiments and debates for the purposes of a doctoral thesis entitled “*Ludic Culture in the Towns of the Southern Baltic Coast in the Late Middle Ages. An Archaeological Study*”.

The realm of medieval play and entertainment continues to strike us as somewhat enigmatic today. This is mainly due to the scarcity of information available in written sources. Combining archaeological artefacts and experiments designed to study the actions and behaviours of actual children in contact with specific toy items helped shed more light on that world. The use of experiment to explain behaviour in archaeology is a completely novel approach. What follows from the analysis of collected artefacts is that the towns of the region resembled one another also in terms of toys and play, which lends further support to the claim about the cultural unity of the region in the late Middle Ages. The project is also of great social importance in that it places an emphasis on the features we share with our ancestors – and play is no doubt one of them.

Dr. Paulina Romanowicz

A graduate in history at the University of Szczecin (2009) and archaeology at the University of Łódź (2010). In 2014, she successfully defended a doctoral thesis entitled “*Kultura ludyczna w miastach południowego wybrzeża Bałtyku w późnym średniowieczu. Studium archeologiczne*” [“*Ludic Culture in the Towns of the*

Southern Baltic Coast in the Late Middle Ages. An Archaeological Study]. Since 2011, she has worked at the Institute of Archaeology and Ethnology of the Polish Academy of Sciences, at the Centre for the Medieval Archaeology of the Baltic Region in Szczecin. Her research interests centre on the medieval and early modern period in the Baltic area, the archaeology of childhood, the archaeology of modernity, and the history of games and play. She manages the PRELUDIUM grant awarded by the National Science Centre.





Wing asymmetry of the
honey bee as an
environmental indicator

NCN Panel: **NZ**

SONATA BIS 3

Call announced on: **14th June 2013**

Principal Investigator:

Dr. hab. Adam Tofilski, University of Agriculture in Kraków

Project title:

Directional asymmetry of honey bee wing

Many living organisms have a symmetrical structure, but their symmetry is usually not perfect and individual specimens may deviate from it to varying degrees. On account of its distinct bilateral body symmetry and easy access to a large number of individuals of known origin, the honey bee is an ideal species to study the phenomenon.

