

Annual
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Report

2016

POLISH ACADEMY of SCIENCES

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Foreword from the President of the Academy



A. POWAŁOWSKA

The year 2015 was a period of important changes in the Polish Academy of Sciences. The new leaders, elected for the 2015–2018 term, intend to prepare the Academy for the upcoming challenges.

By far the most pressing issue now is to maximize absorption of EU grants available to scientific institutions. If science in Poland is to evolve in accordance with the highest world standards, we must improve the level of EU funding acquired and use it efficiently. The Academy wants and has to play a significant role in that process. For this reason, the concept of the Excellence in Science Department was created with a clearly stated purpose, which is to assist Polish researchers in applying for grants awarded by the European Research Council. It is worth noting that similar organizational units exist in all countries which succeed in ERC competitions. The new unit will operate under the direct supervision of one of the Vice-Presidents of the Academy, supported by PAS members, substantive employees of PAS departments, as well as a large group of ERC grant winners and Polish members of ERC evaluation panels. The Polish Academy of Sciences is one of the leaders in obtaining ERC grants in Poland – I do hope our knowledge and experience will be an essential part of the ERC grants boosting plan.

Annual Report 2016 of the Polish Academy of Sciences is a source of comprehensive information about yearly multi-discipline activities of the Academy's departments, branches, scientific and task-force committees, scientific units, and foreign scientific centers. The emphasis is on last year's outstanding scientific achievements, some standing a real chance to be put into practice. I hope the *Annual Report 2016* will become a valuable reading experience for all interested in the performance of our institution and science in Poland.

Presidium of the Polish Academy of Sciences

The Presidium of the Academy is the statutory organ responsible for all strategic issues in periods between sessions of the General Assembly of the Academy. The Presidium is composed of the President, five Vice-Presidents, five representatives of the Divisions of the Academy (one for each Division), presidents of the Academy's Territorial Branches, a representative of the Council of Directors of Academy Research Units, chairs of all Divisions' Councils of Provosts, and the Chancellor of the Academy.

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The authorities of the Polish Academy of Sciences for the 2015–2018 term (from left): E. Nęcka, S. Malepszy, J. Duszyński, E. Frąckowiak, P. Rowiński, S.J. Czuczwar, T. Latała

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The PAS General Assembly session, Warsaw, 3 December 2015

J. OSTAŁOWSKI

General Assembly of the Polish Academy of Sciences

The Academy's highest governing body is the General Assembly, a gathering consisting of all national members of the Academy. The General Assembly directs the work of the Academy and supervises its whole activity, adopting resolutions binding on other bodies of the Academy. The General Assembly of the Academy may make statements on issues of importance to the nation and the State.

In December 2015, a debate on the issue of migration took place during the 131st General Assembly of the Polish Academy of Sciences. The members of the Academy adopted a position statement on that issue, in which they underscored the need for Poland to cooperate with other countries of the European Union and to strive to promote attitudes of mutual openness between the receiving communities and immigrant communities.

Realizing the challenges brought by the current humanitarian crisis and recognizing the gravity of migratory issues for discussion about the future of the European Union, the General Assembly of the Polish Academy of Sciences drew attention to the need for measures of the following types to be undertaken:

- Recognizing that cooperation among EU member states under the framework of European solidarity should be key for resolving the current migratory problem.
- Undertaking broad efforts aimed at promoting attitudes of mutual openness between the receiving communities and immigrant communities.
- Remaining open to the inflow of migrants, in keeping with the country's immigration potential, while consistently honoring the rule that they must conform to the legal and social model that prevails in Poland.
- Creating a system, more effective than at present, for preventing foreigners from being taken advantage of in the labor market (by being offered low wages or no vacation time) and violations of their basic rights (having their passports taken away or being restricted from leaving their places of residence and employment).
- In the context of immigration to Poland, the Poles and persons of Polish origin living abroad should be offered opportunities in accordance with their needs.



J. OSTAŁOWSKI

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Humanities and Social Sciences

At the end of 2015, the Academy's Division I (Humanities and Social Sciences) comprised 49 members (26 ordinary and 23 corresponding members) and 28 foreign members. It is with deep regret that we note that Czesław Kupisiewicz, an ordinary member of Division I, passed away in 2015.

Division I held 2 plenary sessions in 2015. At the first, on 7 May, Prof. Jerzy Brzeziński presented the conclusions of the Council of Provosts from the evaluation of the Division's institutes. Prof. Jerzy Wilkin presented information about the situation at the Institute of Economics. The members of commissions awarding the Division's scientific prizes were appointed, and the composition of the Team for the Humanities and Social Sciences Publications was selected. Dariusz Doliński presented a paper entitled *Czy tylko źli ludzie czynią zło? O wadze badań Stanleya Milgrama dla nauk społecznych* [Do Only Bad People Do the Evil? On the Significance of Stanley Milgram's Research in Social Sciences].

At a plenary session held on 12 November, Michał Wierzchoń presented the activities of the Polish Young Academy and Konrad Osajda delivered

a lecture entitled *Za kurtyną osobowości prawnej. O istotcie „osoby prawniczej”* [Behind the Curtain of Legal Entity – the Essence of “Legal Person”]. The Division's scientific prizes were also awarded. The Erazm Majewski Prize in the field of archaeology was won by Asst. Prof. Bogdan Żurawski, professor at the Institute of Mediterranean and Oriental Cultures (PAS), for his two-volume publication comprising *Volume 1: St Raphael Church I at Banganarti, mid-sixth to mid-eleventh century. An introduction to the site and the epoch* and *Volume 2: Kings and Pilgrims, St Raphael Church II at Banganarti, mid-eleventh to mid-eighteenth century*. In the field of demography the prize was won by Dr. Marcin Stonawski for his thesis *Kapitał ludzki w warunkach starzenia się ludności a wzrost gospodarczy* [Human Capital, the Ageing Population Factor and Economic Growth]. In the field of the history of culture the prize was awarded to Prof. Jan Szemiński and Prof. Mariusz Ziółkowski for their thesis *Mythes, rituels et politique des Incas dans la tourmente de la Conquista* [Myths, Rituals and Politics of Incas in the Turmoil of the Conquista]. The prize in Oriental studies was awarded to Prof. Anna



M. MLEKICKI

The ceremony at which the Division I scientific awards were conferred to the winners, held on 8 December 2015 at the Division I headquarters

Krasnowolska for her paper entitled *Mythes, croyances populaires et symbolique animale dans la littérature persane* [Myths, Folk Beliefs and Animal Symbolism in Persian Literature]. The Władysław Spasowski Prize in the field of pedagogy was won by a team under the leadership of Prof. Maria Dudzikowa composed of Asst. Prof. Ewa Bochno, Dr. Ireneusz Bochno, Dr. Sylwia Jaskulska, Dr. Karina Knasiecka-Falbierska, Dr. Mateusz Marciniak and Dr. Renata Wawrzyniak-Beszterda for their publication entitled *Doświadczenia szkolne I rocznika reformy edukacji a zmiany zasobów jego kapitału społecznego w warunkach szkoły wyższej* [School Experience of the Participants of the 1st Year of Reformed Education and Changing Accumulation Patterns in the Process of Higher Education].

The Division's Council of Provosts held 3 meetings in 2015. During the meeting on 16 January, the Council elected its chair – Jerzy Brzeziński and deputy chair – Grażyna Borkowska. Furthermore it selected the candidates to the Council from among Polish and foreign scientific milieu (Hubert Izdebski, Krzysztof Kawalec, Francesco Coniglione, Antony Polonsky). The meeting on 20 January was dedicated to the evaluation of activities of the Institute of Economics in 2013–2014. The Council approved the evaluation results and supported the motion of the Scientific Council of the Institute of Economics to dismiss Asst. Prof. Cezary Wójcik, professor at the Polish Academy of Sciences and at the Warsaw School of Economics, from the function of the Institute's director. During the Council's meeting on 5 November, the evaluation of activities of the Institute for the History of Science and the Institute of Law Studies over the years 2013–2014 was discussed. The Council of Provosts adopted a resolution approving the results of the performed evaluation, with a reservation to convey to directors the recommendations for the improvement of the institutes' situation. During the meeting, the Council also adopted the statement on the amendment of the Act on financing science and its consequences for research community, presented by Grażyna Borkowska.



M. MILEKICKI

On 8 December 2015, the Division I scientific awards were conferred to the winners. From left: Prof. Jerzy Brzeziński (Chair of the Council of Provosts), Prof. Edward Nęcka (Vice-President of the Academy), Prof. Jerzy Duszyński (President of the Academy)

In 2015, the Institute of Political Studies (PAS) celebrated the 25th anniversary of its foundation.

Members of Division I received numerous awards and distinctions. Jerzy Axer was awarded the prize of the Rector of the University of Warsaw. Jerzy Brzeziński was conferred the title of honorary professor of the University of Silesia. Andrzej Buko was decorated with the Knight's Cross of the Order of Polonia Restituta and received the Golden Frombork Medal awarded by the Pułtusk Academy of Humanities. Dariusz Doliński received an honorary award of the PAS Committee on Psychology for organizing the Malewski Prize. Jacek Fisiak became an honorary member of the Scientific Council of the Angus McIntosh Centre for Historical Linguistics, University of Edinburgh. Stanisław Gajda was awarded the prize of the Saint Petersburg University and the Mickiewicz-Puszkina Medal of the Association of Cooperation Poland-East. Michał Głowiński won the Jan Długosz Prize for his volume *Rozmaitości interpretacyjne* [Interpretation Sundries]. Franciszek Grucza was granted *honoris causa* honorary doctorate by the University of Opole. Andrzej Koźmiński won the first prize in 2015 edition of

“Economicus” Competition of the daily newspaper “Dziennik Gazeta Prawna” and the prize of PKO Bank Polski for his book *Czas pokera* [Poker Time]; he was also granted the title of doctor *honoris causa* of the University of Szczecin and received the Wektor 2015 Prize awarded by the Employers of the Polish Republic. Ewa Łętowska received the Medal for Civic Wisdom, conferred by the monthly “Kraków,” and the Teresa Torańska Prize of the “Newsweek” Foundation for public activity. Mirosława Marody received the Prize of the PAS President for the book entitled *Jednostka po nowoczesności. Perspektywa socjologiczna* [Post-Modern Individual. A Sociological Perspective]. Ryszard Nycz received the Laur

Jagielloński prize. Henryk Samsonowicz was conferred the title of an honorary citizen of Warsaw. Jan Strelau was awarded the Teofrast Superstar Prize of the monthly “Charaktery” and the Tadeusz Kotarbiński First Rector of the University of Łódź Prize. Piotr Sztompka was conferred the title of doctor *honoris causa* of the Academy of Fine Arts in Cracow. Andrzej Walicki was awarded the special prize of the Minister of Culture and National Heritage for his services to Polish culture. Jerzy Wilkin was granted *honoris causa* honorary doctorate by the Warsaw University of Life Sciences (SGGW).

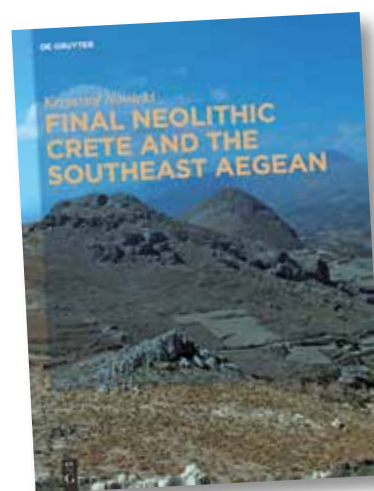
Division I oversaw a total of 24 scientific committees and 3 task-force committees in 2015.

The transition from the Neolithic to Early Bronze Age in Crete, c. 3700–2900 BC

K. Nowicki | Institute of Archaeology and Ethnology | Polish Academy of Sciences

This paper presents a brief summary of an ongoing research project concerning settlement changes in Crete between the latest phases of the Neolithic period and the early centuries of the Bronze Age (c. 3700–2900 BC). The problem of the transition between these two periods is of crucial importance for understanding the foundation of the first civilization in Europe, commonly called “Minoan,” which was built on somewhat earlier social, political and economic progress of the neighboring lands in the Near East and Egypt. The project is being carried out in the Institute of Archaeology and Ethnology, Polish Academy of Sciences, and the fieldwork was possible thanks to the courtesy of the Greek archaeological authorities and grants awarded by the Institute for the Aegean Prehistory (Philadelphia), the Committee for Scientific Research, Poland (grant No. 5 HO1H 021 20), the Ministry of Science and Higher Education, Poland (grant No. N N109 215835), and the P.M. Warren Visiting Professorship, University of Bristol.

Intensive field investigations undertaken as part of this project have revealed an unprecedented increase in number and sizes of sites in Crete during the second half of the fourth millennium BC. There is hardly any other period of Aegean prehis-



tory which sees such a “demographic explosion.” It is also at this time that the first signs were traced of a level of territorial organization above that of a single settlement, and of a more complex social organization. All the archaeological evidence, when analyzed together, suggests strongly that the speeding up of processes linked to settlement change and the transition of the local Neolithic Cretan communities to the Bronze Age were caused by large scale movements of people from the East, most probably from Anatolia, although this was not a single event



Fig. 1. Katalimata in the Cha gorge. The Neolithic site is situated in the middle of the left cliff of the gorge

involving one single group of immigrants. This scenario, earlier considered by some scholars to be several centuries later (from the beginning of the Bronze Age), is further supported by the studies of contemporary settlement patterns in the Dodecanese – a natural bridge between Anatolia and Crete. This period was preceded by less clear changes in settlement location, starting in the later first half of the fourth millennium BC and marking the end of the Late Neolithic settlement pattern.

The two periods – the early and late Final Neolithic – covered about 500 to 600 years (c. 3700/3600–3100 BC). Unstable settlement conditions are apparent during this time in the entire Aegean, not only Crete. In Crete, however, the character and sequence of settlement changes is better known than elsewhere in the region, due to a much larger number of identified archaeological sites and to especially thorough studies.

In general, the early Final Neolithic period (c. 3700/3600–3400/3300 BC) is characterized by relocation of habitation sites to defensible hill-tops, directly above earlier-exploited arable land. The outermost of this group of sites was Monastiraki Katalimata in the Cha Gorge, eastern Crete (Fig. 1), excavated by the author in 1993–2000. The

excavation at this site, earlier regarded as having only Bronze and Iron Age phases of occupation, unexpectedly revealed a Neolithic stratum that was sealed under five non-continuous layers. That discovery opened entirely new research problems concerning the historical circumstances of the end of the Neolithic period in Crete.

The results of almost twenty years of fieldwork following the Neolithic discoveries at Katalimata included a detailed description of over 170 sites in Crete (of which over 120 have been identified as the result of this project) in their broader southeast Aegean context. These were presented in a book entitled *Final Neolithic Crete and the Southeast Aegean*, published in 2014. This publication, however, did not end the project. Field investigations were continued in 2014 and 2015, bringing to light over 40 new archaeological sites related to the subject.

The main objectives of the most recent investigations included a search for sites from the early phase of the Final Neolithic – much more poorly represented in archaeological evidence than sites of the late phase – and further research into the expansion process which characterized the late phase of the Final Neolithic and the beginning of the Bronze Age. The results of this work show that our



Fig. 2. The coast at Xerokampos, eastern Crete. The Neolithic settlements are located on the rocky ridges around the bay

understanding of the transition between the Late and Final Neolithic (early in the fourth millennium BC), and the character of settlement patterns during the early Final Neolithic is still very unsatisfactory. Among the 40 new Final Neolithic sites identified in 2014 and 2015, 12 were of early Final Neolithic date. The updated list of the early Final Neolithic sites offers a new basis for a more thorough analysis of topographic preferences behind settlement relocation during this period and may help to further clarify what caused the dramatic transition between the Late Neolithic and Final Neolithic periods (c. 3700–3600 BC) and the relation between the different groups of people represented by early and late Final Neolithic pottery groups – two problems which are at present still obscure.

Another important result of the most recent field research was the identification of a series of short-lived sites from the transitional period between the Final Neolithic and Early Bronze Age periods (c. 3100–2900/2800 BC) on defensible hills and ridges along the northern edge of the Asterousia Mountains, immediately above the Mesara plain (southern Crete), and often near and above the later, much more stable, Early Bronze to Middle Bronze Age settlements. This group of sites may shed new light on the interpretation of the settlement expansion from the southern coast

across the Asterousia Mountains and on the origins and development of the tholos tombs in southern Crete. A similar expansion process from the coast, colonized already at the beginning of the late Final Neolithic period (see the settlements on the Xerokampos coast, eastern Crete in Fig. 2), to inland valleys and upland plains was previously recorded in other regions of Crete.

