

Annual Report 2012



NATIONAL SCIENCE CENTRE
POLAND

CONTENTS

About the NCN	04
NCN Funding Opportunities	10
Facts and Figures	14
Project Evaluation	24
International Cooperation	28
Research Stories	32

About the National Science Centre

The National Science Centre (Narodowe Centrum Nauki, NCN) is a government executive agency set up in 2010 to fund basic research. The Centre funds research projects and supervises its progress and completion. It also disseminates information on calls for proposals among the research community, takes part in organising international funding schemes and inspires and oversees the financing of basic research from sources other than the state budget for science.

Basic research is experimental or theoretical research work that strives to expand knowledge of the fundamentals of phenomena and observable facts.

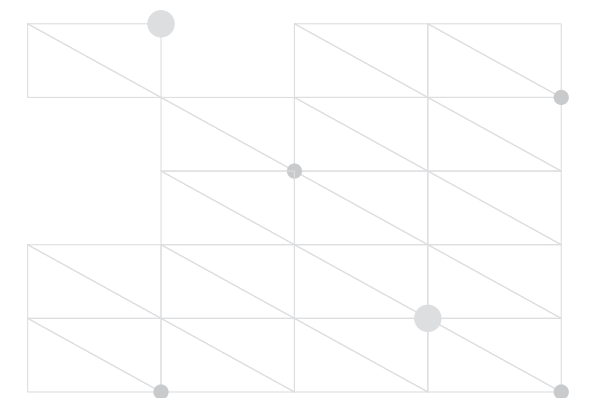
OUR AIMS

- Financing the best projects in the area of basic research
- Supporting researchers starting their career in research
- Supporting researchers wanting to establish new research teams, including interdisciplinary endeavours capable of competing on the global stage
- Creating new employment opportunities in research projects
- Inspiring international cooperation in research

OUR MISSION

Improving the quality of research in Poland by means of a competition-based system of funding opportunities, furthering the advancement of Polish research on the international arena.

The National Science Centre launched its activities in March 2011, subsequently, 2012 was the first full year of operation for the National Science Centre. Over those twelve months, the Centre focused on activities such as the optimisation of eligibility requirements, developing evaluation procedures within NCN funding opportunities and encouraging international cooperation in research.



The NCN Director

The Director of the NCN is the executive responsible for financial management as well as the correct and efficient completion of NCN tasks. The Director also acts as a formal and legal representative on behalf of the Centre. The NCN Director, Professor Andrzej Jajszczyk, was selected by the NCN Council and appointed by the Minister of Science and Higher Education.

The NCN Council

The NCN Council is a policy making board consisting of 24 distinguished researchers representing different academic fields. The Council sets priority areas in basic research, decides on the type of programmes and allocates funding, specifies call regulations and selects members of the Expert Teams responsible for proposal evaluations. The function of chair of the NCN Council is currently performed by Professor Michał Karoński.

IN 2012 THE COUNCIL CONSISTED OF THE FOLLOWING MEMBERS:

- Prof. Michał Karoński – Mathematics, Discrete Mathematics
- Prof. Jacek Błazewicz – Informatics, Theory of Algorithms, Bioinformatics (until 13 December)
- Prof. Zbigniew Błocki – Mathematics, Complex Analysis
- Prof. Tadeusz Burczyński – Mechanics, Computer Science, Computational Sciences (since 14 December)

- Prof. Bożena Czerny – Astronomy, Astrophysics
- Prof. Andrzej Duda – Chemical Sciences, Polymer Chemistry (until 13 December)
- Prof. Elżbieta Frąckowiak – Chemical Sciences, Electrochemistry (since 14 December)
- Prof. Krzysztof Frysztański – Sociology, Social Work (until 13 December)
- Prof. Jakub Gołąb – Experimental Medicine, Immunology, Experimental Oncology
- Prof. Maciej Grochowski – Linguistics, Semantics (since 14 December)
- Prof. Janusz Janeczek – Geology, Mineralogy
- Prof. Janina Jóźwiak – Economics, Demography, Statistics
- Prof. Krzysztof Jóźwiak – Medicinal Chemistry, Molecular Pharmacology (since 14 December)
- Prof. Sergiusz Jóźwiak – Pediatrics, Child Neurology, Epileptology (since 14 December)
- Prof. Leszek Kaczmarek – Neurobiology
- Prof. Ireneusz Kamiński – Public International Law, European Law, Human Rights Law (since 14 December)
- Prof. Tomasz Kapitaniak – Theoretical and Applied Mechanics, Nonlinear Dynamics (until 13 December)
- Prof. Mirosław Kofta – Psychology, Social Psychology (until 13 December)
- Prof. Małgorzata Kossowska – Social Psychology, Social Cognition (since 14 December)
- Prof. Henryk Kozłowski – Chemical Sciences, Biological and Medicinal Chemistry Bioinorganic Chemistry
- Prof. Leszek Leszczyński – Legal Theory, European Human Rights Law, Comparative Law (until 13 December)

- Prof. Teresa Malecka – Theory of Music
- Prof. Michał Malinowski – Electronics, Optoelectronics (since 14 December)
- Prof. Tomasz Motyl – Veterinary Sciences, Animal Physiology
- Prof. Krzysztof Nowak – Biochemistry, Cell Biology, Experimental Endocrinology
- Prof. Wojciech Nowakowski – Archeology, Pre- and Protohistory
- Prof. Ryszard Nycz – Cultural and Literary Studies (until 13 December)
- Prof. Jerzy Patka – Pharmacy, Pharmacology, Analytical Chemistry, Biochemistry (until 13 December)
- Rev. Prof. Andrzej Szostek – Philosophy, Ethics
- Prof. Adam Torbicki – Cardiology, Angiology, Internal Medicine
- Prof. Wojciech Tygielski – Modern History (until 13 December)
- Prof. Maciej Wołowicz – Oceanology, Marine Biology (since 14 December)
- Prof. Marek Żukowski – Physics, Quantum Theory, Quantum Optics

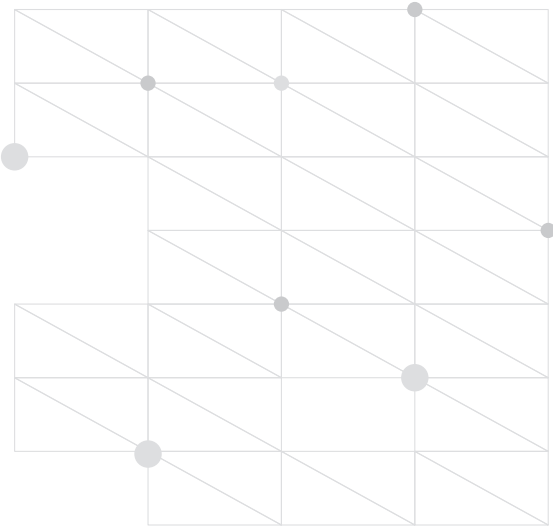
The NCN Office

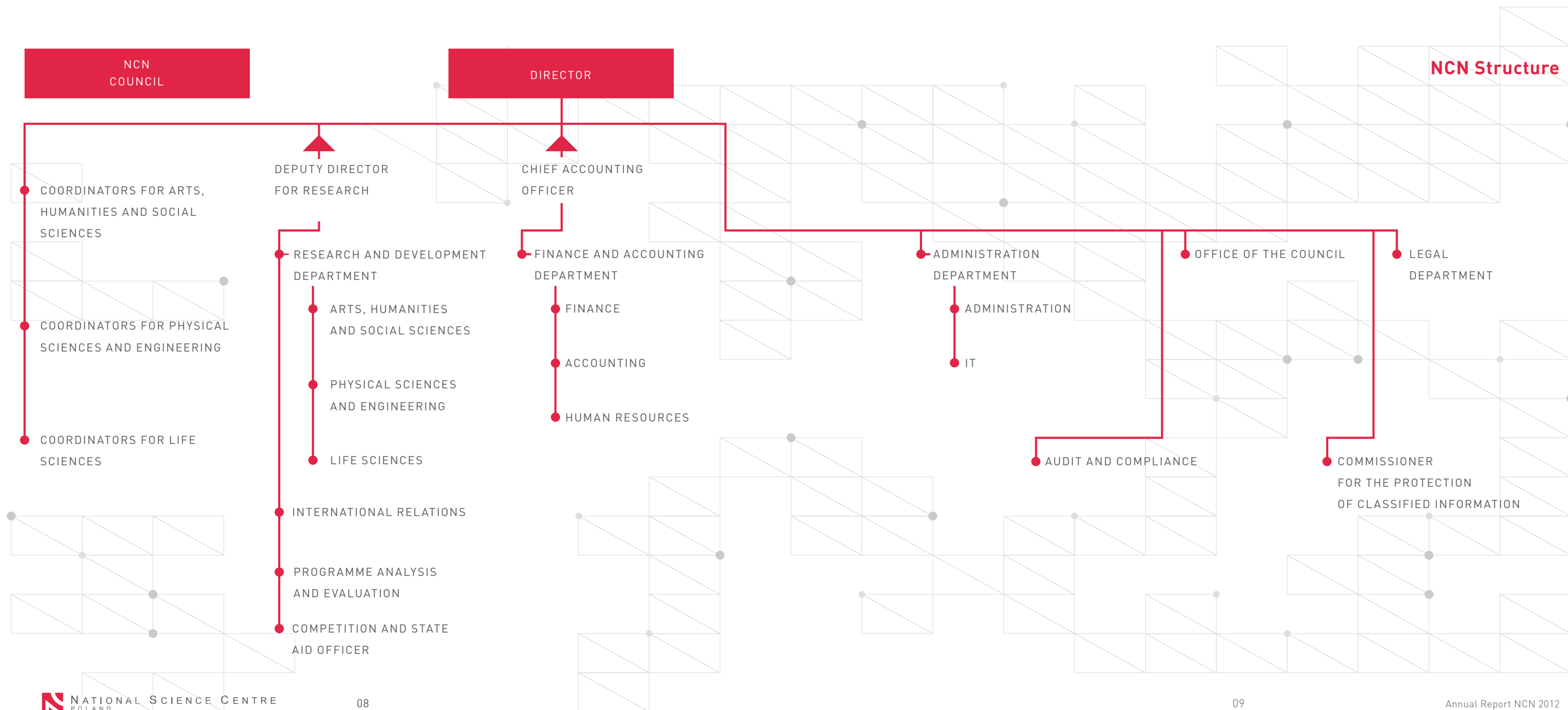
The NCN Office is a body combining the efforts of a number of the NCN's departments and teams. On a day to day basis the Office is responsible for processing calls for proposals and organising meetings for experts at the peer review evaluation stage. The office also provides support to the applicants and answers their