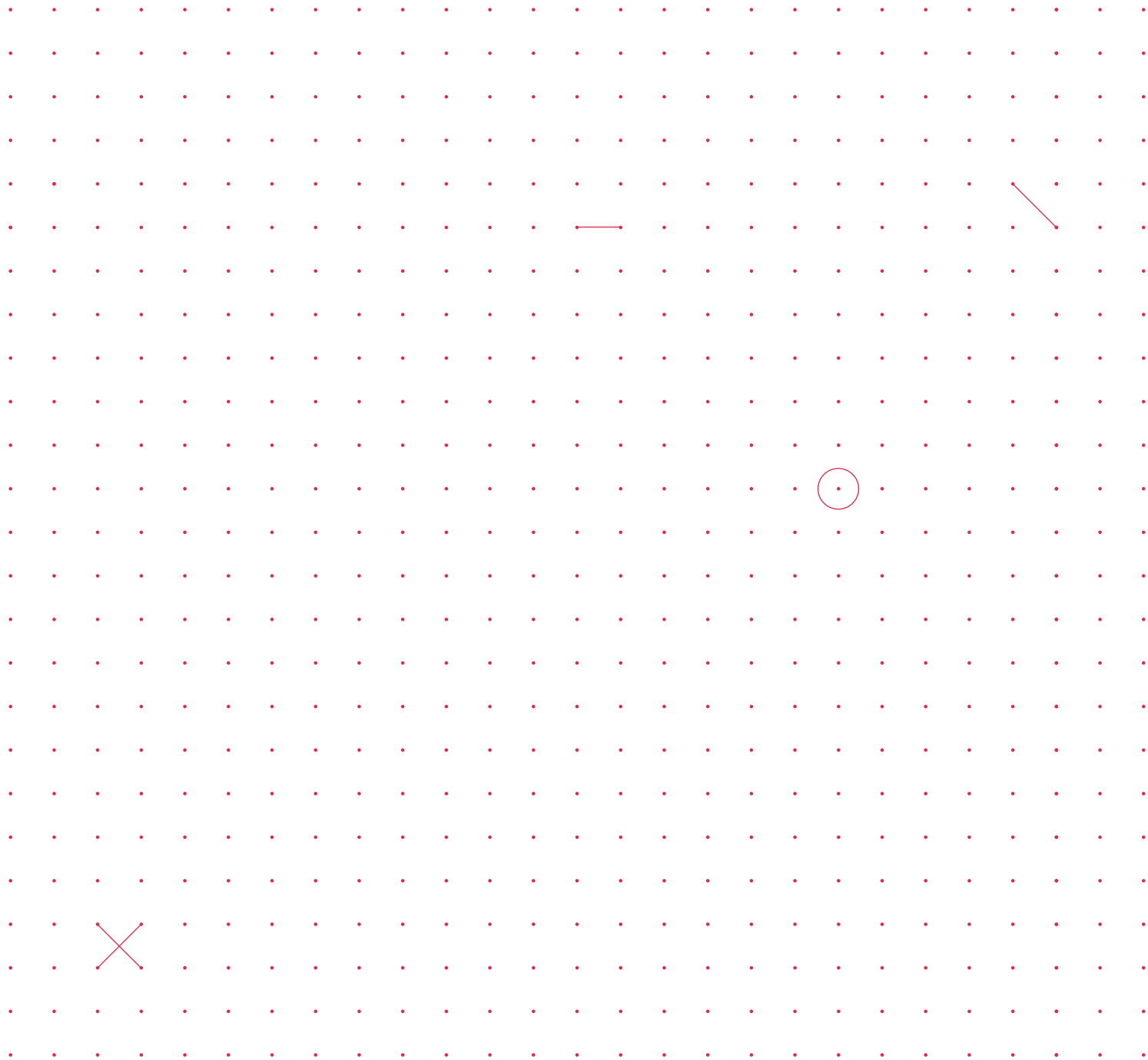
Bee colonies normally comprise tens of thousands of worker bees with kinship ties that can be easily discovered and controlled. Importantly, bees have many symmetrical organs, such as two pairs of membranous wings, which lend themselves to simple measurement because of their flat surfaces and easily discernible vein patterns. In honey bees, right wings and left wings are never ideally symmetrical in terms of shape and size. Even though the differences between them are relatively small, precise studies on large groups have confirmed that the right wing tends to be larger than the left. This kind of asymmetry, similar to right-handedness in humans, is known as directional asymmetry as opposed to fluctuating asymmetry, where the differences between the two sides are random and result in the same average size. Asymmetry may grow owing to the detrimental impact of the environment during larval development; for this reason, it is a good indicator of environmental quality. Knowing this may prove particularly useful today, when the mortality of bee colonies is on the rise. Unlike fluctuating asymmetry, directional asymmetry has not yet been extensively studied. It may be surprising to observe it in the wings of the honey bee, since simple intuition suggests that symmetrical wings should be much better for flying. There are two possible explanations. One holds that while bees would indeed fly more efficiently with symmetrical wings, detrimental conditions during development make ideal symmetry difficult to achieve. The other interprets wing asymmetry as an adaptation to the very exigencies of flight.

The research team has developed a new automatic wing measurement method that relies on computer image analysis to measure a wide range of traits in a large group of bees. In general, larger bees have been shown to be less asymmetrical. Currently, the team is investigating wing asymmetry in specimens raised in optimal and stressful conditions to determine the impact of pesticides, low temperatures, inbreeding, and a number of other factors. Preliminary findings suggest that wing asymmetry is found in honey bees independent of the presence of environmental stressors. Further research should provide additional evidence concerning the influence of asymmetry on flight.

Dr. hab. Adam Tofilski

Graduate in biology from the Jagiellonian University. In 1994, he went on to work as a teaching-and-research assistant at the Department of Apiculture of the Academy of Agriculture in Kraków; seven years later (2001), he defended a doctoral thesis at the Faculty of Biology and Earth Sciences of the Jagiellonian University. From 2002 onward, he continued working at the Department of Apiculture as Assistant Professor. In 2002-2004, he held a fellowship at the Laboratory of Apiculture and Social Insects, University of Sheffield in the United Kingdom, during which he collaborated with Francis Ratnieks. Since his return to Poland, he has been employed at the Department of Pomology and Apiculture at the University of Agriculture in Kraków. In 2010, he was awarded the title of habilitated doctor at the Faculty of Biology and Earth Sciences of the Jagiellonian University.





www.ncn.gov.pl

**PERFORMING FOR
POLISH RESEARCH**

2 · 0 · 1 · 7 ·