The project will be continued in 2016.

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The paradigm of development and the effectiveness of pro-innovative EU structural help

J. Kotowicz-Jawor | Institute of Economics | Polish Academy of Sciences

The aim of the study is to identify the key causes of the limited innovation effects of the EU public help. The key hypothesis of the analysis is that the main reason behind the low efficiency of pro-innovative EU structural funds is the current stage of economic development, i.e., transition period from the economy stimulated by efficiency growth to the stage of economy boosted by innovation with the maximizing of knowledge as development paradigm. The research covers the years 2007–2013 and includes the latest period of programming EU help dedicated to, inter alia, improvement of the innovativeness of Polish economy. The execution of the project has been planned for the years 2014–2015.

The research conducted up to date showed that the companies' conservatism on financing for development (from their own funds) is linked to the reluctance to undertake innovative investment in high-risk conditions. This risk also increases the instability of the regulatory system. Unwillingness to use structural funds for development is often determined by a shortage of own funds for the project contribution. Companies are oriented mainly to protect their own property.

The main determinants of the low efficiency of pro-innovative structural EU funds are unadjustedness of institutional environment of enterprises, lack of transparency and stability of regulatory system, high transaction costs (costs of contracts, lack of trust toward partners), unadjustedness of the conditions of public aid allocations, discretionary methods of allocation, rejecting the real innovation, and preferring to allocate EU funds for the purchase of machinery and equipment rather than new technologies. As a result, there is a tendency to imitative rather than innovative development. The problems indicated included an information gap between the research and development sector and enterprises, the low quality of managers and intellectual capital (trust, willingness to co-operate, creativity), and also the lack of a long-term vision of development and innovation policy. In Poland there seems to be a lack of understanding of the fundamental role of knowledge as a resource and of the criterion of maximizing knowledge for the development of enterprises and for the improvement of their competitiveness.

It is recommended to build a National System of Innovation (NSI) aiming at deep, qualitative reform

Panel discussion
"Effectiveness of
the Pro-innovative
EU Structural Help
between 2007–2013"
held at the PAS Institute
of Economics on
15 December 2015.

From right:
Prof. Adam Ambroziak,
Prof. Stefan Krajewski,
Prof. Joanna
Kotowicz-Jawor,
Prof. Marzenna Weresa,
Janusz Chojna,
Romuald Zadrozny,
Witold Grabysz



of the education system at all levels, improvement of research sector by enhancing its financial condition, and creation of regulations supporting the commercialization of knowledge. In order to stimulate innovation of enterprises, it is proposed to use fiscal instruments (tax reliefs). The key to increasing pro-innovative role of structural funds is to improve the institutional environment of enterprises and to stabilize regulatory systems, which can reduce the risks of innovation.

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Spółeczeństwo międzywojenne: nowe spojrzenie Interwar Society: A New Perception

W. Mędrzecki | J. Żarnowski | Institute of History | Polish Academy of Sciences

The volume *Interwar Society: A New Perception. Social Metamorphoses 10* summarizes the research project realized since 2010 “The Society of the Second Polish Republic. A New Attempt at Synthesis,” carried out under the supervision of Janusz Żarnowski in the Social Transformations in the 19th and 20th Century Section at the Institute of History, headed by Włodzimierz Mędrzecki. The project was financed by the National Science Centre and the Institute of History of the Polish Academy of Sciences. The main purpose of this initiative was to confront findings of the Polish social history of the 1960s and 1970s, especially those presented in publications of Janusz Żarnowski, Zbigniew Landau, and Jerzy Tomaszewski, with the outcomes of research conducted in the following decade into the social history of interwar Poland, and with present thought of the social sciences and humanities on studies and descriptions of social structure and social life. An analysis and verification of former historiographical achievements in combination with individual research of the participants of the programme made



it possible to present a new, synthetic vision of the social history of Poland in the interwar period.

About 150 researchers were invited to participate in the programme, and their individual work was focused on the following factors shaping the structure and social reality of interwar Poland:

- 1) The state – its role as a factor of changes and social stabilization. The tools influencing the shape of the society were, inter alia, the legislation, practices of exercising power and maintaining public order, economic, social, educational and school policies, and especially the army, having direct impact on thousands of young people, as well as state mass media, including press and the radio.
- 2) Demography – and especially the stage of the so-called demographic transition which characterized the interwar society of Poland. A number of other topics were undertaken, related to changes in birth rate, demographic dynamics of selected social groups, and demographic dimension of the Spanish influenza pandemic that spread throughout Poland in 1918.
- 3) Economy – here the focus was on the attempts at describing and analyzing the most important working establishments in which the citizens of interwar Poland were employed from the perspective of the organization of working process, its effectiveness, as well as the role and impact of the workplace and mode of work on individual social position. Another key problem analyzed was work performance and rules governing the distribution of income generated by employment on the scale of the entire state and society.
- 4) Culture – especially the shaping and functioning of global and particular symbolic universes in social practice and the interpretations of social reality of interwar Poland made by its literary and artistic communities.
- 5) Confessions and religion – in the context of studying the role played by religion as an element of identity and a factor co-shaping the behavior pattern and lifestyle of an individual.
- 6) Nationality – national and ethnic self-identification of the citizens of the Second Polish Republic, especially in borderlands, as well as assimilation processes. Another important subject were the questions of state policy towards political and social ambitions of different nationalities inhabiting Poland in the interwar period.
- 7) Socialization processes – the socialization was presented both on the level of civic education

and on the level of socialization to social roles, including gender roles. A very important uniformizing role, especially in the process of civic education, was played by state institutions and those dependent on the state.

- 8) Social margin – a factor which has been omitted in research, but contributes to a general image of the society.

All in all, over 150 papers were presented and discussed during working meetings, and 130 of them were published. Apart from that, a large number of less formal discussions were held; they contributed significantly to solving disputable issues which were presented in the publications only in an indirect way.

The materials that are the fruit of the conferences devoted to individual research problems were published as parts of the editorial series of the Social Transformations in the 19th and 20th Century Section financed by the Institute of History of the Polish Academy of Sciences titled “Social Metamorphoses” (vols. 4–9, 2012–2014) and in scientific periodicals.

The presented volume has been prepared by the team of the authors on the basis of several years of research described above and concurrent discussions on the subject. The articles offer initial proposals of a “new synthesis” of the society of the Second Polish Republic declared in the title of the project. Undoubtedly, they deserve thorough reading and special reflection for they include a substantial body of new facts offering a reliable verification of the interpretation canon fossilized for decades. At the same time, they present a large number of research proposals that enrich our knowledge about the social reality in Poland in the interwar period, thus providing inspiration for further ideas and research into the social history of Poland in the 20th century.

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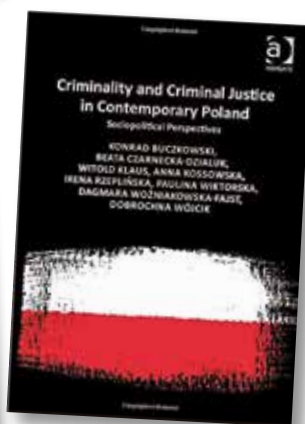
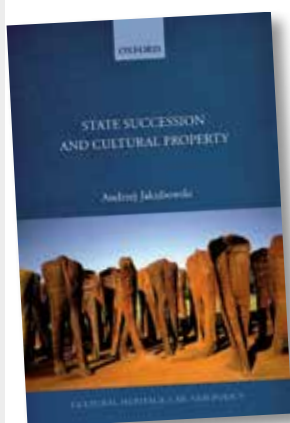
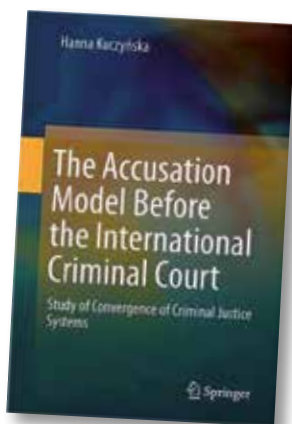
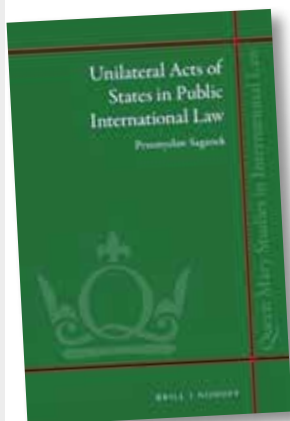
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Criminality of foreigners – a research project with practical operational tools for the Polish Border Guard

I. Rzeplińska | Institute of Law Studies | Polish Academy of Sciences



The Institute of Law Studies of the Polish Academy of Sciences is the leader of the project “Criminality of Foreigners,” implemented in cooperation with the University of Białystok and Medcore, a private IT company. It is based on an effective, multidimensional dialogue between scientific and business communities forming a research consortium. In 2014, the project received funding from the National Centre for Research and Development. Its core objective is to create an IT-based information system designed for the purposes of the Polish Border Guard (PBG). The system will provide access to a wide range of sources of data concerning the criminality and victimization among foreigners in Poland. These sources come from the PBG’s internal database and other external data banks run by various state authorities and agencies. Aggregated together, they will facilitate the strategic analysis of data, essentially increasing the efficiency of the PBG in identifying crimes and victimization among foreigners. The project also intends to develop and elaborate model methodology for strategic analysis of data. Importantly, project participants will carry out comprehensive research and analysis of the phenomenon of crime and victimization among foreigners in Poland. Thus, its outcomes will be threefold:

Inauguration of a cycle of lectures co-organized by the Institute of Law Studies and the Polish Ministry of Foreign Affairs. From left: Artur Nowak-Far (Vice-Minister of Foreign Affairs), Prof. Władysław Czapliński (Director of the Institute of Law Studies), Prof. Lucius Cafilish (United Nations International Law Commission)



K. SIEMION-BIELSKA

1) a new IT instrument; 2) a comprehensive and up-to-date data source on criminality and victimization of foreigners in Poland; 3) a model methodology applicable to aggregated data. All these elements will offer the Polish State authorities a unique opportunity to support their strategic and operational actions aimed at preventing and combating crime among foreigners.

The Institute of Law Studies, alongside its obligations as the project leader, carries out research on the criminality and victimization of foreigners. The topic of these studies is highly significant as the present knowledge about the nature, scale, and consequences of crimes committed by foreigners in Poland is incomplete and profoundly fragmented. In fact, few empirical materials concerning this phenomenon are currently available. The statistics collected by the Police, PBG, and courts are the only sources of information which create any possibility whatsoever to conduct a thorough analysis of the problem of criminality among foreigners in Poland. The last comprehensive study in this regard was carried out in mid 1990s by the Department of Criminology of the Institute of Law Studies. Moreover, when it comes to the issue of victimization of migrants, there are no comprehensive studies in this field (with the exception of those concerning human trafficking).

Since the accession to the European Union in 2004, Poland's eastern border has become the external border of the European Union, and since December 2007 – the external border of the Schen-

gen Area. Thus, the borders of Poland have different status. This resulted in an increase in crime characteristic for both internal and external borders of the EU and those of the Schengen Area. This is due, primarily, to the fact that important communication routes from Eastern Europe and Asia to Western Europe lead through the territory of Poland. These are also used for criminal activities, such as illegal migration, human trafficking, smuggling of goods, etc. Moreover, the abolition of controls at internal borders of the EU and Schengen Area has facilitated illegal migration and often negatively affected financial interests of the EU Member States.

The project analyzes various types of border crimes. It also investigates the problem of organized crime in relation to criminal activities of groups composed of foreigners and groups comprising both foreigners and Polish citizens. The research mainly focuses on particular features of members of these groups, the structure of such specific collectivities, and *modus operandi* of specific crimes. When analyzing the crime of foreigners in Poland, the project also refers to international standards of prosecution and punishment of selected types of offenses and crimes committed with the involvement of foreigners, such as cross-border crime, terrorism, and human trafficking.

The Institute of Law Studies conducts criminological and victimological analyses of various forms of criminality among foreigners in Poland (the most serious crimes, border and economic crimes, organized crime, and human trafficking). It also exam-

ines the trends of changes within these areas and their causes. The Institute's research activities refer to mechanisms and systems designed to prevent and combat various forms of crime among foreigners, which are vital to improving the efficiency of public authorities. In this way, the experience of Polish law enforcement authorities is analyzed *vis-à-vis* the practices of other states, including possible outcomes of international cooperation. In addition, European and international standards relating to prosecution and punishment of perpetrators of selected types of crime as well as the existing prevention programs are also investigated. Thus, the project will also offer training programmes designed for the PGB's internal purposes and accompanied by a series of substantive and methodological materials for the PGB officers, covering both different forms of criminality among foreigners and the methods of improvement of the law concerning prevention and prosecution of crimes committed by foreigners.

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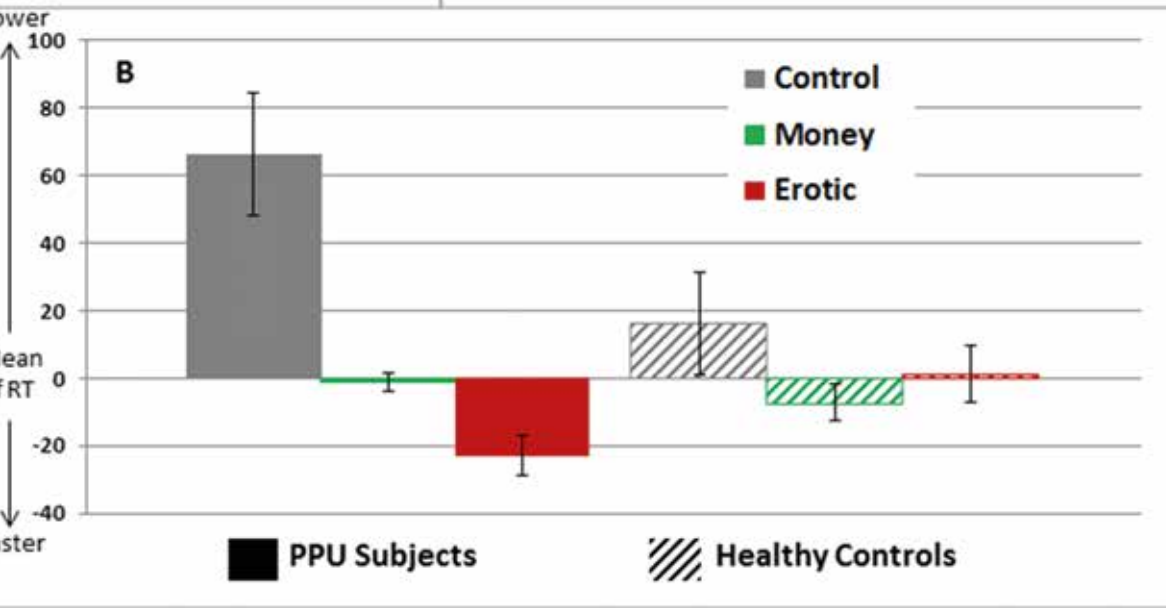
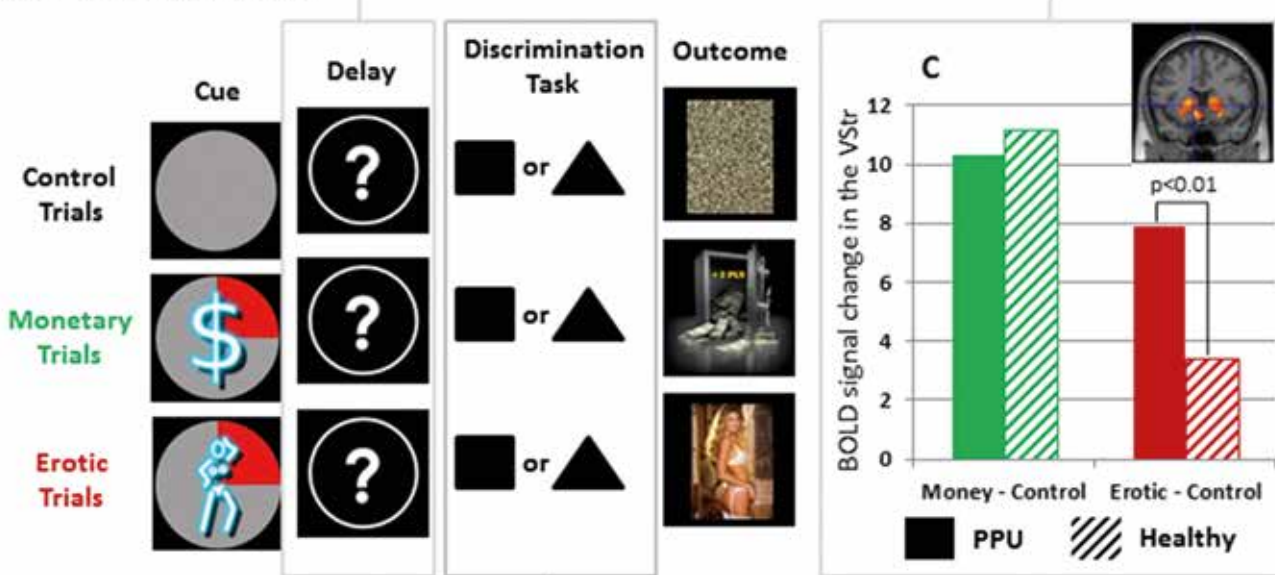
Problematic pornography consumption – psychological, behavioral, and neurobiological aspects

M. Gola | Institute of Psychology | Polish Academy of Sciences

In recent years, there has been an increase in the number of people suffering from compulsive sexual behaviors (CSB), such as excessive pornography consumption, compulsive masturbation, or use of paid sexual services. There is ongoing discussion among therapists and researchers about how to conceptualize those problems – some researchers suggest an addiction framework, some point to natural learning processes. Nonetheless, pornography consumption (PC) is popular (67.6% of man and 18.3% of woman use pornography on a regular basis minimum once per week) and for some individuals it becomes an out-of-control behavior and a reason for treatment seeking. This topic is important both socially and politically, which is reflected in an increasing number of high-profile movies (e.g. *Shame* by McQueen or *Nymphomaniac* by von Trier) and speeches by leading politicians (e.g. David Cameron). Following mass culture, neuroscience is also beginning to explore this topic.