queries. Furthermore, its major responsibilities include the administrative and financial management of grant agreements and fostering international cooperation.

Discipline Coordinators

The NCN's Discipline Coordinators are scientific officers responsible for launching calls for proposals for research projects and project evaluation process management. Their responsibilities also include evaluation of the impartiality of the peer review process. Discipline Coordinators must hold a doctoral degree and are appointed by open competition. In the NCN there are three teams of coordinators, each responsible for one critical area of study at the NCN: Arts, Humanities and Social Sciences; Physical Sciences and Engineering; and Life Sciences.





NCN Funding Opportunities

The National Science Centre funds projects carried out by scientists, academics, national and international research teams, as well as doctoral scholarships and post-doctoral internships. Calls for proposals are issued four times a year. There are nine types of calls, each addressed to a wide range of researchers at different stages of their research career.



Types of funding schemes

PRELUDIUM

Aimed at pre-doctoral researchers starting their career in research. This funding scheme seeks to inspire scientists to develop innovative ideas and helps them gain research experience, thus becoming a prelude to their future career.

SONATA

Targeted at emerging researchers with up to 5 years scientific experience since their PhD award. This funding opportunity strives to encourage the researchers to create an innovative scientific or academic approach or piece of equipment, thereby helping their transition to independent researchers.

SONATA BIS

Addressed to researchers with 2-12 years scientific experience since their PhD award. This funding scheme gives the scientists the incentive to establish a new research team and become independent research leaders.

HARMONIA

Aimed at applicants wanting to carry out research in cooperation with foreign partners. This funding scheme offers researchers the opportunity to develop scientific ideas in collaboration with international peers and gives them access to large-scale international research infrastructure.

MAESTRO

Designed for advanced researchers wanting to conduct pioneering research, including interdisciplinary research which is important for the development of science. Projects within this funding scheme should surpass the current state of knowledge, lead to the creation of new paradigms, or forge pathways to new frontiers in that field.

SYMFONIA

Applicants in this funding opportunity should be advanced researchers wanting to carry out interdisciplinary or cross-domain research in collaboration with teams representing different areas of research. Projects submitted under this funding scheme are expected to go beyond current frontiers of knowledge and gain new perspectives in science and humanities.

OPUS

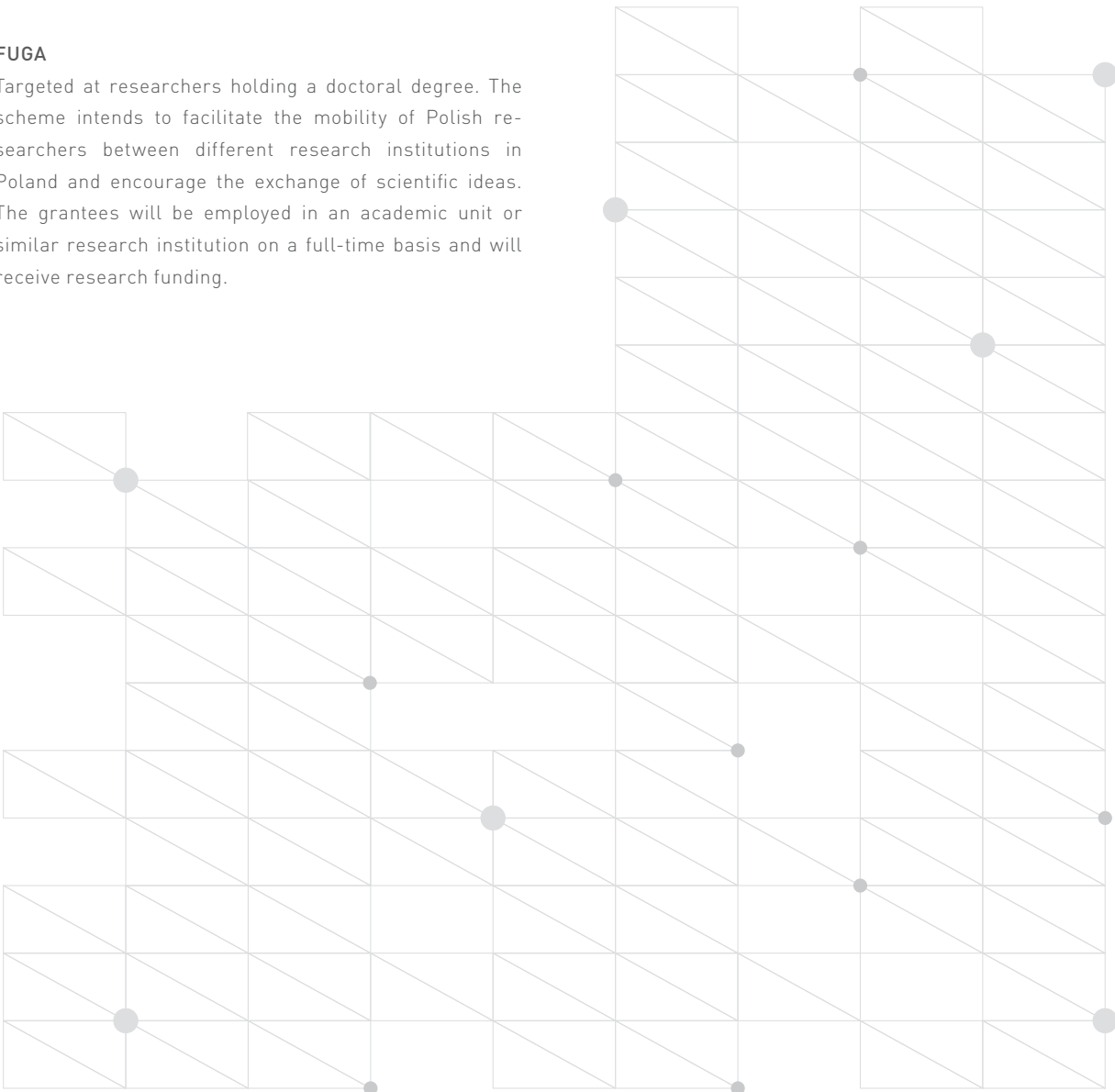
Intended for a wide range of applicants, irrespective of their research experience. The research proposals submitted under this funding scheme may include the purchase or construction of research equipment.

ETIUDA

This funding opportunity, addressed to PhD candidates, intends to provide the best young researchers with financial support and optimal working conditions. The applicants in this scheme should plan a research stay abroad which will be funded solely by the NCN. The awardees will also receive a monthly salary and are obliged to obtain their PhD degree within 12 months of completing the scholarship.

FUGA

Targeted at researchers holding a doctoral degree. The scheme intends to facilitate the mobility of Polish researchers between different research institutions in Poland and encourage the exchange of scientific ideas. The grantees will be employed in an academic unit or similar research institution on a full-time basis and will receive research funding.