Recent publications report high variability of pornography consumption among non-problematic and problematic users (from 0.5 to 20 hours in both groups). It inspired us to ask a very important question – whether the individuals seeking treatment as a consequence of their problematic PC do so because of excessive consumption of pornography (quantity) or rather due to more complex psychological and behavioral factors related to PC (quality), such as associated habits, their functions, and subjective feeling of loss of control over one's behavior. To address this question we studied 569 heterosexual Caucasian males, including 132 treatment seekers with out-of-control sexual behaviors. According to our best knowledge, our study is the first direct examination of associations between the frequency of PC and actual behavior of treatment seeking (defined as visiting a psychologist, psychiatrist, or sexologist for this purpose). Analysis shows that treatment seeking is not correlated with the mere frequency of PC, but there is a significant correlation

A: Experimental Task



A: Incentive delay task. Participants first saw a cue informing them about the type (pictogram), intensity (size of pictogram) and probability (pie chart) of an upcoming reward. Then the cue was replaced with a question mark, symbolizing a delay period during which a pseudo-random draw was performed according to the probability announced. Following this anticipation phase, participants had to perform a target discrimination task within 1 s. The target was either a triangle (left button press required) or a square (right button press required). Both their performance and the result of the pseudo-random draw determined the nature of the outcome. In rewarded trials, participants saw a monetary amount displayed on a safe (1–8 PLN) or an erotic picture (with high or low erotic content), and had to provide a hedonic rating on a continuous scale. In non-rewarded and control trials, participants saw a scrambled picture (top). The total amount of money won was paid to the participant at the end of experiment.

B: Results of reaction times analysis. RTs were measured during the discrimination task. Shorter RT indicates higher motivation induced by cue.

C: Results of BOLD signal analysis (Ventral Striatum)

with negative symptoms of PC. Furthermore, this relation is mediated by experience of losing control over sexual behavior, which is in itself correlated with religiosity. Severity of negative symptoms and subjective experience of compulsive sexual behavior are much better predictors of treatment seeking than the mere frequency of PC. Our results indicate that future studies in this field should focus more on the impact of PC on the individual's life (quality) rather than its mere frequency (quantity).

Recent works attempt to relate CSB symptoms with the concept of behavioral addiction by investigating brain responses to visual sexual stimuli (VSS), assuming that they play the role of incentive cues. Here we argue that such an assumption is wrong and may lead to incorrect interpretation of results obtained within the Incentive Silence Theory (IST) – a framework commonly used for addictive behaviors.

We claim that in most experimental setups, VSS play the role of reward rather than cue. We tested this hypothesis in a group of heterosexual males seeking for treatment because of problematic pornography use, using an incentive delay task (IDT) manipulating two types of incentives (erotic vs. monetary). This task allowed to disentangle cue- and reward-related effects. We show that similarly to monetary rewards, VSS has rewarding value. Participants learned cues of both incentives obtaining higher accuracy levels and shorter reaction times (RTs) than for cues of neutral stimuli. The superiority of VSS over monetary rewards (measured by hedonic ratings) was significantly related to general sexual arousability, while the superiority of erotic cues (measured by RTs) was related specifically to the declared arousability for VSS and weekly amount of pornography consumption. Our findings cast new light on seemingly contradictory results of recent papers and help to discuss them within IST framework, in which the reaction to cue is related with “wanting,” and to reward – with “liking.” We provided a reinterpretation of recent papers suggesting that in terms of IST, most of them show decreased VSS “liking” among participants with CSB and frequent pornography users.

In 2015 we received an OPUS research grant from the National Science Center (2014/15/B/HS6/03792; M. Gola) for the continuation of our studies, covering genetic and neurobiological mechanisms underlying problematic pornography consumption and CSB. We believe that our recent and future findings will provide a better understanding of such problems and contribute to improving treatment effectiveness.

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Biological and Agricultural Sciences



A. MIRGOS

Plenary session in April at the Center of Neurobiology, Nencki Institute of Experimental Biology in Warsaw

In 2015, the Academy's Division II comprised 70 domestic and 44 foreign members. During the year the Division said farewell to two of its full members – Prof. Zofia Kielan-Jaworowska, who passed away on 13 March 2015, and Prof. Romuald Klekowski, who passed away on 5 May 2015, and to one foreign member – Prof. David Shugar, who passed away on 31 October 2015. As of 31 December 2015, the Division's Chair of Provosts consisted of 38 members. For the 2015–2018 term, the following eminent Polish and foreign scholars were appointed members of the Council: Prof. Hanna Jańska, Prof. Zofia Szweykowska-Kulińska (from Poland), Prof. Adam Lukaszewski, Prof. Alexander Wlodawer (from abroad). Prof. Romuald Zabielski was elected Chair, and Prof. Andrzej Jerzmanowski Deputy Chair of the Division's Council of Provosts effective as of 1 July 2015.

In 2015, the Division held two plenary sessions. The April plenary meeting took place at the Center of Neurobiology, Nencki Institute of Experimental Biology in Warsaw. The assembly voted in favour of appointing Prof. Leszek Kaczmarek (full member of the Academy) the Dean of the Division II: Biological and Agricultural Sciences for the 2015–2018 term, and adopted several other resolutions concerning organizational issues in the new term. Twenty six Scientific Committees of the Division continued

their activities throughout the year. Eleven of them organized or co-organized 14 scientific events with partial financial support from the Academy. In 2015, the Division took further steps to adjust the number and structure of the Scientific Committees for the nearest new term, to the end of making their network more fit to the dynamically changing nature of modern science. The Commission appointed by the Dean of the Division presented three variants of the new network, recommending the version proposing 9 committees. After extended and wide discussions in the scientific community, two variants proposed by the Commission were subjected to voting by members of the Academy and directors of institutes, which resulted in choosing the variant proposing 9 committees. This proposal was next accepted in voting by General Assembly of the Academy on 3 December 2015. The new network of committees cooperating with the Division in term of 2015–2018 consists of: the Committee on the Molecular Biology of the Cell, the Committee on Organismal Biology, the Committee on Environmental and Evolutionary Biology; the Committee on Biotechnology, the Committee on Agronomic Sciences, the Committee on Forestry Sciences and Wood Technology, the Committee on Food and Nutrition Sciences, the Committee on Zootechnics and Aquaculture, and the Committee on Veterinary Sciences and Biology

of Reproduction. The Division decided to hold election of the members of new committee members via the electronic system.

In 2015, the Division's Chair of Provosts continued the restructuring of auxiliary scientific units. This resulted in the incorporation of the Research Station for Ecological Agriculture and Preservation of Native Breeds in Popielno to the Institute of Animal Reproduction and Food Research in Olsztyn and organizational changes in the Department of Ichthyobiology and Aquaculture in Gołysz. The actions towards incorporation of the Department of Anthropology in Wrocław into the Institute of Immunology and Experimental Therapy in Wrocław have been initiated. In 2015, the Council of Provosts completed 11 competition proceedings for choosing directors of research institutes of the Division.

The November plenary meeting of the Division took place in the Institute of Biochemistry and Biophysics of the Polish Academy of Sciences in Warsaw. Professor Romuald Zabielski, Chairman of the Council of Provosts, presented information on the draft amendments to categorization proposed by the Committee for Evaluation of Research Units. By Resolution No. 12/2015 the plenary meeting approved proposal for the composition of the Council of Division for the term 2015–2018: Prof. Stefan Malepszy – Vice-President of the Academy supervising the work of Division II, Prof. Leszek Kaczmarek – Dean of the Division II, Prof. Romuald Zabielski – Chairman of the Council of Provosts, Prof. Andrzej Jerzmanowski – Deputy Chairman of the Council of Provosts, Prof. Adam Zięćik – a representative of the national members, and Prof. Piotr Zielenkiewicz – a representative of the directors of the institutes of the Division, member of the Board of Directors.

During the autumn meeting, the Division awarded the following medals, prizes and distinctions in 2015. The Michał Oczapowski Medal was awarded to Professors David Shugar (foreign member of the Division, Canadian citizen), Tadeusz Chojnacki, Karol W. Duczmal, Andrzej B. Legocki, Jerzy Preś, and Stefan Wierzbowski. The Division II Awards were given as follows: to the team of Jakub Włodarczyk, Magdalena Dziembowska, Michał Stawarski, Zsuzsanna Szepesi, Aleksandra Janusz, and Leszek Kaczmarek, for a series of research works on the role of outermatrix metalproteinase 9 in synaptic plasticity; to the team of Magdalena Król,

Tomasz Motyl, Kinga Majchrzak, Karol Pawłowski, and Joanna Mucha, for a series of research works concerning on metastasis and drug resistance of breast cancer in bitches; to the team of Andrzej Ciereszko, Mariola Dietrich, Joanna Nynca, and Mariola Słowińska, for a series of research works on characteristics and proteomic analysis of proteins of the reproductive system in fishes and birds. Piotr Maszczyk was awarded a distinction for a series of research works on the predator–prey relationship on a model of zooplanktivorous fish–zooplankton. The distinction for outstanding scientific monograph was awarded to the team of Stanisław Brożek, Ewa Błońska, Piotr Gruba, Jarosław Lasota, Maciej Zwydak, Tomasz Wanic, Piotr Pacanowski, Ryszard Mazurek, Michał Gąsiorek, Tomasz Zaleski, Paweł Zadrozny, and Paweł Nicia, for the monograph entitled *Gleby w środowisku przyrodniczym i krajobrazach Europy* [Soils in Natural Environment and European Landscapes]. In addition, a number of members of the Division were honored with prestigious state orders and scientific medals and awards in 2015.

In September, a special conference “Challenges in Molecular Biology, Biophysics and Biomedicine” was held in Warsaw to celebrate the 100th birthday of Prof. David Shugar. The conference was organized by the PAS Institute of Biochemistry and Biophysics and the Department of Physics, University of Warsaw. On this occasion the Michał Oczapowski Medal was conferred upon Professor David Shugar.

The authorities of the Division participated in last year's celebrations of the anniversaries of the Division's research units. In May, 25 years passed since the opening to the public of the Botanical Garden of the Polish Academy of Sciences in Pow-sin. On this occasion, a Garden Festival was held from 15 to 24 May to celebrate the Garden's anniversary, including presentation and summary of its many years of service for science and society. At the request of the Division, the Garden was awarded the Medal of the Polish Academy of Sciences for outstanding contributions with regard to the social role of science.

In May, the Division celebrated the 60th Anniversary of the Institute of Genetics and Animal Breeding in Jastrzębiec; in June – the 60th Anniversary of the Institute of Physiology and Animal Nutrition, and in September – the 60th Anniversary of the Research Station for Ecological Agriculture and Preservation of Native Breeds in Popielno.

MicroRNA signature in human brain tumors and using catalytic nucleic acids for microRNA inhibition

A. Belter | M.Z. Naskręt-Barciszewska | K. Rolle | Institute of Bioorganic Chemistry | Polish Academy of Sciences

Glioblastoma multiforme (GBM) is the most devastating, rapidly growing primary human brain tumor with high morbidity and mortality among patients. The current management of GBM is based on cytoreduction through surgery, followed by radiotherapy and chemotherapy. Patients with glioblastoma fail to achieve long-term survival, which is a result of acquired resistance to chemotherapeutics or radiation. Despite combined modality treatment, GBM recurs and is invariably fatal. The median patient survival is only approximately 6–8 months.

Although recent therapeutic treatment strategies have been progressing toward individualized therapy and many targeted drugs have been investigated, the identification of molecular biomarkers in GBM is still of considerable therapeutic importance. The primary aim of our study was to gain broad information on microRNA expression pattern in malignant gliomas to establish the list of potential biomarkers of GBM, secondary – to find new accurate and specific therapeutic tools for glioblastoma treatment through inhibition of microRNAs.

MicroRNAs are short non-protein coding RNAs, acting as crucial regulators of gene expression of up to 90% of human genes. These tiny RNA molecules tune cell growth, tissue differentiation, cell proliferation, embryonic development, apoptosis, and cellular signaling. Even a slight shift in microRNA level could lead to significant changes of transcriptome, and as a result, of cell phenotype. Many reports have revealed that microRNAs play crucial roles in tumorigenesis, angiogenesis, invasion, and apoptosis in various types of tumors.

We focused on the identification of microRNA expression signatures in malignant gliomas using microRNA microarrays, deep sequencing approach and broad meta-analysis. MicroRNAs that were most frequently deregulated in glioblastoma tissues, as well as in peritumoral areas, were compared with normal human brain (Fig. 1). We identified microRNAs associated with the progression from glioma grade III to glioma grade IV and found 30

novel microRNA biomarkers of glioblastoma and 25 candidate microRNAs associated with malignant glioma progression. Meta-analysis provided a panel of 35 glioblastoma-related microRNAs which can be used as novel biomarkers and potential therapeutic targets for GBM.

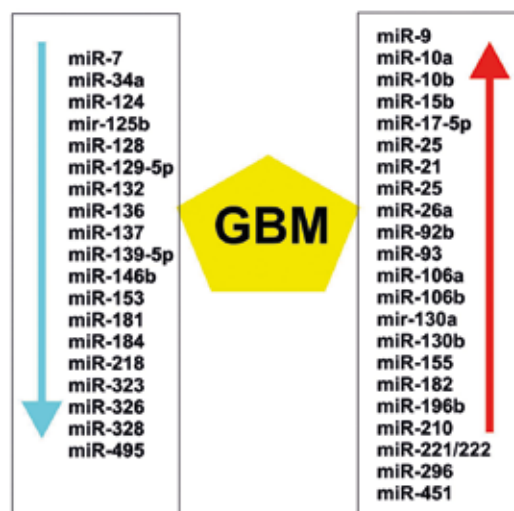


Fig. 1. MicroRNAs consistently deregulated in glioblastoma. The most common overexpressed microRNAs in GBM are shown with an “up” arrow, and downregulated – with a “down” arrow

Since microRNA regulatory potential was observed, we looked for the possibility to regulate the level of microRNAs and their precursors with catalytic nucleic acids such as hammerhead ribozymes and DNAzymes. Previously, these small nucleic acids had been successfully used to inhibit mRNA molecules and regulate their expression. We decided to design catalytic RNAs and DNAs to inactivate these tiny regulatory RNAs.

We developed hammerhead ribozymes and DNAzymes specifically and efficiently cleaving miR-21 and/or its precursors *in vitro* to decrease miR-21 level in the glioblastoma derived cells. The results provide a strong argument that the invasion

of both miR-21 and its precursors with catalytic nucleic acids is possible, thus both mature microRNA and its precursors could be a therapeutic target, and anti-miR-21 ribozymes and DNAzymes are potential tools to reduce miR-21 pool in the cells, silencing respective functions of these oncomiR. Yet even a slight modulation of microRNA profile has great impact on expression of numerous transcripts and thus, on cell phenotype. Indeed, we found that miR-21 depletion with ribozymes and DNAzymes results in a significant increase in PTEN protein, which is a well-known, direct and functional target of miR-21. Previously, it had been shown that inhibition of miR-21 and PTEN upregulation limit cellular proliferation, enhance apoptosis, decrease cell invasiveness, sensitize the chemo- or radiotherapy-

resistant cells to standard treatment. In this work we showed that anti-miR-21 catalytic nucleic acids efficiently decrease miR-21 level in the cells. We postulate that they could be possibly used in the treatment of diseases with elevated cellular miR-21 content, such as brain tumors.

The observation that the expression of many microRNAs in human glioblastoma is boosted and correlates with tumor grade and stage of disease opened new perspectives in GBM prognosis and treatment. We delivered the hammerhead ribozymes and DNAzymes, specifically and efficiently cleaving miR-21 and/or its precursors *in vitro* and decreasing miR-21 level in the glioblastoma derived cells. We demonstrated that anti-microRNA catalytic nucleic acids are a novel terrific arsenal for a specific and ef-

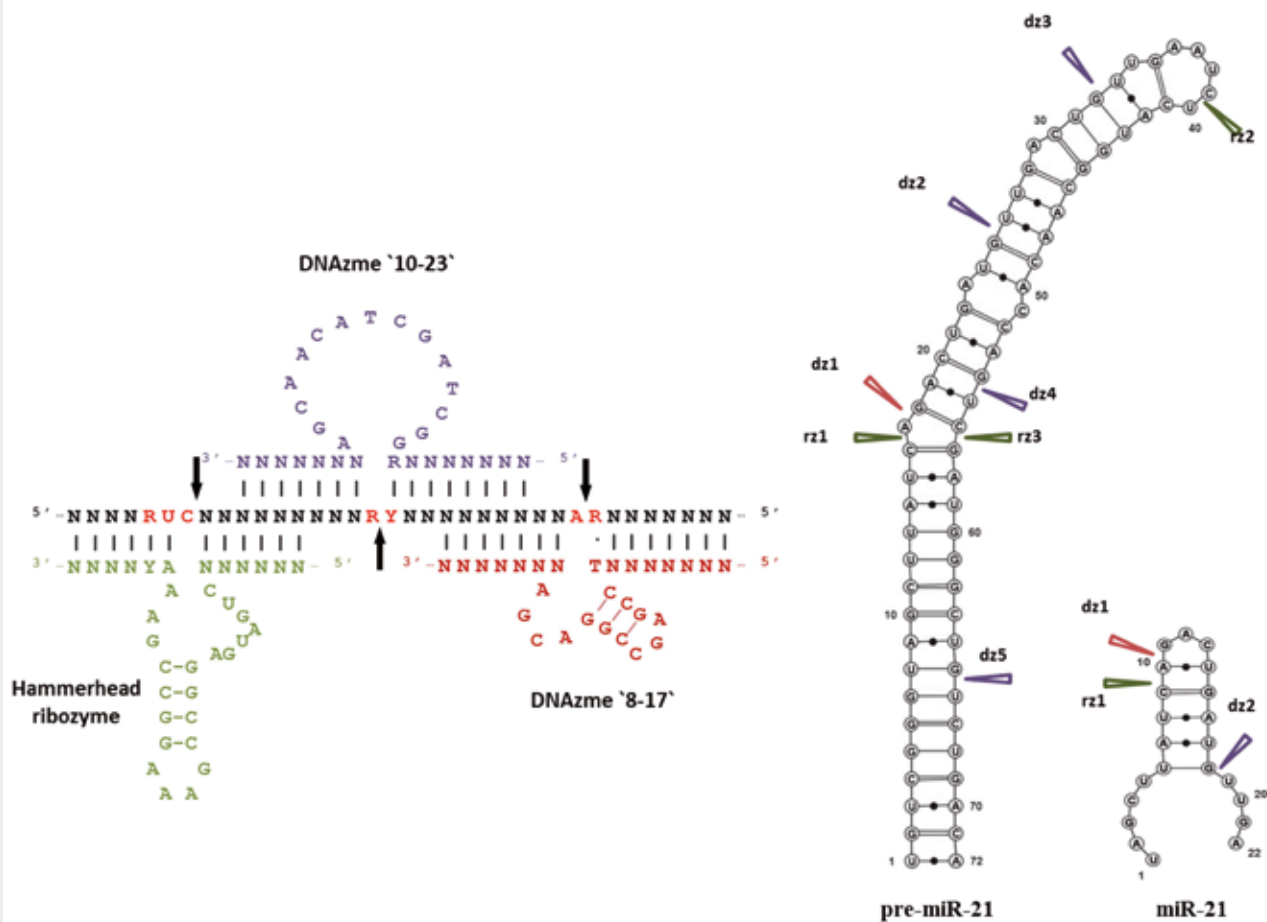


Fig. 2. Secondary structure of anti-miR-21 hammerhead ribozymes, DNAzymes, miR-21 and pre-miR-21. Sites of cleavage with catalytic nucleic acids are marked by arrows. Ribozymes and DNAzymes perform a single intramolecular RNA hydrolysis reaction *in trans*, giving products with a 5'-hydroxyl group and a 2', 3'-cyclic phosphate. The highly conservative ribozyme and DNAzyme catalytic cores are flanked by arms of any sequence. This property allows for a rational design of catalytic nucleic acids for targeting virtually any RNA

fective fight against diseases with elevated cellular miR-21 content such as brain tumors.

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Oxidative stress, iron, and amyotrophic lateral sclerosis

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Amyotrophic lateral sclerosis (ALS) is the most widespread motor neuron disease. It is characterized by a progressive and selective degeneration of neurons in motor cortex and lower motor neurons projecting from the brainstem and spinal cord. In consequence, the disease leads to gradual skeletal muscle weakness, atrophy, and paralysis and it is usually fatal within 2–3 years from the onset. Although ALS is mostly a sporadic disease (sALS) of generally unknown etiology, approximately 10% of ALS cases, defined as familial ALS (fALS), are due to genetic factors. Mutations found within the *SOD1* gene encoding an antioxidant enzyme, superoxide dismutase 1 (SOD1), were the first established genetic cause of ALS and are nowadays estimated to account for up to 20% and 3% of fALS and sALS cases, respectively. Oxidative stress – a condition arising from an imbalance between the production of reactive oxygen species (ROS) and the efficiency of antioxidant de-

fense systems – has been proposed to be implicated in ALS pathogenesis. Animal models of ALS are in vast majority transgenic mice that overexpress mutated human *SOD1* gene. Although in general these models recapitulate accurately human disease, some critical differences exist between the animal and human pathology. An important one concerns an increased enzymatic activity of the SOD1 in some transgenic mice widely used in ALS research, a phenomenon which does not occur in humans. SOD1 is a particular antioxidant enzyme, as it converts the superoxide anion radical ($O_2^{\cdot-}$) to another ROS – hydrogen peroxide (H_2O_2). It seems therefore that the final effect of SOD1 overexpression depends on the balance between the beneficial effects of the $O_2^{\cdot-}$ scavenging and the destructive effects of H_2O_2 production. The toxicity induced by oxidative stress has been reported in both SOD1 null mice and in mice overexpressing human wild-type *SOD1* gene.



4-month-old mouse males hemizygous for the human $SOD1^{G93A}$ transgene exhibit a phenotype similar to ALS in humans – becoming paralyzed in one or more limbs with paralysis due to loss of motor neurons from the spinal cord (right-hand panel). Age-matched transgenic males carrying the normal allele of the human $SOD1$ gene (left-hand panel)

Commonly accepted paradigm of iron dichotomy in biological systems states that iron is essential for the function of many enzymes and thus it is fundamental for most biological life forms, but, on the other hand, it is toxic in excess. Toxicity of iron is usually explained by its ability to induce oxidative stress through the catalysis of the Fenton reaction, leading to the formation of the hydroxyl radical ($\cdot\text{OH}$), a highly destructive oxidant. Both aforementioned ROS interact with iron in the Fenton reaction: O_2^- as a rate-limiting reducing factor for the pre-existing pool of free iron active in the generation of $\cdot\text{OH}$, and H_2O_2 as a factor that directly reacts with ferrous iron to yield this radical.

Misregulation of iron homeostasis in the CNS, which results in the pathological iron accumulation and in increased formation of ROS, is a frequent phenomenon. The elevated amounts of iron deposits have been reported in the brain and spinal cord of ALS patients and mice overexpressing mutated human $SOD1$ gene. Presumably, the most convincing argument supporting pathological involvement of iron accumulation and iron-mediated oxidative stress in the progression of ALS derives from studies showing beneficial effects of iron chelation therapy in transgenic mice overexpressing human mutated $SOD1$ gene. It has been proposed that in

ALS, oxidative stress strongly affects cellular iron balance, leading to iron overload in motor neurons, and thus creates a vicious circle to exacerbate oxidative injury. However, it remains unclear up to what extent $SOD1$ mouse models of ALS reproduce the mechanisms of oxidative stress induction in human pathology. In particular, an intriguing question remains open: how (if at all) the increased $SOD1$ activity observed in the CNS of transgenic $SOD1^{G93A}$ and $SOD1^{G37R}$ mice affects their iron metabolism. Strictly speaking, it is still unclear which iron metabolism dysregulation mechanisms can be considered as a disease-specific (and thus can be used to draw conclusions in humans), and which should be regarded as a secondary, model-associated effect.

In order to clear up this issue, in addition to mice overexpressing human mutated $SOD1^{G93A}$ gene we used two types of control age-matched mice – wild-type mice and mice overexpressing human wild-type $SOD1$ gene. In those mice we compared the expression pattern of iron-related genes in their brain stems, spinal cords, skeletal muscles, and livers. We also determined iron content and distribution in their *gastrocnemius* muscles.

We demonstrate that the overexpression of both $SOD1$ and $SOD1^{G93A}$ genes accounts for a substan-

tial increase in SOD1 protein levels and activity in selected tissues and that not all the changes in iron metabolism genes (for example H-ferritin) expression are specific for the overexpression of the mutated form of SOD1. Importantly, among various analyzed genes, only *Hmox1*, encoding heme oxygenase 1 – an important oxidative stress responder – was found to be induced solely in mice overexpressing human mutated *SOD1* gene and only in tissues known to be affected by ALS. Similarly, iron accumulation in the *gastrocnemius* muscle was also exclusively restricted to mice carrying *SOD1*^{G93A} mutation in the symptomatic stage of disease.

It has been postulated that cytoprotective effect of HO1 requires the co-induction of H-ferritin chain, which limits the pro-oxidant effect of the free iron released from the heme following HO1-mediated enzymatic reaction. Coming back to the concept of the iron-mediated toxicity in ALS, it is tempting to propose that in *SOD1*^{G93A} mice HO1 acts together with ferritin to limit the reactivity of heme-derived intracellular iron.

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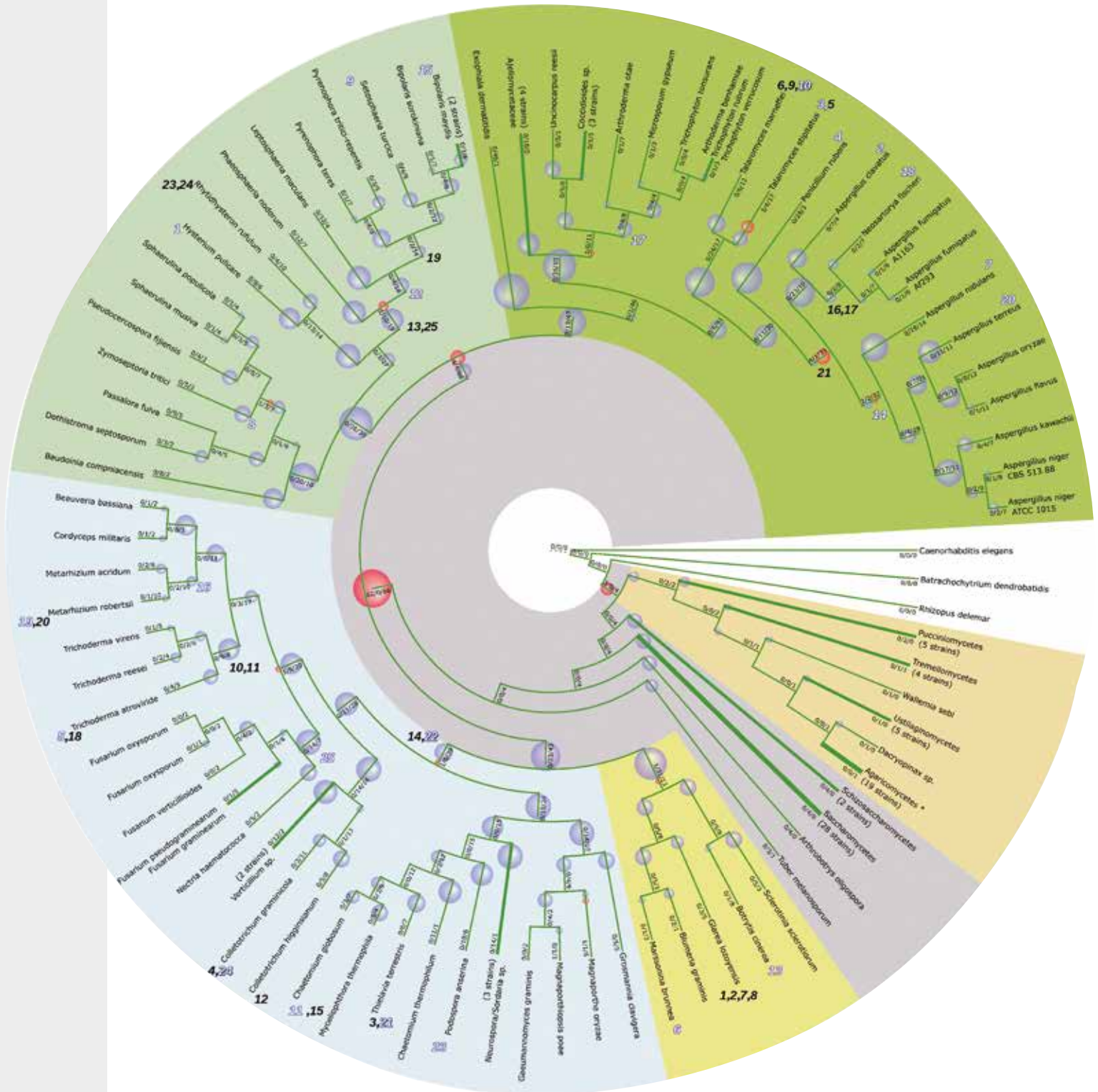
A long film about extinction – describing the history of aromatic polyketide biosynthesis in fungi

G. Koczyk | A. Dawidziuk | D. Popiel | Institute of Plant Genetics | Polish Academy of Sciences

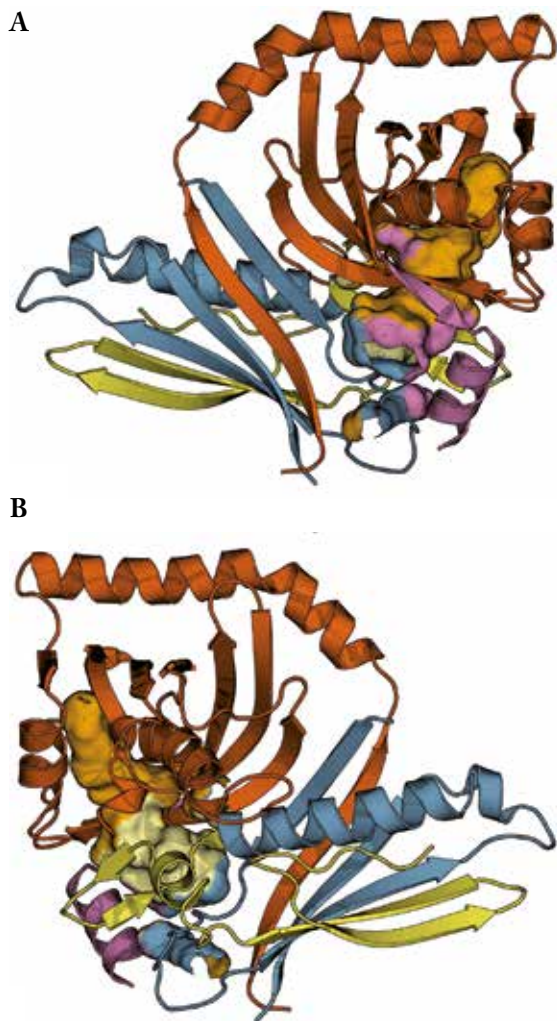
The fungi are among the most prolific metabolite producers in the biosphere. The vast array of bioactive compounds incorporates the major groups of compounds such as alkaloids, polyketides, sesquiterpenes, short peptides of non-ribosomal origins, as well as hybrid metabolites of mixed origin. While a probable conjecture is that the biosynthetic pathways evolved as shunts to take advantage of the excess of primary metabolite building blocks, the origins of biosynthetic diversity in forms of evolutionary events (e.g. speciation, duplication, loss and horizontal transfer) are still largely unexplored. Until recently, the most frequent lines of inquiry were focused on deductive analysis of highly relevant, yet singular scenarios – the fates of particular genes and metabolic clusters associated with biosynthesis of particular metabolites.