Facts and Figures for 2012

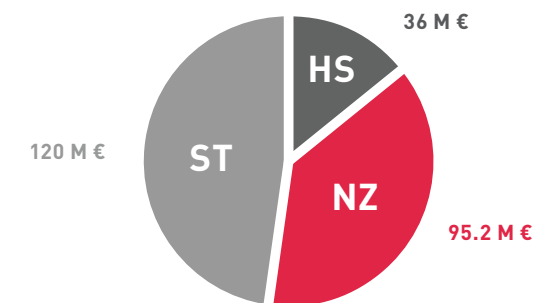
NCN in numbers

- 15 announced calls
- 11 concluded calls
- 2 488 projects that qualified for funding*
- 21% success rate (submitted proposals that were granted funding)*
- more than € 251 M allocated for research projects*

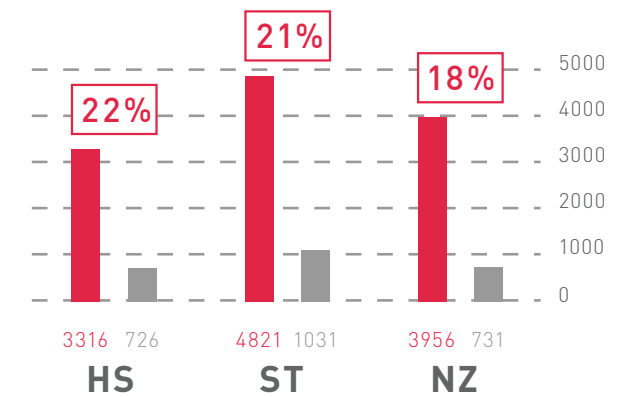
* Statistics for NCN calls concluded in 2012

In 2012 the National Science Centre received 9 983 proposals totalling € 1.05 billion in requested funding. The total amount of funding granted amounted to € 251.2 million.

Resources distributed in 2012 by field of research



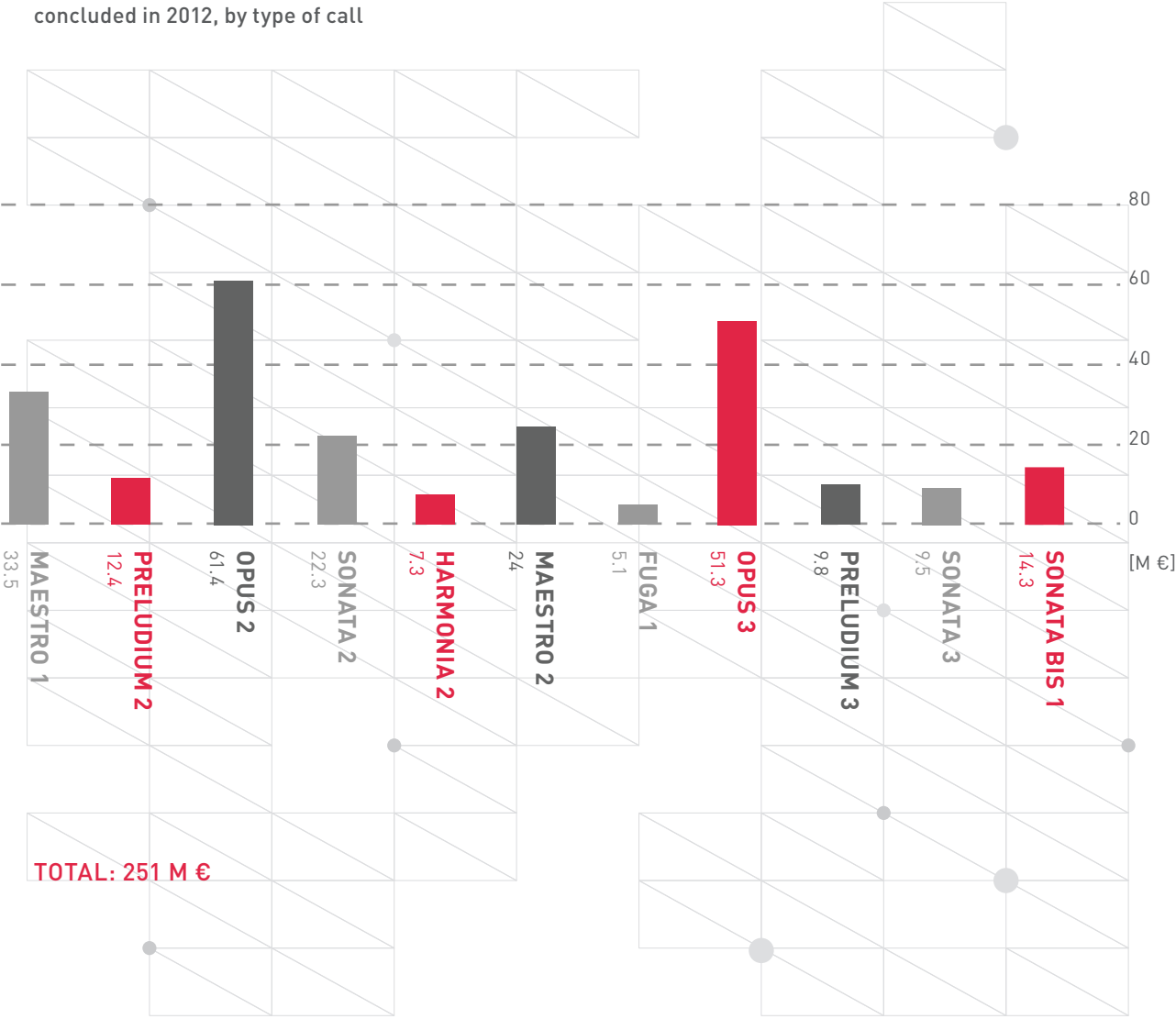
Number of proposals submitted and grants awarded in calls concluded in 2012 by academic domain, including success rate



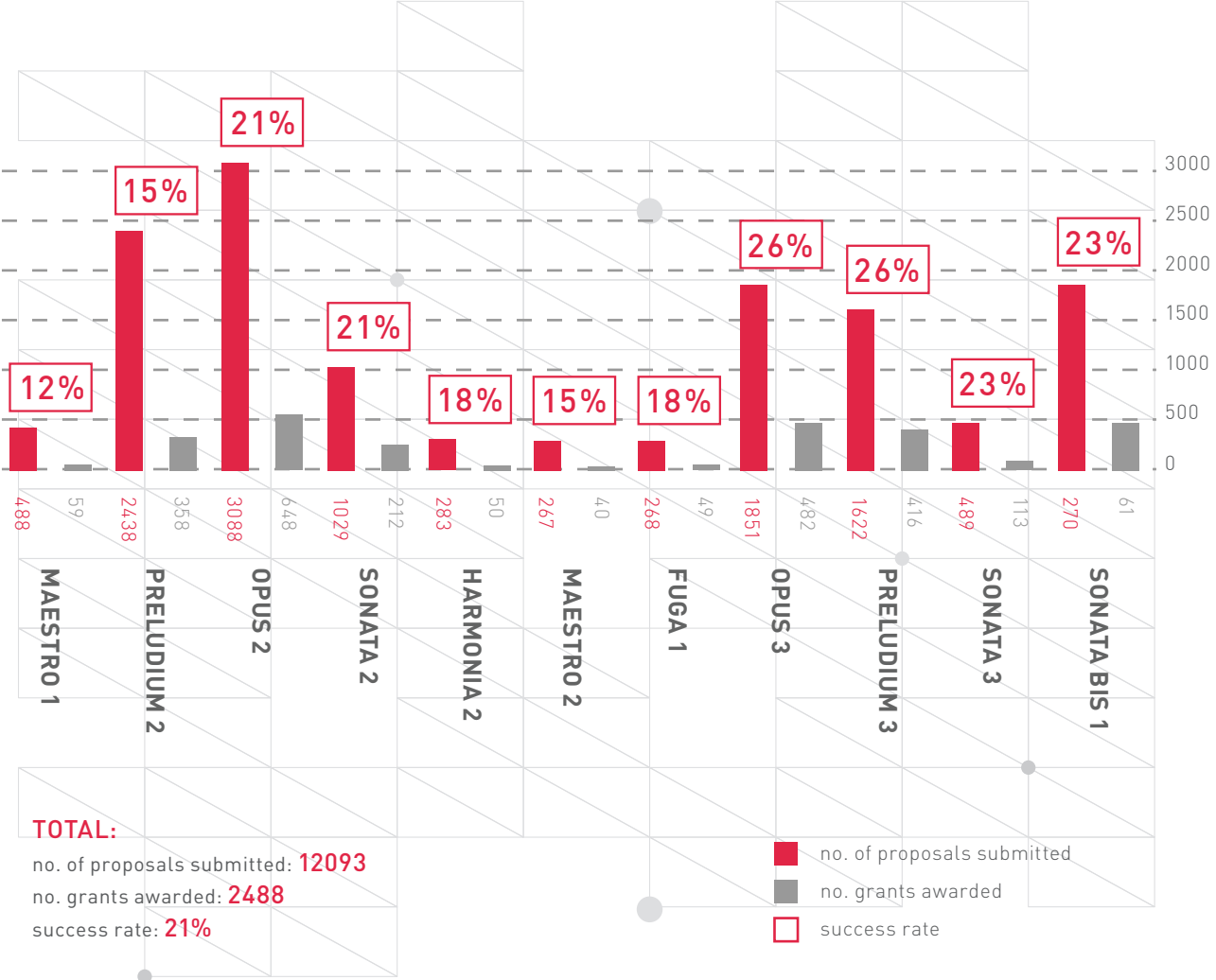
- no. of proposals submitted
- no. of grants awarded
- success rate

HS – Arts, Humanities and Social Sciences
 NZ – Life Sciences
 ST – Physical Science and Engineering

Resources awarded under funding schemes concluded in 2012, by type of call



Number of proposals submitted and grants awarded in calls concluded in 2012 by type of call, including success rate



NCN Grantees

Leading Host Institutions

Every year the NCN releases a ranking of the top host institutions. In 2012 the indisputable leaders were Jagiellonian University, with 248 proposals that qualified for funding, and the University of Warsaw which had a total of 244 grants awarded.