Our research focused on the origins of biosynthesis of one of best characterized groups of fungal

secondary metabolites – the aromatic polyketides. By focusing on the evolution of core biosynthetic enzymes (non-reducing polyketide synthases, NR-PKSs), we were able to provide a “phylogenomic roadmap” resource, supporting the ancient origins of this part of secondary metabolism in over 100 fungal genomes. The diverse, yet gapped distribution of different biosynthetic activities in higher fungi is shown to be the effect of duplications which mostly predated the separation of four main classes of filamentous fungi (*Sordariomycetes*, *Leotiomycetes*, *Dothideomycetes*, *Eurotiomycetes*). The initial diversity was subsequently thinned by aggressive selection, moderated in turn by less frequent but non-negligible occurrences of horizontal transfer (supported by reconciling the family history of NR-PKS with the corresponding ancestry of fungal species *en bloc*).



The ancestral duplications, subsequent transfers, and gene losses in the NR-PKS complement annotated on the simplified species tree of higher fungi (Koczyk et al. 2015). Deletions are indicated by violet bubbles, duplications by red bubbles. Transfer events are marked by their respective numbers (filled outlines indicate donors, hollow outlines indicate transfer acceptors). Salient broad taxa within higher fungi are highlighted by colored backgrounds (in clockwise direction: *Basidiomycota*, *Leotiomyces*, *Sordariomycetes*, *Dothideomycetes*, *Eurotiomycetes*)



The fragmentation of PT domain into pieces encoded on different exons facilitates gated access to cyclization chamber in NR-PKSs associated with synthesis of larger compounds (aflatoxins, fusarubins). The structural relationships are visualized in *A. parasiticus* PksA model (PDB: 3HRQ, chain A). The large, filled shape corresponds to the inner surface of cyclization chamber, where all exons contribute to the chamber entrance area. Views from the front (A) and back (B) are both shown

From the mechanistic viewpoint, much of the diversity incurred in evolution from the base building block of aromatic polyketides (orsellinic acid derivatives, synthesized by all higher fungi) has been due to accretion of key classes of accessory enzymes mainly associated with oxidative changes (enoyl-CoA reductases) and molecular polymerisation (laccases). This has been accompanied by rewired transcriptional regulation evidenced in the differential distribution of transcriptional factors in the immediate genomic context of core genes. Notably, our

inquiry into the statistically significant associations within the genomic context was not tied to prior preconceptions of functional role within the biosynthetic process. Thus, we were also able to demonstrate, e.g., the conserved genomic context (housekeeping genes) associated with the present placement of tetrahydroxynaphthalene synthase gene (core NR-PKS associated with biosynthesis of melanins).

A final, yet interesting tidbit pertains to the evolution of polyketide synthase gene structure as related to the NR-PKS protein structure. By analyzing the conservation of splicing sites, we were able to show that product template domain structure associated with synthesis of bulkiest compounds (aflatoxins, fusarubins) is frequently split into discrete pieces encoded on different exons. These pieces all contribute to gating the access to the enzyme's cyclization chamber – hinting that gene structure plasticity facilitates mechanistic requirements.

The images and associated captions included with this report are provided from the paper “The Distant Siblings—A Phylogenomic Roadmap Illuminates the Origins of Extant Diversity in Fungal Aromatic Polyketide Biosynthesis” and are used under the conditions of the Creative Commons Attribution License, which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited. The research was supported by the Polish National Centre for Research and Development (LIDER/19/113/L-1/09/NCBiR/2010) and Polish National Science Centre (SONATA/2011/03/D/NZ2/01435) grants.

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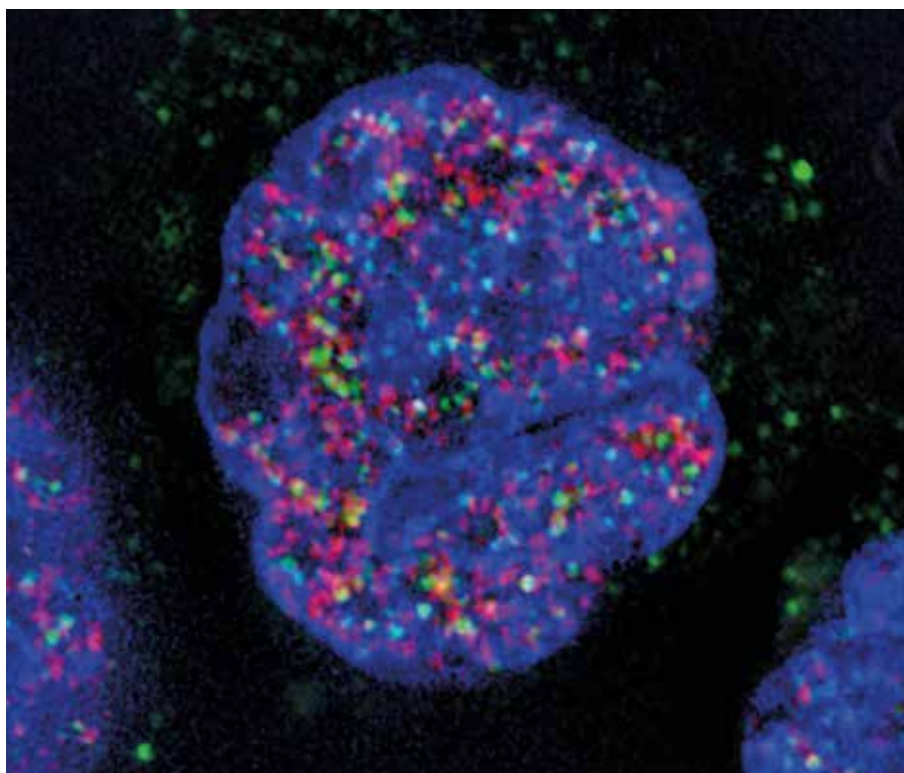
Novel insights into the architecture of the human cell nucleus

G.M. Wilczyński | A. Magalska | P. Trzaskoma | J. Włodarczyk | B. Ruszczycki | Nencki Institute of Experimental Biology | Polish Academy of Sciences

The human genome consists of more than three billion pairs of specific nitrogen bases called nucleotides. Surprisingly, within this pool, genes, i.e. the DNA fragments encoding proteins, constitute less than 2%. Geneticists have long been intrigued with the following riddle: since such a large part of the genetic code is disabled, why replacing just a single nucleotide within it can sometimes lead to the development of a disease? The answer was found by the team of Prof. Yijun Ruan from the Jackson Laboratory for Genomic Medicine (JLGM) in Farmington, USA. This study also included a critical contribution by a group of scientists from the Nencki Institute of Experimental Biology (PAS)

in Warsaw. The results of the study have recently been published in scientific journal “Cell,” the most prestigious journal in the field of biology (impact factor: 32).

The DNA in cells is wrapped around proteins known as histones. Such an arrangement produces chromatin fibers that are responsible for packaging of the genetic material into chromosomes. Based on data obtained with the use of a cutting-edge method of chromatin conformation capture ChIA-PET (chromatin interaction analysis by paired-end tags), the group of Prof. Ruan came to a novel view on the three-dimensional structure of chromatin in the nucleus of human cells. They found that the CTCF



Structured illumination superresolution microscopy demonstrating colocalization of CTCF and RNA Polymerase II

protein, so far functionally associated with chromatin looping and transcription silencing, forms, in fact complexes with RNA Polymerase II the enzyme that actually performs transcription. This meant breaking a long-standing dogma that the two proteins do not have much in common.

The task of the Nencki group was to verify these results in a totally independent way – using a morphological approach, including fluorescence super-resolution microscopy combined with sophisticated FRET (Fluorescence Resonance Energy Transfer) technique. The inventive combination of the two techniques provided an unprecedented insight into the structure of the chromatin with the final resolution of 10 nm, which outperforms the current high-end superresolution methods. The Warsaw group, inspired by Prof. Wilczyński, involved Dr. Adriana Magalska, Paweł Trzaskoma, Prof. Jakub Włodarczyk and Dr. Błażej Ruszczycki. In conclusion, Polish measurements and analyses made it possible to confirm the existence of a relationship between CTCF and RNA polymerase II, both forming adjacent chromatin loops.

This observation might also explain why the replacement of a single nucleotide for another in the inactive fragment of DNA can cause a person to become susceptible to a disease. If a change occurs, for example, within the CTCF protein binding site, it may not be able to form looping. As a result, the proper chromatin loop cannot form, leading to the changes in the geometric conditions in which RNA polymerase II transcribes genes. The above-described data was based on the analysis of human cell lines, i.e., immortalized cancer cells derived from certain individuals. A much more intriguing issue is the large-scale chromatin architecture and its rearrangements occurring in fully differentiated cells as a result of their activity. Recent research performed at the Nencki Institute clearly points to the utmost importance of the large-scale chromatin organiza-

tion in neurons which can influence gene expression, brain function, behavior, and disease.

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Mathematics, Physics, Chemistry and Earth Sciences

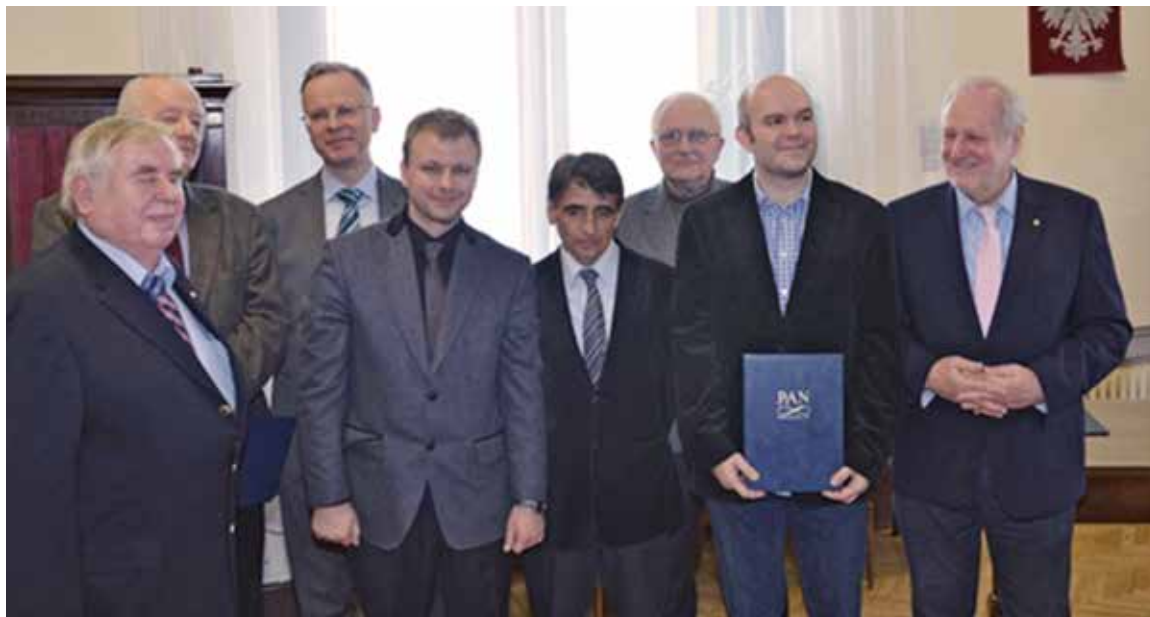
The Academy's Division III covers fundamental activity in such fast-developing areas of science and technology as astronomy, physics, mathematics, chemistry, and Earth sciences. The Division consists of 90 national members of the Academy (52 ordinary members and 38 corresponding members), 53 foreign members, and 9 members of the Polish Young Academy.

Division III coordinates the activity of 19 research institutes with 1,363 researchers (compared to 1,233 in 2014) pursuing fundamental research in domains represented in the Division as well as in various applied research fields. In 2015, the institutes carried out 1,028 research projects. Over the past year, researchers from the Division's institutes published 2,682 papers in refereed journals of international circulation, and the institutes were engaged in editing 15 scientific journals. Fifteen of the institutes affiliated with the Division are authorized to confer doctorate (PhD) degrees, while fourteen may confer *habilitation* (DSc) degrees. The institutes run their own four-year postgraduate studies leading to PhD degrees, or participate in such programs conducted by local universities. Scientists from the institutes are also engaged in teaching and joint research programs in collaboration with neighboring universities.

The scientific committees affiliated with the Division, encompassing 456 members, are as follows: the Committee on Analytical Chemistry, Committee on Astronomy, Committee on Chemistry, Committee on Crystallography, Committee on Geographical Sciences, Committee on Geological Sciences, Committee on Geophysics, Committee on Maritime Research, Committee on Mathematics, Committee on Mineralogical Sciences, Committee on Physics, and Committee on Quaternary Research. Acting as bodies representing the entire scientific community, these committees express scientific opinions, discuss research priorities, and are engaged in organizing scientific events and publishing journals. Certain committees associated with the Division play the role of National Committees within the scope of their disciplines and represent the Polish scientific community among corresponding international scientific organizations. The institutes and committees of Division III are involved in publishing numerous scientific journals: *Acta Physica Polonica A*, *Artificial Satellites – Planetary Geodesy* in the domain of astronomy and physics, *Biotechnologia* [Biotechnology] in the domain of chemistry, *Fundamenta Mathematicae*, *Studia Mathematica*, *Acta Arithmetica*, *Colloquium Mathematicum*, *Annales Polonici Mathematici*, *Bulletin of the Polish Academy of Sciences – Mathematics*,



From left: Prof. Paweł Rowiński (Vice-President of the Polish Academy of Sciences), Prof. Janusz Jurczak (ordinary member of the Academy), Prof. Jerzy Duszyński (President of the Polish Academy of Sciences), Prof. Roman Micnas (corresponding member of the Academy)



From left: Prof. Roman Micnas (corresponding member of the Academy), Prof. Stanisław Massel (ordinary member of the Academy), Prof. Paweł Rowiński (Vice-President of the Polish Academy of Sciences), Asst. Prof. Tomasz Sowiński (laureate of the Stefan Pieńkowski Award in 2015), Prof. Władysław Dąbrowski (laureate of the Maria Skłodowska-Curie Award in 2015), Prof. Janusz Jurczak (ordinary member of the Academy), Asst. Prof. Witold Bednorz (laureate of the Waclaw Sierpiński Award in 2015), Prof. Jerzy Duszyński (President of the Polish Academy of Sciences)

and *Dissertationes Mathematicae* in the domain of mathematics, as well as *Acta Geophysica*, *GeoPlanet: Earth and Planetary Sciences Series*, *Oceanology*, *Studia Quaternaria*, and *Acta Geologica Polonica* in the domain of Earth sciences.

In 2015, Division III continued to be engaged, directly or via its Committees, in the promotion of gifted high school and university students. The International PhD Studies established at Division III in 2000 continued to operate in 2015. The Division's institutes actively participated in various projects under the European Union Framework Programme.