HOST INSTITUTION	NO. OF GRANTS*	FUNDING AWARDED* (IN €)
Jagiellonian University, Krakow	248	27.2 M
University of Warsaw	244	23.2 M
Adam Mickiewicz University, Poznan	135	11.8 M
AGH University of Science and Technology, Krakow	83	9.4 M
University of Wroclaw	80	8.1 M
Wroclaw University of Technology	59	5.5 M
University of Gdansk	58	7.4 M
Warsaw University of Technology	58	6.7 M
University of Lodz	55	3.4 M
University of Silesia in Katowice	52	5.3 M

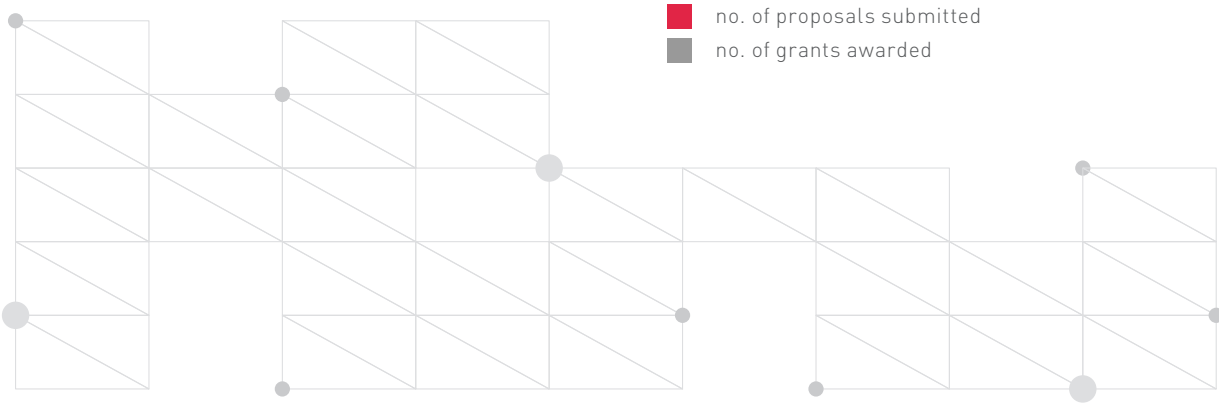
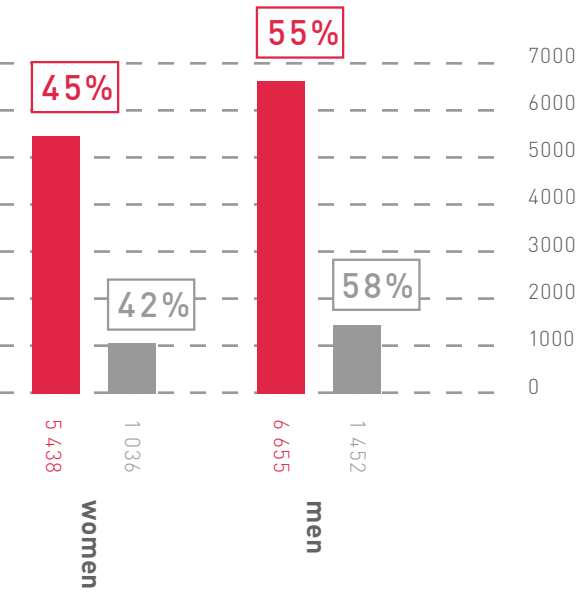
*Data for NCN calls concluded in 2012.

Regarding the average number of research projects financed by the NCN per researcher, the leader is the Nicolaus Copernicus Astronomical Center, PAS, with a score of 0.7 grants awarded per person. Leading host institutions, i.e. Jagiellonian University and the University of Warsaw, were able to secure a score of around 0.1. Ranked second is the International Institute of Molecular and Cell Biology in Warsaw, with 0.6 projects awarded per person. Nencki Institute of Experimental Biology, PAS, can boast an average of 0.5 projects accepted per researcher.

Proposals granted funding per researcher associated with the unit

- 0.7 Nicolaus Copernicus Astronomical Center, PAS
- 0.6 The International Institute of Molecular and Cell Biology in Warsaw
- 0.5 Nencki Institute of Experimental Biology, PAS, Warsaw

Share of female and male principal investigators in proposals submitted



Early career researchers

One of the priorities of the Centre is to support and develop the scientific careers of pre-doctoral and doctoral researchers about to embark on a career in research. For this group of researchers the Centre has specifically designed funding schemes such as PRELUDIUM and ETIUDA, aimed at those individuals without a doctorate degree, and SONATA and FUGA, for researchers holding a doctoral degree. In all calls concluded in 2012, half of all beneficiaries were made up of these starting researchers.

- 51% of all proposals were submitted by young researchers
- 51% of all proposals awarded funding were submitted by young researchers
- 28% of the overall funding granted under NCN calls was issued to internships and projects carried out by young researchers*

*Data for calls concluded in 2012.

Budget and accounts: highlights 2012

The NCN budget in 2012 amounted to € 207.8 M. This included a statutory subsidy earmarked for financing research projects which totalled € 197.8 M and an operating budget amounting to € 9.2 M. The investment subsidy amounted to € 0.8 M. In 2012 the Centre financed 9700 research projects including 3259 grants selected under NCN calls for a total budget of 89.5 M, and 6441 grants re-

ceived from the Ministry of Science and Higher Education worth approximately 108.1 M. Around 3.02% of the operational budget was spent on administration with NCN staff remuneration making up 0.87% of that.

NCN BUDGET IN 2012	BUDGET (IN €)	FUNDS ALLOCATED (IN €)	TOTAL % OF BUDGET USED
Total budget	207.8 M	203.6 M	97.9
-operating budget	9.2 M	6 M	65.3
-statutory subsidy	197.8 M	197.5 M	99.9
-investment subsidy	0.8 M	0.1 M	12.5

Funds allocated in 2012, by type of call (in €)

197.8 M	Funds allocated in 2012, by type of call (in €)
45.9 M	OPUS
11.7 M	PRELUDIUM
14.5 M	SONATA
6.1 M	HARMONIA
0.5 M	FUGA
11.0 M	MAESTRO
108.1 M	Projects received from the Ministry of Science and Higher Education:
97.3 M	– projects financed under calls no. 30-40
10.8 M	– international non-cofinanced projects

Staff and Recruitment

At the end of December 2012, the National Science Centre employed a total of 107 full time staff.

STAFF BREAK DOWN BY POST	STAFF AS OF 1/01/2012	STAFF AS OF 31/12/2012
Management	2	2
Chief Accountant	1	1
Discipline Coordinators in Arts, Humanities and Social Sciences	3	5
Discipline Coordinators in Physical Sciences and Engineering	4	7
Discipline Coordinators in Life Sciences	5	5
Arts, Humanities and Social Sciences	8	11
Physical Sciences and Engineering	15	16
Life Sciences	15	15
Administrative Dept. (incl. IT)	14	14
Office of the Council	4	3
Legal Department	3	3
International Relations	1	2
Programme Analysis and Evaluation	1	2
Finance and Accounting	14	17
Audit and Compliance	1	3
Competition and State Aid Officer	0	1
TOTAL	91	107

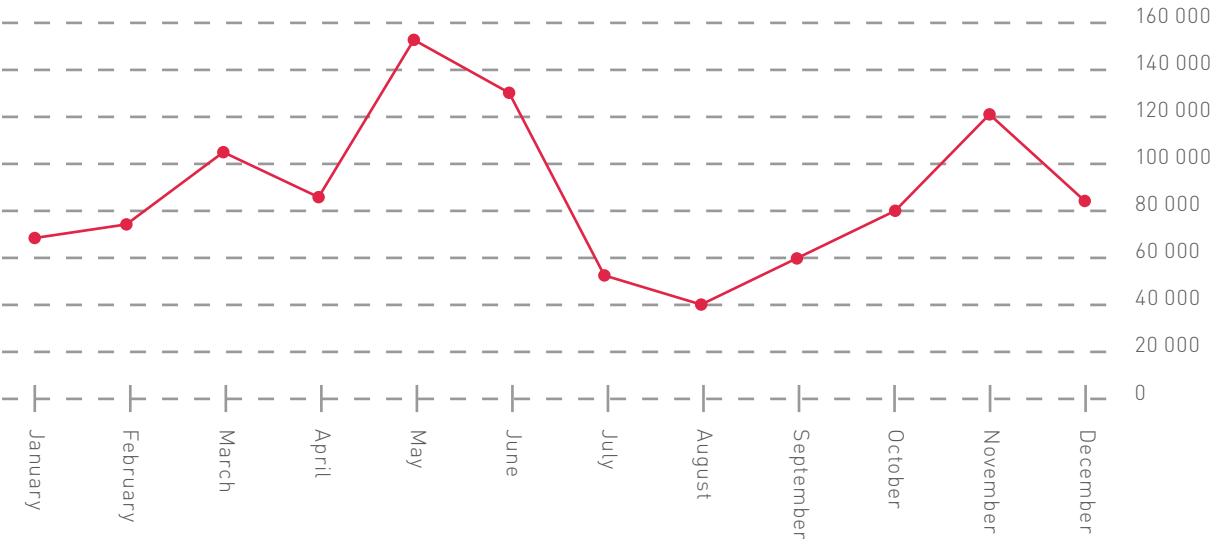
Promoting research

One of the most important goals of the Centre is to promote NCN funding opportunities in Poland and abroad. Therefore the Centre maintains the website www.ncn.gov.pl in both Polish and English and releases a monthly newsletter including information about NCN activities. You can also follow the NCN through our Facebook profile where we publish news about our calls for proposals as well as the research stories of our grantees. The NCN also disseminates information via brochures, annual reports and numerous articles in magazines addressed to both the research community and the general public.