Two plenary sessions of Division III were held in 2015. At the first, on 27 March, Prof. Karol Grela, Polish organic chemist, delivered an invited lecture on "Catalytic olefin metathesis reaction: a modern method of synthesis and its prospects in the production of pharmaceuticals." On 5 November, an invited lecture: "The general theory of relativity and its contemporary applications," was presented by Prof. Marek Demiański from the Faculty of Physics, University of Warsaw. The topic was related to the 100th anniversary of the formulation of the general theory of relativity by Albert Einstein; through this lecture, the Academy joined the global celebration of the General Relativity's Centennial. Members of

the Division were briefed about this year's Nobel Prizes in physics and chemistry. An invited presentation on the Nobel Prize in physics in 2015 was given by Prof. Ewa Rondio from the National Center for Nuclear Research. She discussed the discovery of Prof. Takaaki Kajita and Prof. Arthur B. McDonald, who proved that neutrinos have mass. Prof. E. Rondio presented the process of observation of neutrinos and the discovery of their oscillations. A significant contribution of Polish physicists to this discovery was indicated. Finally, Prof. M. Jeżabek, Director of the PAS Institute for Nuclear Research, informed about the opening of the Bronowice Cyclotron Centre, which is engaged in the application of cyclotrons in scientific research and tumor radiotherapy.

In keeping with tradition, the Division granted its annual prizes in 2015. The prestigious Maria Skłodowska-Curie Award in physics was bestowed upon Prof. Władysław Dąbrowski from the Faculty of Physics and Applied Informatics, University of Science and Technology in Kraków, for his outstanding contribution to the development of the physics of semiconductor detectors with applications for research in elementary particle physics, solid state physics, neurobiology, biology, and cultural heritage.

The Division III research awards were also conferred. The Waclaw Sierpiński Award in mathematics was given to Asst. Prof. Witold Bednorz from the PAS Institute of Mathematics for a series of papers devoted to the solution of Michel Talagrand's hypothesis, called the Bernoulli conjecture, and for setting equivalent conditions on restrictions of important class of stochastic processes – the Bernoulli processes. The Stefan Pieńkowski Award in physics and astronomy went to Dr. Tomasz Sowiński from the PAS Institute of Physics for a series of papers on the applications of the Hubbard model for description of ultracold atomic gases in optical lattices. The Włodzimierz Kołos Award in chemistry was received by Asst. Prof. Dawid Pinkowicz from the Department of Chemistry, Jagiellonian University, for a set of papers dealing with magneto-structural correlations in new, multifunctional magnetic materials based on molecules. The Maurycy Pius Rudzki Award in Earth sciences was given to Dr. Beata Szymczycha from the PAS Institute of Oceanology in Sopot for a series of papers on assessing the impact of the load of chemicals together with ground waters on the ecosystem of the Gulf of Puck, but also the whole of the southern Baltic and extrapolating the results on the Baltic Sea. The awards ceremony took place on 8 December 2015, with the participation of the President of PAS.

In 2015, members of the Division were frequently commended and honored for outstanding achievements in science. Prof. Stanisław Penczek received the prestigious Prize of the Foundation for Polish Science in the field of chemical and material sciences for elaboration of the theory of ring-opening polym-

erization and its use for synthesis of biodegradable polymers. Prof. Piotr Bizoń was awarded with the Prize of the Prime Minister of Poland for outstanding scientific achievements and he also received the Humboldt Research Prize. Honorary doctorate was granted to Prof. Mieczysław Mąkosza by the Warsaw University of Technology. Prof. Lechosław C. Latos-Grażyński received the Maria Skłodowska-Curie and Wilhelm Klemm Lectureship Award of the German and the Polish Chemical Society. Prof. Henryk Szymczak was awarded the Marian Smoluchowski Medal of the Polish Physical Society. Prof. Andrzej Witkowski was awarded the Officer's Cross of the Order of Polonia Restituta by the President of Poland. Prof. Andrzej L. Sobolewski became member of the National Science Center. Prof. Paweł Kulesza was Chairman of the Department of Electrochemistry of the Electrochemical Society and became member of the Board of Directors (top management) of the Electrochemical Society. Prof. Wiesław Pleśniak was honored with the Individual Prize of I rank of the Rector of the Jagiellonian University. Prof. Tomasz Dietl became ordinary member (Fellow) of the American Physical Society. Prof. Zbigniew Galus was elected honorary president of the Polish Chemical Society. Prof. Bogdan Marciniec received the honorary Tadeusz Sendzimir Medal. Prof. Henryk Iwaniec was awarded the Shaw Prize in Mathematical Sciences, as well as the Stefan Banach Medal conferred by the Presidium of PAS. Professors: Paweł Rowiński, Aleksander Guterch, Janusz Pempkowiak, and Krzysztof Birkenmajer were awarded the Badge of Honor "Bene Merito" by the Minister of Foreign Affairs.

Direct tracing of damage evolution in an eighteenth-century commode

L. Krzemień | M. Łukomski | M. Strojcecki | Haber Institute of Catalysis and Surface Chemistry | Polish Academy of Sciences

Experts of the Haber Institute of Catalysis and Surface Chemistry (PAS) and Conservation Department of the Victoria and Albert Museum in London carried out a long-term condition assessment of a French commode, dated 1760–1765, displayed

in the Museum's Furniture Gallery. The commode is an exquisite example of luxury European Rococo furniture, in which original Japanese lacquer panels, obtained from Japanese screens or cabinets, were re-used as thin sheets to decorate new furniture.

The condition of concern in this case was substantial debonding of the lacquer sheets and the risk of progressing physical damage in the complex multi-layered structure of the piece, induced by variations of relative humidity in the gallery. Two instrumental techniques, acoustic emission (AE) analysis and digital speckle pattern interferometry (DSPI), were used to monitor with precision micro-crack propagation in the construction and debonding of the lacquer panels.

AE is defined as the energy released due to physical damage in a structure experiencing stress due to some deterioration mechanism. Energy passes through the material as ultrasound and sound waves and is detected on the surface by a microphone which converts the surface vibration to an electrical signal. The technique is non-invasive, continuous, economically viable, and capable of operating in real-world conditions in museums and historical buildings. The Institute's team successfully used the technique to trace the fracturing intensity in wooden sculptures or furniture endangered by variations of temperature and relative humidity in historical churches and museums. For the monitoring of the commode, the microphones recording AE were mounted inside the piece near existing cracks (Fig. 1). Comparing the signals at two points and frequency filtering allowed even very low levels of physical damage to the commode to be detected in spite of the high background noise typical of the museum environment.

In turn, the DSPI technique makes use of speckles – a granular pattern of light and dark – produced



Fig. 1. An AE sensor located close to the tip of an existing crack at the wall of the commode which is the area most at risk of climate-induced fracturing

whenever a rough surface is illuminated by a laser light. The equipment needed is portable and the method is capable of mapping displacements of surface decorative layers – polychrome, gilding or lacquer – to a fraction of a micrometer (Fig. 2). Damage areas can be traced at an incipient stage and the technique is precise and repeatable enough to follow the defect development between subsequent condition surveys. The Institute's research group has considerable experience in using DSPI to diagnose damage of the pictorial layers in paintings.



Fig. 2. Digital speckle pattern interferometry system used to diagnose damage areas in the lacquer layer of the commode – the investigated field is illuminated by a laser beam

The DSPI measurements of the preservation state of the reference areas on the surface of the commode performed at the interval of one year did not reveal any signs of damage development. Since areas particularly damaged or prone to damage development were selected as the reference areas, the conclusion is that the surface as a whole was not affected by the environmental conditions in the gallery. Also, the amazing sensitivity and reproducibility of the AE sensors in detecting extremely small signals enabled determining that the commode's damage during one year was not more than 0.2 mm of the crack propagation.

The general conclusion from the long-term study was that the climatic conditions in the gallery practically did not produce any new flaws in the

wooden structure and the surface lacquer layers of the commode feared by the conservators. The study also showed that techniques of direct tracing damage in historic objects have a considerable potential in the assessment of climatic control strategies in museums, so that the desirability of the collections' preservation is optimally reconciled with the need to control the investment and energy costs of climate control systems.

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Achievements of the Institute of Geophysics in the field of Arctic research and education

M. Majdański | Institute of Geophysics | Polish Academy of Sciences

The Institute of Geophysics supports integration of international research in the Arctic. Stanisław Siedlecki Polish Polar Station in Hornsund is part of a multidisciplinary laboratory for polar research (PolarPOL), which is included in the Polish roadmap of research infrastructure. It is a base for wide international cooperation in Arctic research led by the PAS Institute of Geophysics. This laboratory consolidates scattered scientific community interested in Arctic studies and strengthens the role of Polish researchers in the international polar society.

In recognition of its role in polar research, the Polish Polar Station was invited to join the SIOS project founded by EU under INFRA 2.2.3 program in 2015. The Svalbard Integrated Arctic Earth Observing System (SIOS) is a collaborative project that coordinates and supports actions for the development of research infrastructures. The main aim of

the project is establishing an Arctic Earth Observing System in and around Svalbard. The system would integrate and complement existing research and monitoring platforms for geophysical, biological, and chemical studies.

The Institute is also part of the AWAKE-2 project (Arctic Climate system study of ocean, sea ice and glacier interaction in Svalbard area), financed by the EU and Norway. Its objective is to explain the interactions between the main components of the climate system in the Svalbard area – ocean, atmosphere, and ice – in order to identify mechanisms of inter-annual climate variability and long-term trends.

Being one of the cofounders of the Centre for Polar Studies, the Institute of Geophysics has been granted the status of Leading National Research Centre (KNOW). It is the highest honor for a scientific organization in Poland, and the first-ever awarded in the field of the Earth sciences.

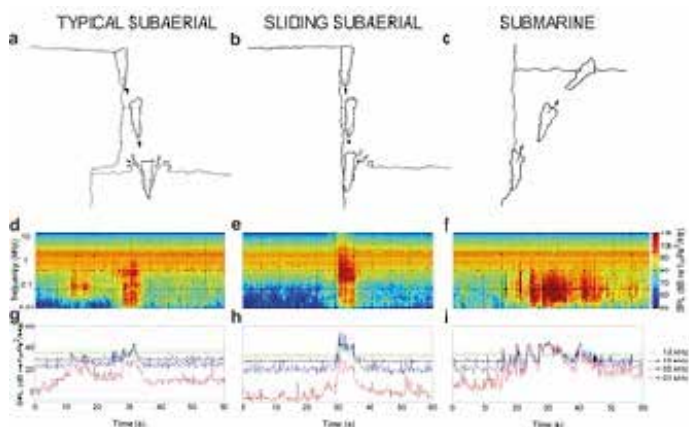


Fig. 1. Sketches of different calving modes with ambient noise spectrograms (after Głowacki et al., 2015 *Geophysical Research Letters*, 42, 804–812)

A basic assumption of the activity of Centre for Polar Studies is being open to a wide domestic and international co-operation with leading research and educational centres for interdisciplinary and specialized polar studies. In 2015 a second recruitment for the Interdisciplinary Polar Studies took place. Several high-quality candidates for the PhD program were admitted, among them foreigners. All lectures and classes are held in English, which increases the international significance and prestige of the program.

One of the most important achievements published in 2015 was the analysis of the Hans glacier calving in Hornsund fiord, Spitsbergen. This paper presents a joint analysis of underwater seismic records with high resolution time-lapse photography of the glacier's head, proving a direct dependence

between different types of calving and generated acoustic energy (Fig. 1). This information allows for using acoustic observations to track the calving processes precisely. This revelation has been widely commented among scientific community and in international media (e.g., BBC, US National Public Radio, Discovery News, DailyMail).

2015 was the final year of the EDUSCIENCE project “Increasing school pupils’ competence in the field of mathematics and natural and technical sciences with the application of innovative methods and technologies.” It was the largest innovative project realized in the field of natural sciences, financed by the EU within the scope of European Social Fund. The project aimed at encouraging school pupils to participate in the process of factual research, to observe the world around them, to ask questions independently and seek answers by applying research methods at their schools. It based on the natural openness of young people to technical innovations and information technology. EDUSCIENCE provided pupils with state-of-the-art tools that they could use in their school work and in the development of their own personality. By involving specialists in modern teaching methods, the project helped students to learn in an enjoyable and, above all, efficient manner. During the project, a large amount of free, open educational materials and an e-platform for teachers have been prepared to develop a new approach for teaching science, enhance students’ skills of recognising and specifying research problems, develop skills in the use of information and computer technologies, and increase girls’ interest in mathematics and science. The project resulted in the invitation of the Institute of Geophysics to European Project Scientix as



Examples of activities realized during EDUSCIENCE project (after EDUSCIENCE portal, <http://www.eduscience.pl/>)

a national contact point. Scientix strengthens the European collaboration of science teachers and the development of innovative methods in educational process.

In 2015, the Institute of Geophysics continued “Geophysics at School,” a proprietary educational project run by young scientists. The aim of this initiative is to popularize knowledge of geophysical issues, geography, geology, and physics among young people in primary, junior, and upper high schools. During special classes at schools and in the observatories in Świdler and Belsk, the researchers and PhD students share their knowledge in a language adjusted to the young audience. In 2015, the following topics were proposed: “Continental drift,” “Is it possible to pre-

dict an earthquake?,” “Where do clouds come from?,” “Why do mountains grow?,” and many more.

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Simons Semesters in Banach Center

F. Przytycki | Institute of Mathematics | Polish Academy of Sciences

In 2015, the PAS Institute of Mathematics won the Simons Foundation Advancing Research in Basic Science and Mathematics Award in the competition Targeted Grants to Institutes in Mathematics and Physical Sciences. The project is to be run in 2015–2019 (extendable by 3–5 years). The program entitled “Simons Semesters in Banach Center” is supported financially by the Simons Foundation and the Polish Ministry of Science and Higher Education. The program consists of 2- to 4-month-long semesters, two or three in a year. They comprise courses, schools, and workshops conducted by senior and junior international leaders, with participation of master and PhD students as well as postdocs from Poland and from abroad, offering tutoring and joint research. Large program conferences will be held in Będlewo – the Institute’s Research and Conference Center.

This is the first Simons Foundation grant in Central-Eastern Europe. In 2015 edition, other winners were Tata Institute (India), Galileo Galilei Institute for Theoretical Physics (Florence, Italy), International Centre for Mathematical Research, Beijing University. Altogether, 20 grants of this type have been awarded until 2015. The program is intended to financially support centers of excel-

lence in mathematics and physical sciences in order to help to establish scientific culture and strengthen contacts within the international scientific community. The aim is to enable institutes to extend and enhance their mission; the program will typically not provide primary support for operating or establishing an institute. The Simons Foundation, created in 1994 by Jim and Marilyn Simons, also awards individual grants and supports activities of



From left: Feliks Przytycki – Director of the Institute of Mathematics, Paweł Rowiński – Vice-President of the Polish Academy of Sciences, Kenneth Wetzel – Attaché for Cultural Affairs, USA Embassy in Warsaw



Participants of a Simons Semester workshop in September 2015

the Simons Institute for the Theory of Computing at the University of California at Berkeley, Simons Center for Data Analysis at New York City, as well as autism research (SFARI).

The Banach Center is part of the PAS Institute of Mathematics. It creates unique possibilities for mathematicians from around the globe to participate in scientific meetings such as conferences, workshops, research groups, forums of various subjects of mathematics, the Banach Center Colloquiums – lectures given by the top specialists in a field (co-organized with the Polish Mathematical Society), and instructional lectures for graduate students. The Banach Center publishes series of proceedings – Banach Center Publications.

The first semester within the program “Simons Semesters in Banach Center,” entitled “Dynamical Systems,” already took place in September–December 2015. It was organized by Krzysztof Barański, Piotr Gałazka, Mariusz Lemańczyk, Feliks Przytycki and Michał Rams. Its main topics were: analysis and holomorphic dynamics, fractals and methods of geometric measure theory, topics in smooth dynamics, Ergodic theory.

More than 80 researchers from over 20 countries participated in the first edition of the program. It

encompassed the following conferences and workshops:

- “Topics in Analysis and Holomorphic Dynamics” (workshop), Warsaw, 15–19 September;
- “Fractal Geometry and Dynamics,” Będlewo, 12–16 October;
- “Ergodic Theory of Dynamical Systems/Transition Surfaces and Dynamics,” Będlewo, 22–28 November.