In 2012 the NCN's activities received extensive coverage in nationwide media outlets. Success stories of NCN grantees attracted the attention of Polish daily newspapers and magazines as well as radio and TV stations. The NCN staff participated in many international conferences and workshops dedicated to research funding systems.



Number of visitors to our website, in 2012, by month (Source: Google Analytics)

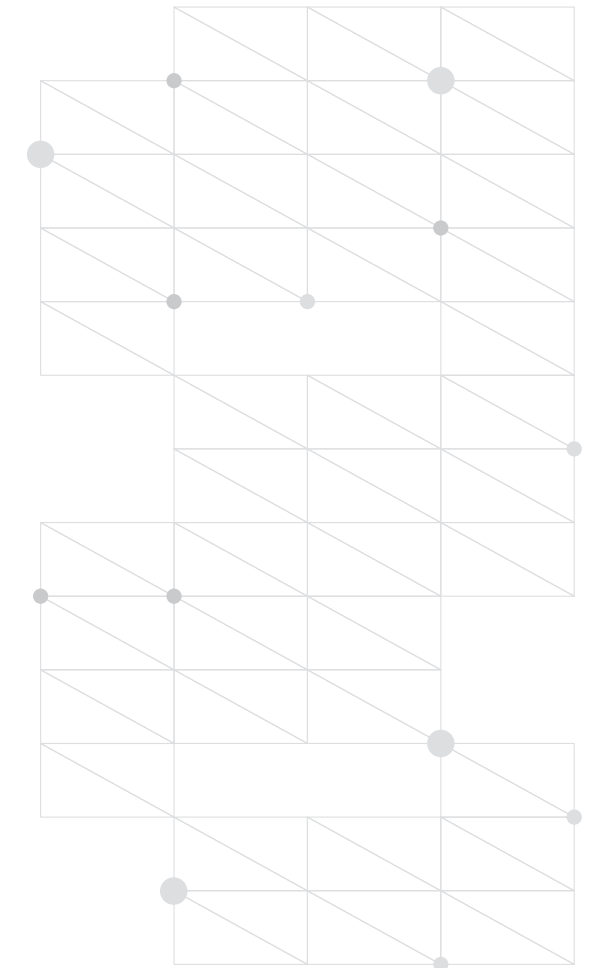


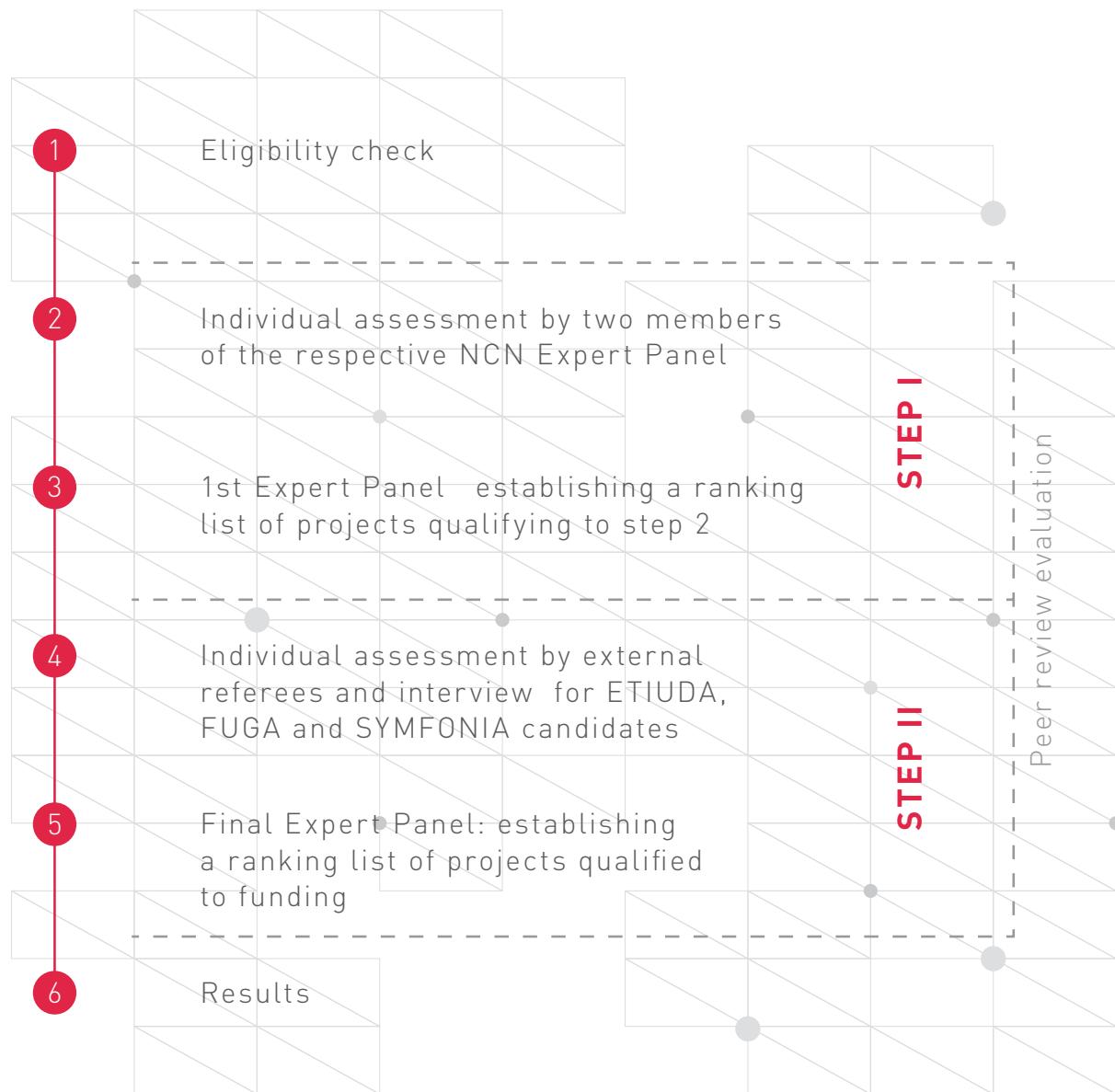
Project Evaluation

In order to select the very best proposals, the NCN employs an evaluation procedure based on a two stage peer review process. The eligibility of research projects submitted to the NCN is checked by NCN Discipline Coordinators. Afterwards the projects are peer reviewed by members of Expert Panels and external referees, both Polish and international.

STEP I – Each Expert Team convene under the leadership of a Chair nominated by the NCN Council who is in charge of assigning the applications to respective Expert Team members. The Experts prepare individual assessments of the assigned proposals. Afterwards the Expert Teams meet to discuss and assess the proposals based on the evaluation criteria, come to a common consensus on individual reviews, calibrate marks and establish a ranking list of those proposals that have qualified for stage two of the merit-based evaluation.

STEP II – External referees are selected by Discipline Coordinators, based on the recommendation of the Chair of the Expert Team, taking into account their field of expertise. The external reviewers work remotely, sending reviews electronically and they do not take part in the Expert Team meetings. During the second meeting the Expert Team draws up a final ranking list.

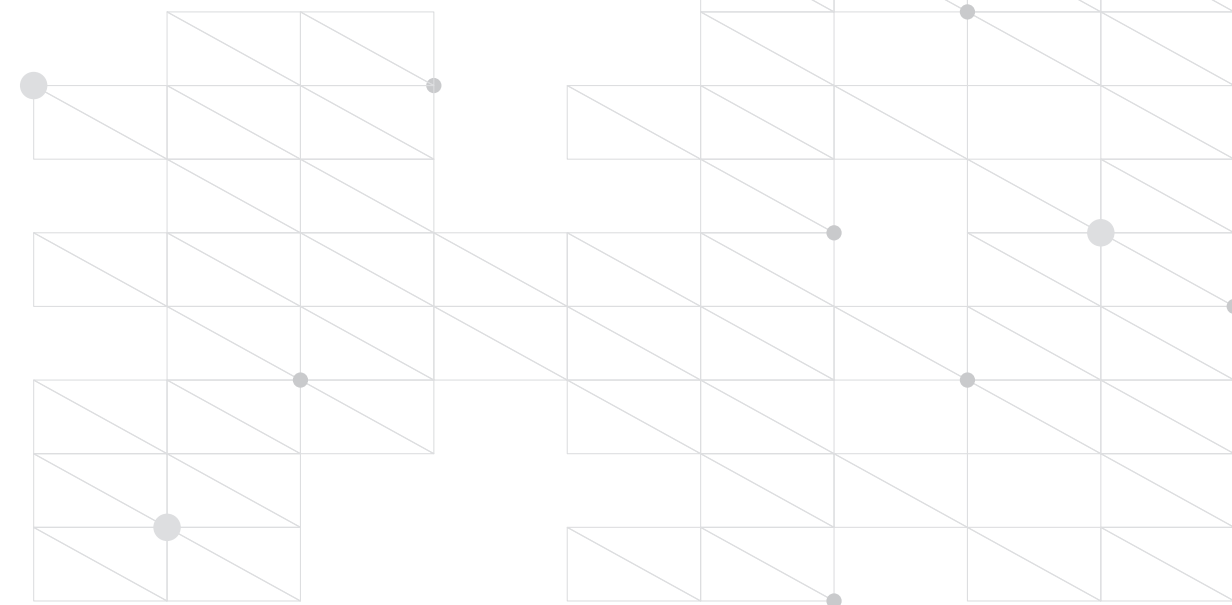




Project monitoring process

The National Science Centre supports and monitors the progress of research projects financed under its funding opportunities. In order to perform this task the Centre assesses the annual and final reports submitted by grant-ees, and conducts interviews and on-site visits in selected host institutions. In 2012 the National Science Centre received 6016 annual and 5051 final reports. Both types of reports undergo a thorough financial and merit-based review process.

The research project monitoring process is essential to NCN activities and the results of the project evaluation process determine whether funding should continue to the next phase of research.



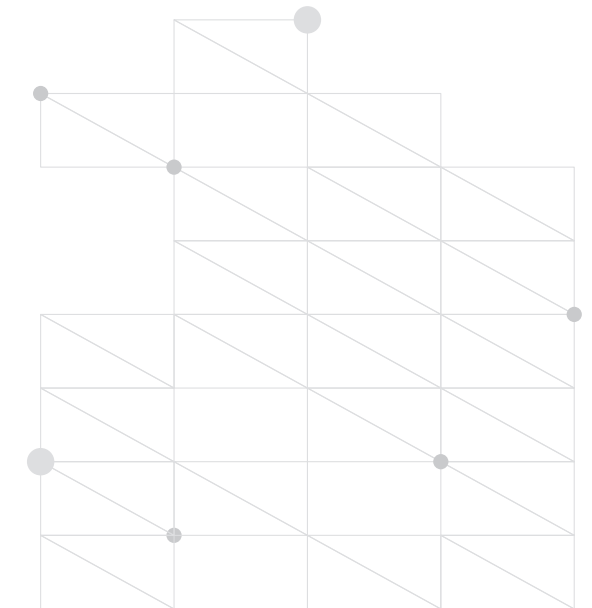
International Cooperation

One of the main objectives of the National Science Centre is to foster international cooperation and allow NCN grantees the freedom to conduct research within a broad international context.

To encourage the collaboration of Polish researchers with foreign partners, the Centre participates in the ERA-net consortia and takes part in Joint Programming Initiatives. ERA-NET and JPI networks organise calls for proposals for research projects conducted by research teams composed of researchers from at least three countries participating in the call. In 2012 within ERA-net schemes the Centre announced 3 calls for proposals:

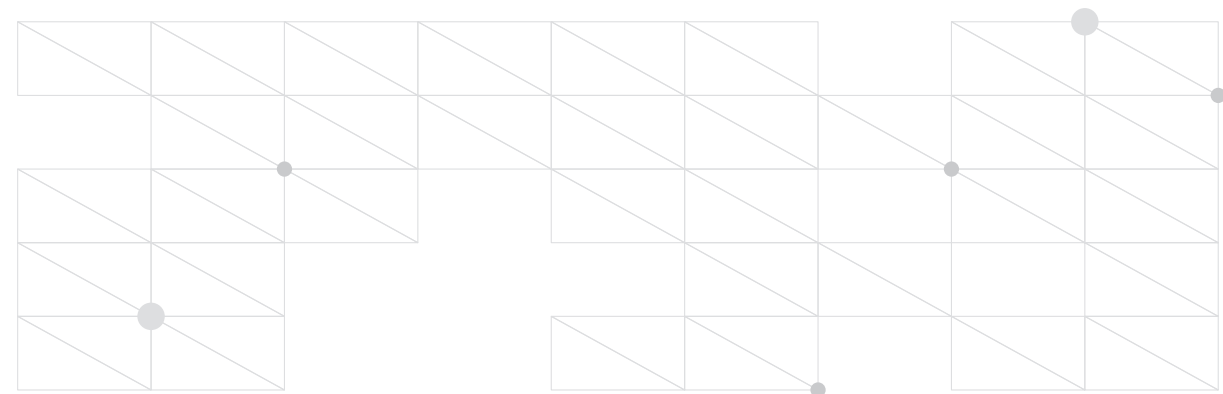
- *Cultural Encounters* – together with the **HERA** consortium (Humanities in the European Research Area) supporting research in the field of Humanities;
- *Targeted R&D and design studies in view of the realisation of future astroparticle infrastructures* – with the **ASPERA-2** network (AStroParticle ERAnet) inspiring international cooperation in Astroparticle Physics;
- *Welfare State Futures* – together with the **NORFACE** network (New Opportunities for Research Funding Agency Cooperation in Europe) funding research in Social Sciences.

Of greatest interest to the Polish research community was the HERA funding opportunity entitled Cultural Encounters. Within this call, Polish research teams submitted 148 applications. The HERA evaluation panel qualified 89 international research proposals to the second step of the evaluation process, out of which, 19 projects included research teams from Polish institutions.



Multilateral Cooperation – NCN participation
in ERA-NET schemes and Joint Programming
Initiatives in 2012

TYPE OF PROGRAMME	NAME	SCIENTIFIC DISCIPLINE	NCN PARTICIPATION STATUS	NCN BUDGET
ERA-NET	ASPERA-2	Astroparticle Physics	associated partnership	€300 000
ERA-NET	HERA	Humanities	full membership	€318 371
ERA-NET	NORFACE	Social Sciences	full membership	€830 000
ERA-NET	INFECT-ERA	Infectious Diseases	full membership	€500 000
Joint Programming Initiative	JPND	Neurodegenerative Diseases	signatory to the call	€500 000
Joint Programming Initiative	JPI CH	Cultural Heritage	signatory to the call	€150 000



In 2012 the National Science Centre became a member of the Infect-ERA consortium supporting research in Infectious Diseases. This consortium plans to launch an international call for proposals in 2013. The Centre also participated in the preparatory works of the Joint Programming Initiative in Cultural Heritage (JPI CH) that aims at establishing a common funding opportunity. The launch of the first JPI call entitled Increasing understanding of cultural values, valuation, interpretation, ethics and identity around all forms of cultural heritage (tangible, intangible and digital heritage) has been planned for the beginning of 2013. The NCN also participates in the call of the EU Joint Programme – Neurodegenerative Diseases entitled Identification of genetic, epigenetic and environmental risk and protective factors for Neurodegenerative Diseases. The results of this funding opportunity will be published in 2013.

The National Science Centre has become a full member of the ApPEC (Astroparticle Physics European Consortium), a body whose mission is to promote and support research in Astroparticle Physics. In May 2012 the NCN also joined Science Europe – an international association of research funding agencies and research institutions from across Europe. The NCN will represent the collective interest of Polish scientists continent-wide and participate in strengthening the European Research Area through fostering cooperation among SE member institutions.



Research Stories

PRELUDIUM

TITLE: PRECISE MEASUREMENTS OF ROTATION
AND ORBITAL ANGULAR MOMENTUM IN THE BINARY
SYSTEMS OF STARS, AS A TEST OF FORMATION
AND EVOLUTION MODELS

PRINCIPAL INVESTIGATOR: PIOTR SYBILSKI, MSC
HOST INSTITUTION: NICOLAUS COPERNICUS ASTRO-
NOMICAL CENTER, POLISH ACADEMY OF SCIENCES

We estimate that about half of the stars in our galaxy are double physical systems, i.e. systems of two stars orbiting around their common center of mass. They can be used as very precise astrophysical laboratories, so that we know not only their basic physical parameters, but we also can learn about their history, how they formed, and evolved, and what will be their probable end. To accurately examine a single star, it is necessary to look at its counterpart in complex systems. Data obtained in this way can be used not only to study the stars themselves, but also their more complex structures, such as star clusters, galaxies and clusters of galaxies. The determination of distance, the modeling of processes in the heart of stars, as well as on their surface are other example applications that will benefit from a better understanding of binary systems.