Numerous mini-courses were delivered during the first semester:

- François Berteloot (Université Paul Sabatier, Toulouse): *Bifurcations, Currents and Equidistribution phenomena in holomorphic dynamics*;
- Peter Haïssinsky (Université Paul Sabatier, Toulouse): *Some topological characterizations of rational maps and Kleinian groups*;
- Davoud Cheraghi (Imperial College, London): *Rigidity, near parabolic renormalization, and indifferent fixed points in complex dynamics*;
- Károly Simon (Budapest University of Technology and Economics): *Dimension Theory of self-affine and almost self-affine sets and measures/ Fractal percolation*;
- Antti Käenmäki (Jyväskylä University): *Dynamics of the scenery flow and conical density theorems*;

- Alexander Olevskii (Tel Aviv University): *Fourier quasicrystals*;
- Marco Martens (SUNY, Stony Brook): *Henon Renormalization*;
- Zoltán Buczolich (Eötvös Loránd University, Budapest): *Kakutani-Rokhlin towers, rotations, ergodic averages*;
- François Ledrappier (University of Notre Dame/CNRS): *Local Limit Theorem in negative curvature*;
- Mark Pollicott (University of Warwick): *Ergodic theory of hyperbolic flows*;
- Lorenzo Díaz (PUC, Rio de Janeiro), Anton Gorodetski (University of California, Irvine): *Non-hyperbolic Ergodic Measures*;
- Pierre Berger (CNRS, Paris 13): *Differentiable dynamics near and far from homoclinic bifurcations*;
- Yanqi Qiu (Aix-Marseille Université): *The Theory of Determinantal Point Processes*;
- Jörg Schmeling (University of Lund): *Dimensional aspects in smooth dynamical systems*.

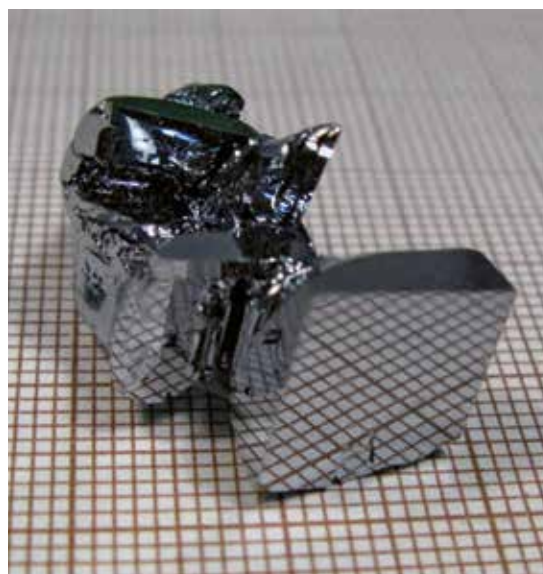
The upcoming semesters within the Simons program at Banach Center will cover the following themes: Algebraic Geometry (Spring 2016), Non-commutative Geometry (Fall 2016), Cross-field PDE (Winter 2017), Complex Analysis and Functional Analysis (Spring 2017), Symmetry and Geometric Structures (Fall 2017).

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Controlling topological materials

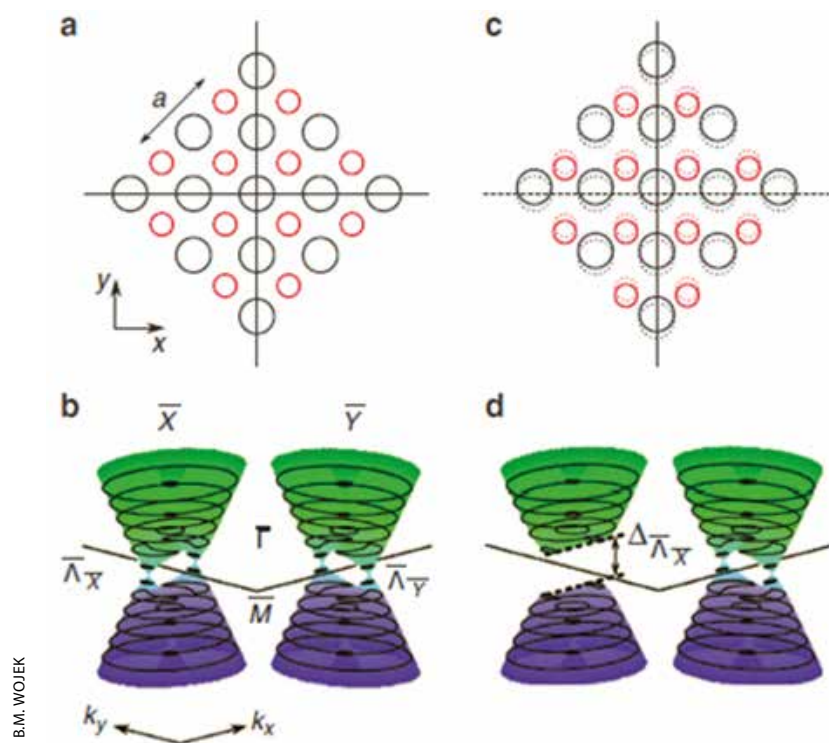
T. Story | P. Dziawa | B.J. Kowalski | A. Szczerbakow | Institute of Physics | Polish Academy of Sciences
O. Tjernberg | B.M. Wojek | M.H. Berntsen | V. Jonsson | KTH Royal Institute of Technology,
Kista, Sweden

In condensed matter physics, two main classes of crystalline electronic materials are distinguished – insulators (with semiconductors) and metals (with semimetals). The key physical factor is the energy gap for electronic excitations; it is present in insulators and semiconductors, but absent in metals and semimetals. At very low temperatures, insulators possess zero electrical conductivity, whereas metals remain good conductors. Recently, a new class of materials – topological insulators – has been theoretically and experimentally discovered. In these quantum materials, insulating properties of the bulk crystal are accompanied by topological metallic boundary states. Such topological materials constitute a new class of quantum electronic systems on the surface of bulk crystals (3D topological insulators, like Bi_2Te_3 or Bi_2Se_3) and on the edges of layered heterostructures (2D topological insulators, like HgTe - CdTe quantum wells). Electronic states of unique properties are observed in those materials. The energy spectrum of topological states is metallic (no energy gap) with lin-



$\text{Pb}_{0.77}\text{Sn}_{0.23}\text{Se}$ bulk monocrystal grown by self-selecting vapor growth (SSVG) method. Mirror-like surfaces visible at the front are natural (001) facets of the crystal of rock-salt structure hosting topological crystalline insulator electronic states

A. SZCZERBAKOW



The allocation of anions and cations at the surface of $\text{Pb}_{1-x}\text{Sn}_x\text{Se}$ (001) crystals for cubic rock-salt crystal structure with two (110) mirror symmetry planes (2a) and distorted crystal structure with just one mirror plane (2c). Figures 2b and 2d present four Dirac cones illustrating the linear energy dispersion relation $E(k_x, k_y)$ for 2-dimensional electronic topological states with metallic energy spectrum (no energy gap, 2b) in cubic lattice and the state with energy gap for only one pair of Dirac cones (2d) in distorted lattice

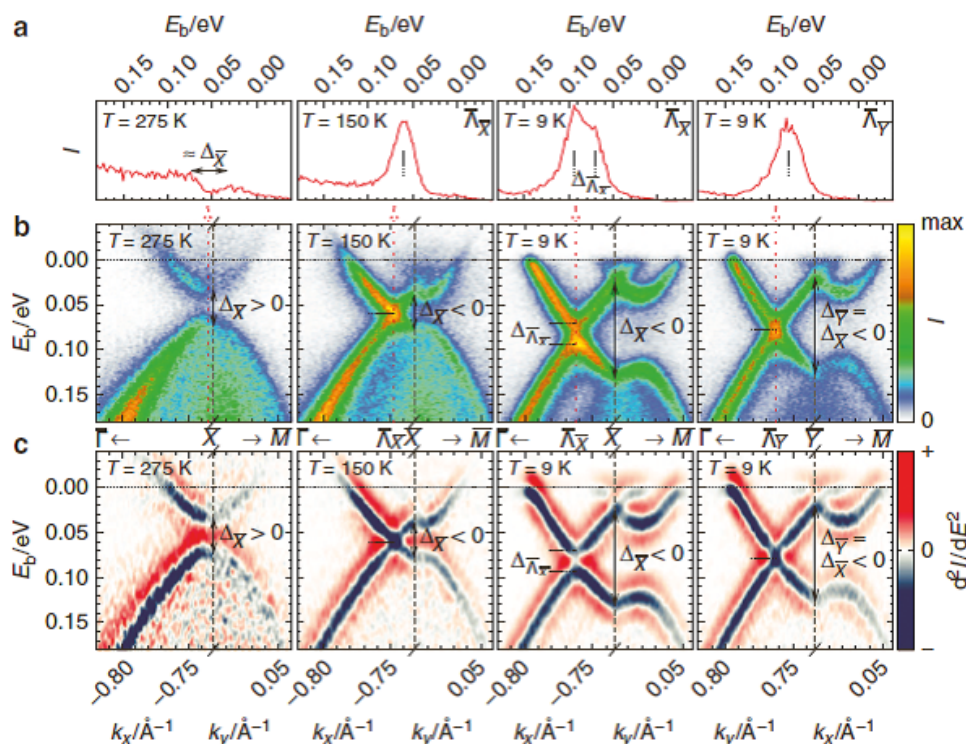
ear Dirac-like energy dispersion (similarly to relativistic massless Dirac electrons) and spin-momentum locking (helical spin texture). Topologically nontrivial properties are encountered in materials in which the inverted band ordering is induced by strong relativistic effects; the time-reversal symmetry warrants the topological protection of the surface or the edge states. In the case of 2-dimensional topological systems, electron backscattering processes are forbidden and perfectly quantized electrical conduction along 1-dimensional edge channels is observed. The strong relativistic coupling of orbital and spin degrees of freedom of electrons in topological materials offers qualitatively new method for generation of spin currents – a key task of semiconductor spintronics.

Among topological materials, IV–VI semiconductors constitute a unique class. In these crystals, the band inversion takes place in an even number of energy valleys (four L-points in the Brillouin zone). They were initially identified as topologically trivial under the basic Z_2 topological classification. Topological crystalline insulators (TCI) are a new group of topological materials with the Dirac-like metallic surface states crossing the semiconductor band gap and exhibiting a characteristic helical spin polarization. In contrast to canonical topological insulators, the surface states in the TCI materials are topo-

logically protected not by time-reversal symmetry, but by crystalline mirror-plane symmetry. The TCI states were experimentally found at the surface of IV–VI semiconductors with the pioneering work on $\text{Pb}_{1-x}\text{Sn}_x\text{Se}$ crystals carried out in 2012 at the PAS Institute of Physics.

An international team of physicists led by Prof. Tomasz Story from the PAS Institute of Physics and Prof. Oscar Tjernberg from the KTH Royal Institute of Technology (Sweden) investigated these surface electronic states by angle-resolved photoemission spectroscopy (ARPES) using the highest quality bulk $\text{Pb}_{1-x}\text{Sn}_x\text{Se}$ monocrystals grown in Poland and the state-of-the-art laser ARPES facility in Sweden. Based on ARPES spectroscopic observations the composition–temperature–deformation topological phase diagram of $\text{Pb}_{1-x}\text{Sn}_x\text{Se}$ was constructed.

As in the TCI materials, the topological protection of surface Dirac states is warranted by crystal symmetry. Breaking this symmetry is expected to open an energy gap in metallic spectrum of Dirac states. In this way one can control the topological states and current flow in future topological devices. After the first experimental evidence from the scanning tunneling microscopy (STM) differential conductivity measurements, the modification of the topological phase diagram brought about by crys-



The ARPES photoemission spectra of $\text{Pb}_{1-x}\text{Sn}_x\text{Se}$ (001) monocrystals revealing the surface band structure $E(k)$. Depending on temperature, Sn content and crystal deformation, either topologically trivial band insulator or topological crystalline insulator state is observed with two or four Dirac electron cones

tal distortion was experimentally found in ARPES studies by the Swedish–Polish team. It was shown that in the topological region of the phase diagram, one observes either all four Dirac cones expected from theory (full cubic symmetry) or only two cones if symmetry is lowered by a specific crystal distortion. In contrast to wavevector-integrated information provided by the STM experiments, the ARPES studies directly test the effect of distortion on electronic surface states in different parts of the Brillouin zone.

These experimental observations open a new field of research with topological states controlled by changing the band structure parameters, by strain engineering as well as by application of out-of-plane magnetic or electric field. Tuning the gap in the energy spectrum of topological surface states is expected to directly influence the performance of thermoelectric, infrared, terahertz as well as electronic devices, such as the topological field effect transistor. Nowadays, the field of topological materials rapidly expands towards new electronic 1-, 2- and 3-dimensional systems (Dirac and Weyl semimetals, transition metal oxides, semiconductor superlattices), as well as

into various other branches of physics, e.g., photonics, acoustics, magnetism, and superconductivity.

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Engineering Sciences

At the end of 2015, the Academy's Division IV (Engineering Sciences) had 72 national members (39 ordinary and 33 corresponding) as well as 37 foreign members. In the past year the Division bid a final farewell to those who passed away; one of its ordinary members, Prof. Kazimierz Thiel, one corresponding member, Prof. Edmund Małachowicz, and one foreign member, Prof. Dietrich Wolf.

Two plenary meetings of Division IV were held in 2015 at the Institute of Biocybernetics and Biomedical Engineering in Warsaw. The spring plenary session was convened by the Dean of Division IV on 9 April. The main objective of this assembly was election of the Committee Members of Division IV Awards. The chairs of the various award subcommittees were elected as follows: Prof. Władysław Włosiński (general), Prof. Zenon Mróz (A: Mechanics), Prof. Wiesław Woliński (B: Electronics and Information Technology), Prof. Ryszard Pohorecki (C: Process Engineering), and Prof. Piotr Korcelli (D: Architecture and Civil Engineering). Attendees

of the spring session could also listen to presentations of research and projects by the newly elected corresponding members of the Academy: Prof. Bożena Kostek (Gdańsk University of Technology) – *Application methods of soft computing* and Prof. Stefan Kowalski (Poznań University of Technology) – *Hybrid techniques of drying of biological materials*.

The autumn session, in turn, was held on 5 November, also at the PAS Institute of Biocybernetics and Biomedical Engineering. On this occasion, the debate concentrated on approving candidates to receive the Division's research awards. The chairs of various award subcommittees selected and presented six candidates. After discussion and voting, the awards were bestowed on the following individuals: Asst. Prof. Magdalena Piasecka from Kielce University of Technology for a set of publications under the general title *Analysis of heat transfer at boiling on smooth heating surfaces*, Asst. Prof. Jacek Rąbkowski from Warsaw University of Technology for a set of papers on *SiC semiconductor power devices*



The conferral ceremony for the Division IV Scientific Awards. From left: Asst. Prof. Sebastian Deorowicz (Silesian University of Technology), Asst. Prof. Arkadiusz Kwiecień (Cracow University of Technology), Peter Baudrexl (CEO of Siemens Sp. z o. o.), Dr. Justyna Szadzińska (Poznań University of Technology), Asst. Prof. Magdalena Piasecka (Kielce University of Technology), Anna Tascher (Director of Corporate Communications and Marketing of Siemens Sp. z o.o.), Prof. Władysław Włosiński (Chair of the Division IV Scientific Awards Committee), Prof. Elżbieta Frąckowiak (Vice-President of the Polish Academy of Sciences), Prof. Antoni Rogalski (Dean of Division IV), Prof. Krzysztof Malinowski (Chair of the Council of Provosts of the Division IV), Asst. Prof. Karol Malecha (Wrocław University of Technology), Asst. Prof. Jacek Rąbkowski (Warsaw University of Technology)

M. MLEKICKI



J. OSTAŁOWSKI

From left:
Asst. Prof. Karol Malecha (Wrocław University of Technology), Asst. Prof. Sebastian Deorowicz (Silesian University of Technology), Dr. Justyna Szadzińska (Poznań University of Technology), Asst. Prof. Jacek Rąbkowski (Warsaw University of Technology), Asst. Prof. Magdalena Piasecka (Kielce University of Technology), Asst. Prof. Arkadiusz Kwiecień (Cracow University of Technology), winners of Division IV Scientific Awards

in energy electronics, Asst. Prof. Sebastian Deorowicz from Silesian Technical University for a set of fourteen papers concerning compression methods and adjusting of genomic sequences, Asst. Prof. Karol Malecha from Wrocław University of Technology for his habilitation (DSc) thesis *Technology and applications of ceramic-polymer modules in technique of fluid microsystems*, Dr. Justyna Szadzińska from Poznań University of Technology for her PhD dissertation *The convection drying efficiency in the cyclic conditions*, and Asst. Prof. Arkadiusz Kwiecień from Cracow University of Technology for a set of sixteen publications and three patents under the general title *Polymer flexible connections in concrete and masonry structures*. The presentation ceremony was held at the seat of the Division on 8 December.

Attendees of the autumn session listened to presentations about research and projects given by two elected corresponding members of the Academy, Prof. Tomasz Kapitaniak (Łódź University of Technology) – *From chaos to chimeras* and Prof. Michał Mrozowski (Gdańsk University of Technology) – *Theoretical, computing and practical aspects of the analysis of electromagnetic fields and circuits*.