The main objective of my research project is to investigate the inclination of the axis of rotation of stars in a binary system, denoted in the figures with the symbol ω , to the orbital angular momentum, marked on the drawing with the symbol L . The angle between these vectors is called the spin-orbit inclination. Due to observational challenges this phenomenon is poorly studied and based only on a few examples. The spin-orbit inclination is in fact only deter-

mined for a number of systems, and even then not always for both components. Previous research lacks the statistical significance of a thorough review, the outcome of which would have a significant influence on the formation and evolution models of stars and planets. It will additionally allow us to verify several assumptions commonly used in the modeling of binary systems, like the alignment of the spin and orbital angular momentum.

The research quandary is measuring the alignment of the two vectors illustrated in the accompanying Figures 1 and 2. One vector is a vector associated with the rotation of a star and the second is a vector associated with the orbit of the binary system. Figure 1 shows a typical situation which is assumed in most publications and numerical models of binaries. The axes of rotation of stars and the orbital angular momentum are aligned. As it transpires, this is not the only possible configuration. Figure 2 illustrates one of the possible configurations we can encounter while researching binary systems.. This configuration opens up a new field in the study of the evolution and formation of stars. Therefore the unusual incidence of spin-orbit vectors will shine a new light on the used models.

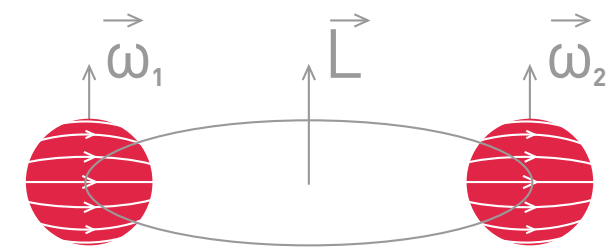
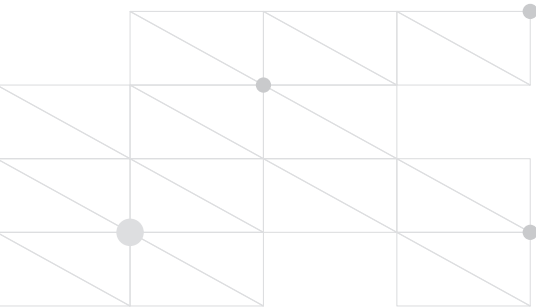


FIGURE 1: A typical configuration of the spin and orbital angular momentum vectors in binary systems. Assumed in most publications and numerical models of the formation and evolution of binary stars.

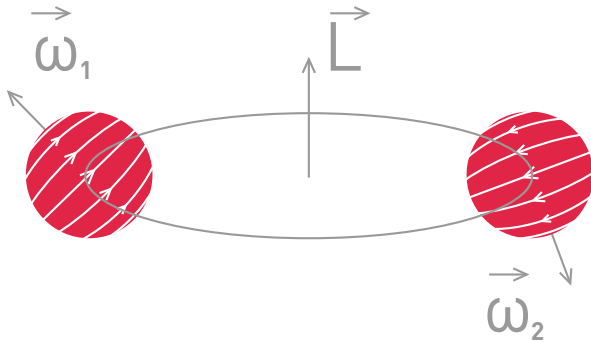
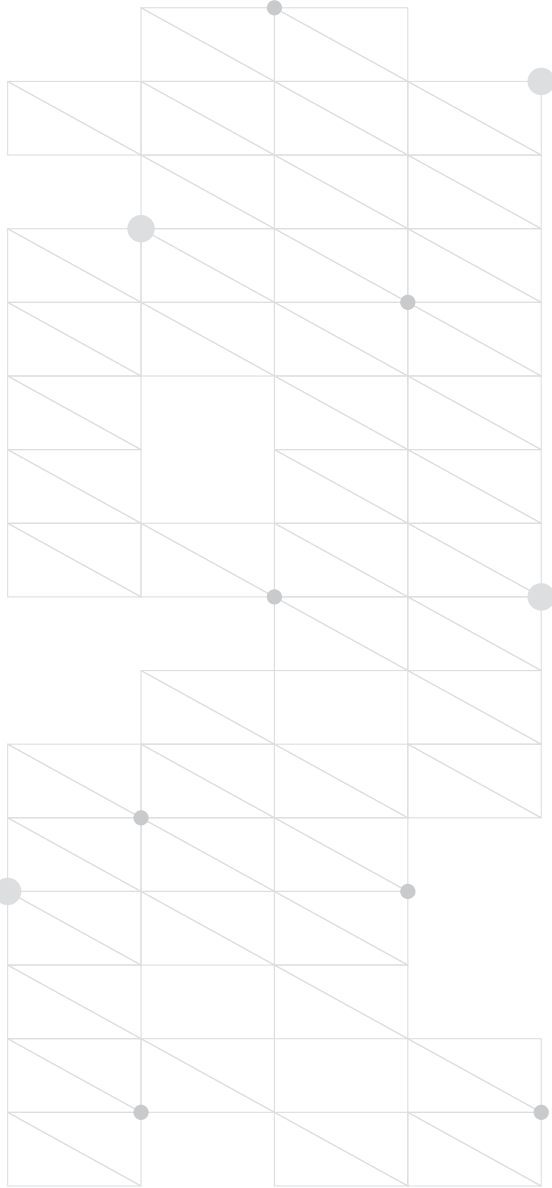


FIGURE 2: One of the possible systems with misaligned axes of rotation of stars and the orbital angular momentum. One of the questions that I will try to answer is the frequency and possibility of binary systems with significantly distorted alignment of these three vectors.

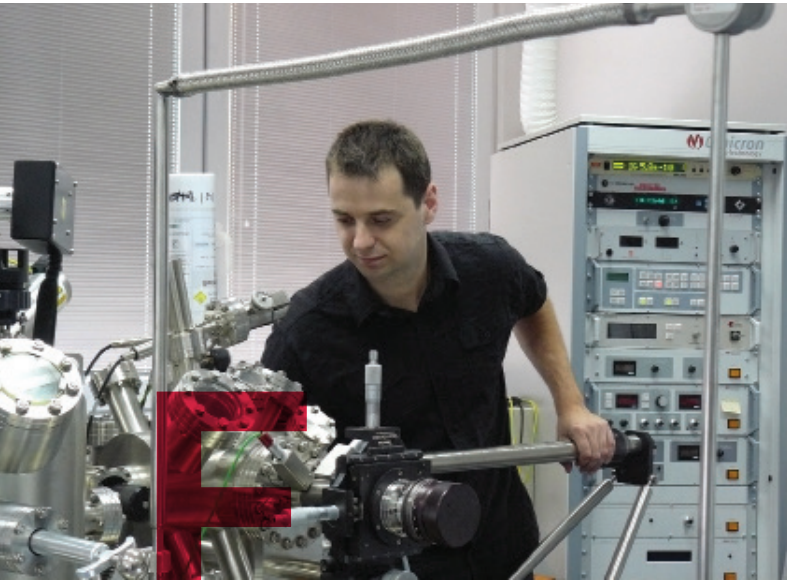
One of the questions to which this research is dedicated is the question whether stars are formed with inclined axes of spin-orbit and what the scale of this phenomenon is. Due to the configuration of the eclipsing binary star systems, we plan to use the Rossiter-McLaughlin effect (astronomical phenomenon, involving obscuring the rotating star with another object, causing asymmetry in the amount of light reaching the observer from different parts of the star; the results of the rotation of the star are different speeds relative to the observer and, due to the Doppler effect, different spectral shifts which can be measured) to study velocity distribution on the star's surface. Changes in the shape of the spectral lines due to eclipses can be modeled and used to determine the spin-orbit inclination.



FUGA

TITLE: THE ELECTRONIC PROPERTIES OF GRAPHENE PLACED ON SUBSTRATES WHICH ARE CHARACTERISED BY THE PRESENCE OF BAND GAP
PRINCIPAL INVESTIGATOR: DR PAWEŁ DĄBROWSKI
HOST INSTITUTION: INSTITUTE OF ELECTRONIC MATERIALS TECHNOLOGY

Graphene is an allotropic form of carbon which occurs in different forms with varying physical properties and chemical reactivity. Graphene is a unique material due to its specific electronic structure as it causes charge carriers to move at very high speed within it. Because of this, graphene is an object of study in terms of its appli-



cation as well as for scientific research. Currently the nature of the extreme mobility of the charge carriers is not well understood. There are many conflicting reports on the physical properties of graphene in scientific literature. Existing research problems arise mainly from the lack of consideration of graphene's electronic structure modifications due to the presence of the substrate and the metal electrodes connected to the system.

In 2006, I began researching graphene/metal interactions under the supervision of Professor Zbigniew Klusek from the Department of Solid States Physics, Faculty of Physics and Applied Informatics, University of Lodz. The results of the research were included in my PhD thesis, titled „The study of the electronic structure of graphene by scanning probe microscopy techniques” and have been published in a series of scientific journals. During my investigations of graphene/metal interactions, I found that there are other factors which may have significant influence on the electronic properties of graphene, such as sample preparation procedures and methods. Furthermore, there were still many conflicting opinions regarding determining the impact of the surface topography on the electronic structure of graphene and the graphene layer's stability. This inspired me to continue the research of this subject in my postdoctoral fellowship.

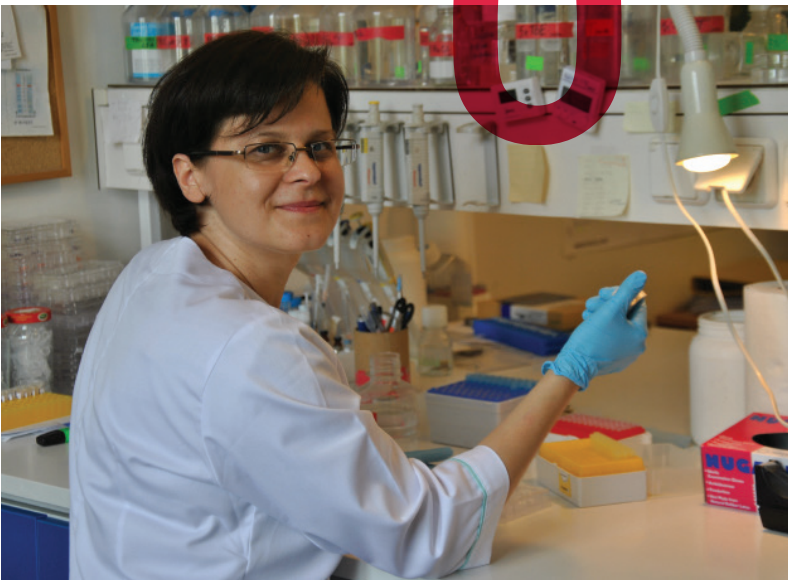
The main aim of this study is the extension of previous research on the study of new systems, composed of graphene layers deposited on various substrates with varying surface roughness and band gap values. The postdoctoral internship, under the auspices of the Nation-

al Science Centre „FUGA” at the Institute of Electronic Materials Technology (ITME) in Warsaw and in particular the cooperation with dr Włodzimierz Strupiński and prof. Jacek Baranowski, allowed me to produce and study high-quality graphene layers deposited on properly prepared insulating and semiconducting substrates. The project allowed me to perform groundbreaking research, the results of which will be published and presented at national and international conferences. These studies will expand on knowledge of the behaviour of the charge carriers in graphene and may provide a basis for further application of graphene.

OPUS

TITLE: ROLE OF AUTOPHAGY IN CHEMORESISTANCE OF GLIOBLASTOMA STEM-LIKE CELLS
PRINCIPLE INVESTIGATOR: DR IWONA CIECHOMSKA
HOST INSTITUTION: NENCKI INSTITUTE OF EXPERIMENTAL BIOLOGY, PAS

Malignant gliomas are the most frequent primary brain tumours, with the median survival rate of patients being about one year. This poor prognosis is due to therapeutic resistance and tumour recurrence after surgical removal. Gliomas contain a rare subpopulation of cells with stem cell-like properties, so-called glioblastoma stem cells (GSC). These cells are believed to be responsible for tumour initiation, recurrence and failure of conventional therapies. Cancer stem cells are defined as undifferentiated cells with self-renewal ability and can

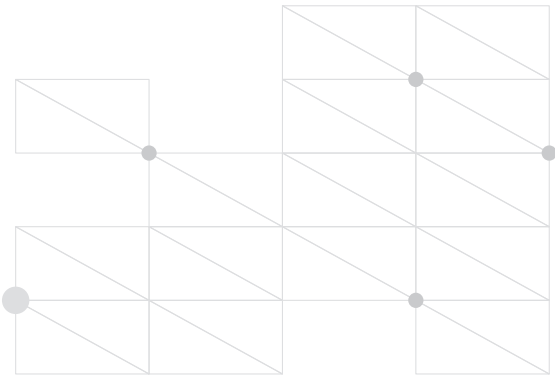


differentiate into multiple lineages. Once forced to differentiate, these cells lose their properties and become more sensitive to chemotherapy. Molecular mechanisms determining differentiation and chemo-sensitivity of GSCs remain poorly defined.

The autophagy is a catabolic process that involves the degradation of unnecessary or dysfunctional cellular components through the cell lysosomal machinery. Autophagy serves to maintain cell homeostasis but is activated in response to cellular stress under pathological conditions. Recent data clearly demonstrate that autophagy is a double-edged sword that could be either protective or detrimental to cells, depending on the nature of the stimulus and extent of autophagy-induction.

Additionally, the capacity of autophagy to recycle cellular components and provide energy could support the differentiation process.

The purpose of this project is to investigate the role of autophagy in GSC resistance to chemotherapy and to modulate these processes. We hypothesised that the induction of autophagy, which may regulate the differentiation of cells, sensitises GSCs to anti-cancer drugs. To determine the potential role of autophagy in differentiation and regulation of cancer stem cells response to drugs, we will use chemical or genetic autophagy inhibitors. Cancer stem cells will be isolated from glioma cell lines and from glioma surgical samples. Our results will uncover the basic mechanisms of glioma biology and shed light on the relationship between autophagy and cell differentiation, but, more importantly, it will reveal mechanisms of glioma cancer stem cell resistance to chemotherapy. Our studies may discover novel biological targets that will contribute to designing innovative therapeutic strategies, aimed at the selective elimination of glioma stem cells or induction of their differentiation.



HARMONIA

TITLE: ALBANIAN-POLISH ARCHAEOLOGICAL
RESEARCH AT THE ILLYRIAN CAPITAL OF SHKODER
PRINCIPAL INVESTIGATOR: PROF. PIOTR DYCZEK
HOST INSTITUTION: ANTIQUITY OF SOUTHEAST-
ERN EUROPE RESEARCH CENTRE, UNIVERSITY
OF WARSAW

The research carried out by Polish archaeologists from the University of Warsaw at Shkoder seeks to explore the urban structure of this ancient city located in present-day Albania.

After more than 50 years Polish archaeologists have returned to Albania where only a few foreign expeditions are currently working. Hence, we belong to an elite group of scientists investigating the past of this particular country. Thanks to our excavations, it has become possible to establish an important scientific branch of research: Illyrian archaeology. Contrary to what the name suggests, this field not only encompasses the history of the Illyrian tribes, but also the cultural changes that affected the entire Balkan Peninsula during the 1st millennium BC.

Even though Shkoder, the capital of the Illyrian kingdom (4th-2nd BC), and in late Roman times the capital of the province Praevalis, has been described by many antique authors, our archaeological knowledge is incomplete. Our project is the first complex scientific approach towards the entire antique city. Its aim is to establish the extent and architecture of the urban structures it encompasses.

We have already gathered deeply interesting data, although we have only carried out the initial fieldwork campaigns,. Most importantly, we have established an antique urban grid and the partial layout of the so-called cyclopean walls from the 4th century BC. We have uncovered a stretch of the massive late-antique city wall and parts of two antique graveyards. Of great importance was the discovery of a well preserved inscription which declares Shkoder a Roman colony and mentions units of the Roman army. This allowed us to verify the written sources, to establish the date when the colony was founded and to learn new hitherto unknown facts about the structure of the Roman army.

Even though it is known that the last Illyrian king – Gentios – surrendered the city in 168 BC, we have had no archaeological evidence at our disposal so far. Layers of destruction, filled with rubble and finds from the 2nd century BC seem to be silent witness to these events. We have also unearthed elements of Roman architecture. A room, richly decorated with colorful marble, wall paintings and stucco, heated by a roman hypocaust oven, can be dated to the 1st century AD. From a later period we have excavated the remains of an antique house had been once mosaics were found. We have succeeded in acquiring a new interpretation and dating of this object. The period of Venetian reign brought new fortifications to the castle and unique pottery to Shkoder, the latter including rare Maiolica ceramics. The battle for Shkoder between the Venetian defenders and the Ottoman army is an important and under-researched event in the history of the city which also had broader consequences for the entire region. We have also solved the mystery of

the so-called „great defensive wall“. Earlier, its datation and function had been unclear. We proved it to be part of the Venetian fortification that had been erected ad hoc. On this occasion we also discovered a hitherto unknown stone quarry. We know that building material for the city was extracted there – probably from antique times onwards. An interesting element of Turkish quotidian life was the discovery of a small pharmacy. During our investigations we also strive to answer a few general scientific questions concerning the urbanisation of Illyria, Greek influences on this culture and also the process of the Romanisation of the entire region during Roman times. Our research should provide the answers to at least some of these.



fol. Piotr Dyczek



PERFORMING FOR POLISH RESEARCH

National Science Centre
ul. Królewska 57
30-081 Krakow, Poland
tel. +48 12 341 90 00
fax +48 12 341 90 99
e-mail: biuro@ncn.gov.pl

www.ncn.gov.pl