Prof. Jan Kiciński, Director of the Institute of Fluid-Flow Machinery, presented information on the new research centre – the Energy Conversion and Renewable Resources Research Center, which was opened on 17 September 2015. The project

was co-financed by the European Union under the Regional Operational Programme for the Mazovia Voivodeship for the years 2007–2013. The Center is a complex of the most modern laboratories in Poland and Europe, equipped with state-of-the-art devices.

On 2 June, the Committee on Mineral Economy and Sustainable Development organized a debate under the auspices of the President of the Polish Academy of Sciences on the issues of *Politics and security of raw materials – the demands of the scientific community*. As a result of the debate, a position supporting the Polish Academy of Sciences was formulated. The position was addressed to the Prime Minister and the Minister of the Environment.

In 2015, the Division continued to regularly publish the quarterly *Bulletin of the Polish Academy of Sciences: Technical Sciences*. The consecutive issues contained studies related to the following thematic clusters: Civil Engineering, Control Sciences, Electronics, Informatics, Mechanics and Nanotechnology (Vol. 63, No. 1); Control Sciences, Electronics, Informatics, Mechanics and Nanotechnology (Vol. 63, No. 2); Informatics, Control Sciences, Electronics, Mechanics and Nanotechnology (Vol. 63, No. 3); Control Sciences, Electronics, Optoelectronics, and Mechanics (Vol. 63, No. 4). The quarterly was ranked 34 in the world in the field of Engineering and it is the only Polish periodical in the engineering sciences to hold a Q1 index. The *Bulletin's* impact



Winner of a Division IV Scientific Award – Asst. Prof. Arkadiusz Kwiecień (Cracow University of Technology) and Prof. Elżbieta Frąckowiak (Vice-President of the Polish Academy of Sciences). From right: Prof. Antoni Rogalski – Dean of Division IV, Peter Baudrexl – CEO of Siemens Sp. z o. o.)

factor for 2015 slightly decreased from 1.00 (5-year IF: 1.107) to 0.914. The remaining indexes were as follows: SCImago Journal Rank (SJR) 2015: 0.410; Source Normalized Impact per Paper (SNIP) 2014: 1.213; Impact per Publication (IPP) 2015: 0.984.

In 2015 the Dean of Division IV collaborated with the Office of International Relations of the Chancellery of the Polish Academy of Sciences in reviewing projects to be carried out under the framework of cooperation coordinated by PAS, wherein the Polish side is represented by a research institute of Division IV.

The Dean of the Division and the Chair of the Council of Provosts participated in consultations on draft regulations prepared by four government ministers: the Ministers of Science and Higher Education, of the Economy, of the Environment, and of Infrastructure.

The current, second, term of the Council of Provosts of Division IV began in January 2015. The Council organized selection procedures leading to appointing directors of the institutes affiliated to Division IV and a number of discussions on important problems such as financing joint research projects with the participation of PAS institutes and the industry. The Council initiated preparations for assessment of the achievements of institutes within four year period from 2013 to 2016; the assessment will be made in 2017. Three plenary meetings of

the Council were organized in 2015. The selection committees appointed by the Council nominated directors of four institutes affiliated to Division IV: the Institute of Computer Science (ICS), Strata Mechanics Research Institute (SMRI), Institute of Theoretical and Applied Informatics (ITAI), the Institute of Metallurgy and Materials Science (IMMS), and the Institute of Chemical Engineering (IChI). Prof. Jacek Koronacki was appointed the Director of ICS since 1 March, Prof. Waław Dziurzyński was appointed the Director of SMRI since 1 April, Prof. Tadeusz Czachórski became the Director of ITAI since 7 April and Prof. Paweł Zięba was appointed the Director of IMMS since 1 July. Finally, on 1 November the post of director of the Institute of Chemical Engineering was entrusted to Prof. Krzysztof Warmuziński. The nominations were conveyed by Prof. Elżbieta Frąckowiak, Vice-President of the Academy, in keeping with a longstanding tradition. The selection procedures and their results met with satisfaction from the respective scientific communities.

Members of Academy belonging to Division IV received a number of honours and distinctions in 2015. *Honoris causa* honorary doctorates were granted to Prof. Ryszard Tadeusiewicz by Agricultural University of Cracow, to Prof. Ryszard Knosala by Opole University of Technology, Prof. Tomasz Kapitaniak by Lublin University of Technology, and Prof. Tadeusz Kaczorek by the AGH University of



Winner of a Division IV Scientific Award – Asst. Prof. Jacek Rąbkowski (Warsaw University of Technology) and Prof. Jerzy Duszyński (President of the Polish Academy of Sciences)

Science and Technology. Prof. Stefan Jan Kowalski received the Prize of the Polish Minister of Science and Higher Education for Life Achievements. Prof. Michał Kleiber, former President of the Polish Academy of Sciences, has been elected Vice-President of the European Academy of Sciences and Arts (EASA), while Prof. Janusz Kacprzyk has been elected member of EASA. In addition Prof. Kacprzyk has been nominated Fellow of the Mexican Society of Artificial Intelligence and received the related permanent title of honorary member of the Soci-

ety (Permanent Honorary Member). Prof. Elżbieta Frąckowiak was nominated editor of *Carbon*, a prestigious scientific journal (Elsevier). Prof. Jan Kiciński won the statuette *Green Phoenix AD 2015* in the category “research” for his scientific achievements and research in the field of ecoenergetics. A team from the Institute of Fluid-Flow Machinery (Prof. Wiesław Ostachowicz, Dr. Paweł Kudela, Dr. Magdalena Mieloszyk, and Maciej Radzieński, MSc) was awarded the First Place of the Dragon-STAR Innovation Award in 2015.

The metaBIAL online simulator in comparing efficacy of different therapy options in patients with previously untreated chronic lymphocytic leukemia

P. Ładyżyński | M. Molik | P. Foltiński | Institute of Biocybernetics and Biomedical Engineering | Polish Academy of Sciences

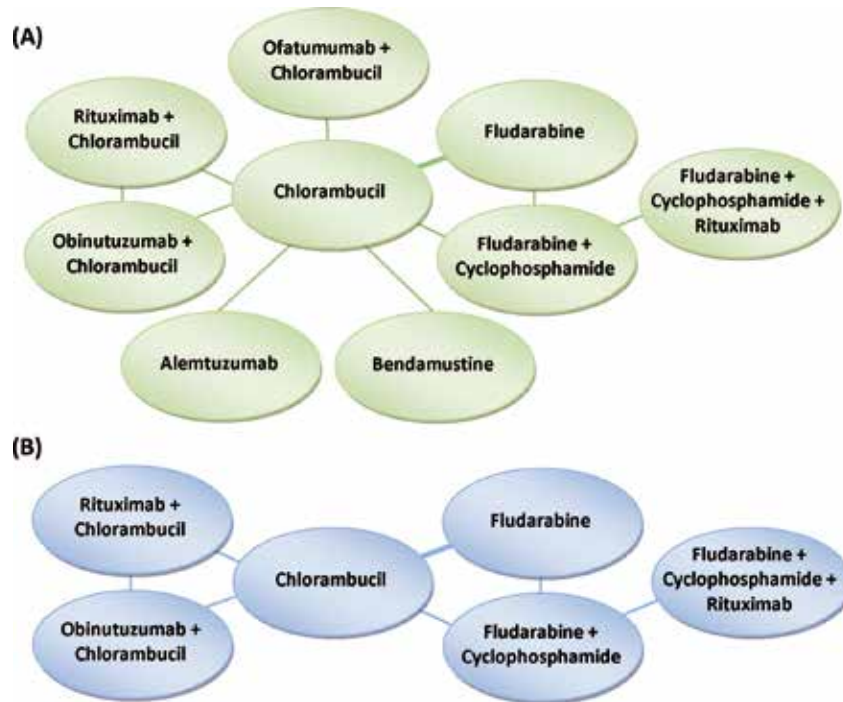
The chronic lymphocytic leukemia (CLL) is the most common subtype of blood cancer in adults with the overall incidence rate equal to 4 per 100 000 in a year. About 70% of all CLL cases is diagnosed in the population aged 65 and older, more often in men than in women. The median survival at diagnosis varies between 1 and over 10 years. A few therapy options are currently available for symptomatic, progressive CLL. Usually, chemotherapy or chemo-immunotherapy is applied that makes use of alkylating agents, purine nucleoside analogues or monoclonal antibodies, either in a monotherapy or in a combination therapy. The response to treatment is varied, making it difficult to select the most appropriate therapy option and to predict progression of the disease. Efficacy of some of the therapy options available have been compared directly in randomized control trials (RCTs) in terms of progression-free survival (PFS) or overall survival (OS). However, the available data are sparse, often conflicting, and most of the therapy options have not been compared directly. The main advantage of the metaBIAL online simulator is that it enables comparing efficacy of different therapy options, even those that have never been compared directly, in patients with previously untreated CLL in respect to PFS and OS.

The predicted survival courses are based on models of hazard functions of competing interventions that make use of the first and the second order fractional polynomials (FPs). The models used in the metaBIAL simulator were selected, using a network meta-analysis technique, from a broad family of parametric survival functions including some of the commonly used, e.g., Weibull or Gompertz.

At the first stage of the study, a literature review was conducted in the NCBI PubMed and Cochrane Library databases to identify RCTs in first-line treatment of CLL using search terms such as “CLL,” “drugs,” “treatment” and names of drugs used as primary agents in CLL therapy. As a result, 467 studies were found. Each study was analyzed to exclude those that described one drug, reported results unrelated to RCT or did not concern treatment of naive patients. Then papers were checked to include studies that measured a survival endpoint (PFS or OS). Finally, nine RCTs were identified for PFS analysis and six RCTs for OS analysis.

At the second stage, a multi-dimensional treatment effect approach was used as an extension of a network meta-analysis to select the hazard models which reproduced RCT data most closely, from a range of models represented with several param-

Fig. 1. Analysis networks of RCTs for the network meta-analysis of: (A) the progression free survival, (B) the overall survival



eters defined using the first and the second order FPs. For the first order FP, the log hazard (h_{At}) of treatment A at time t is given as:

$$\ln(h_{At}) = b_{0A} + b_{1A}t^p, \text{ with } t^0 = \log(t) \quad (1)$$

If we use the first order FP for a single RCT comparing two treatments (A and B), parameters of the model for treatment B are given as:

$$b_{0B} = b_{0A} + d_0 \text{ and } b_{1B} = b_{1A} + d_1 \quad (2)$$

where vector (d_0, d_1) reflects the difference in b_0 and b_1 of the log hazard curve for treatment B relative to A .

Meta-analysis models of treatment B vs. A can be extended to models allowing simultaneous comparisons of B vs. A and C vs. A . When individual pairwise trials are comparable, a network of studies can be built using trials with common arms to allow for both direct and indirect comparisons. Such networks for PFS and OS were built in this study based on the RCTs identified during the literature review (Fig. 1).

An indirect estimate of the relative effect of C vs. B (d_{BC}) can be obtained from the direct estimates of B vs. A and C vs. A :

$$d_{BC} = d_{AC} - d_{AB} \quad (3)$$

To select the best hazard models, we first digitalized survival curves for PFS and OS from the individual RCTs. In each interval $[t, t+\Delta t]$, in each study j , and in each treatment k the number of patients at risk at the beginning of the interval (n_{jkt}) and the incident number of endpoint events (r_{jkt}), i.e., disease progressions in case of PFS, and deaths in case of OS were calculated.

Binomial likelihood distributions were used to describe the number of endpoint events r_{jkt} in each interval $[t, t+\Delta t]$ based on n_{jkt} and p_{jkt} . The hazard rate h_{jkt} is assumed constant within the time interval, and it is estimated using the following formula:

$$h_{jkt} = -\ln(1 - p_{jkt})/\Delta t \quad (4)$$

The fixed and random effect first and second order FP models with powers p in Eq. 1 chosen from the following set: $-2, -1, -0.5, 0, 0.5, 1, 2, 3$ were tested. Parameters of the models were estimated using a Markov Chain Monte Carlo method. The deviance information criteria was used to compare the goodness-of-fit of different models.

The random effect model for $\ln(h)$ with a power coefficient p equal to -0.5 demonstrated the best fit to PFS data. In younger and fit patients, the model with p equal to -2 was the best, while in older and unfit patients the best model was characterized by

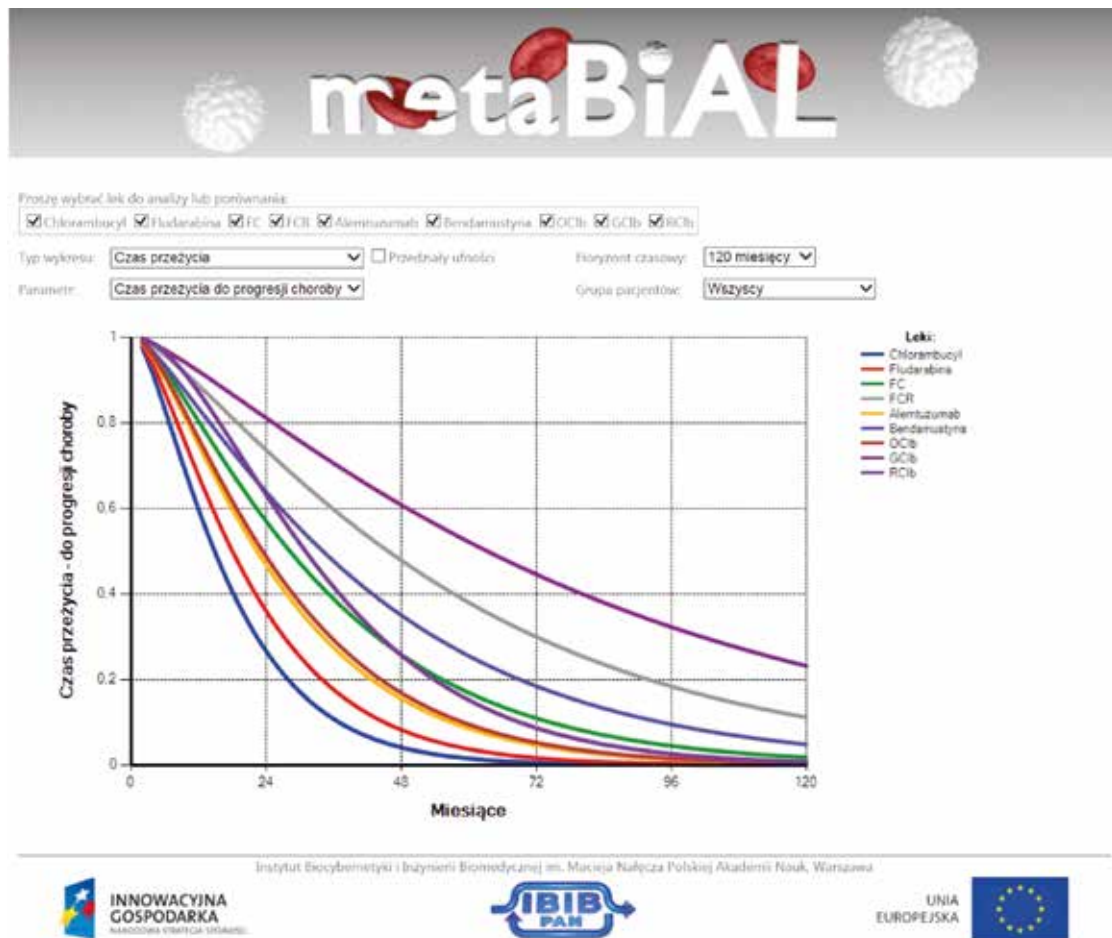


Fig. 2. The metaBIAL online simulator showing a comparison of percentage of patients without progression of the disease as a function of time for different therapy options in patients with CLL (the simulator is available only in Polish)

p equal to 0, i.e., the Weibull model. It was found that the fixed effect first order FP model for $\ln(h)$ with a power p equal to 2 fitted OS data the best in analysis networks composed of all the RCTs, the trials with younger and fit patients, and the trials with older and unfit patients.

At the third stage of the study, the metaBIAL online simulator was implemented using the models fitting the experimental PFS and OS data most closely. The simulator is available online and can be used to compare the posterior courses of hazard rates, hazard ratios, and survivals for each therapy option (Fig. 2).

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Walenty – an innovative valence dictionary of Polish

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Institute of Computer Science | Polish Academy of Sciences

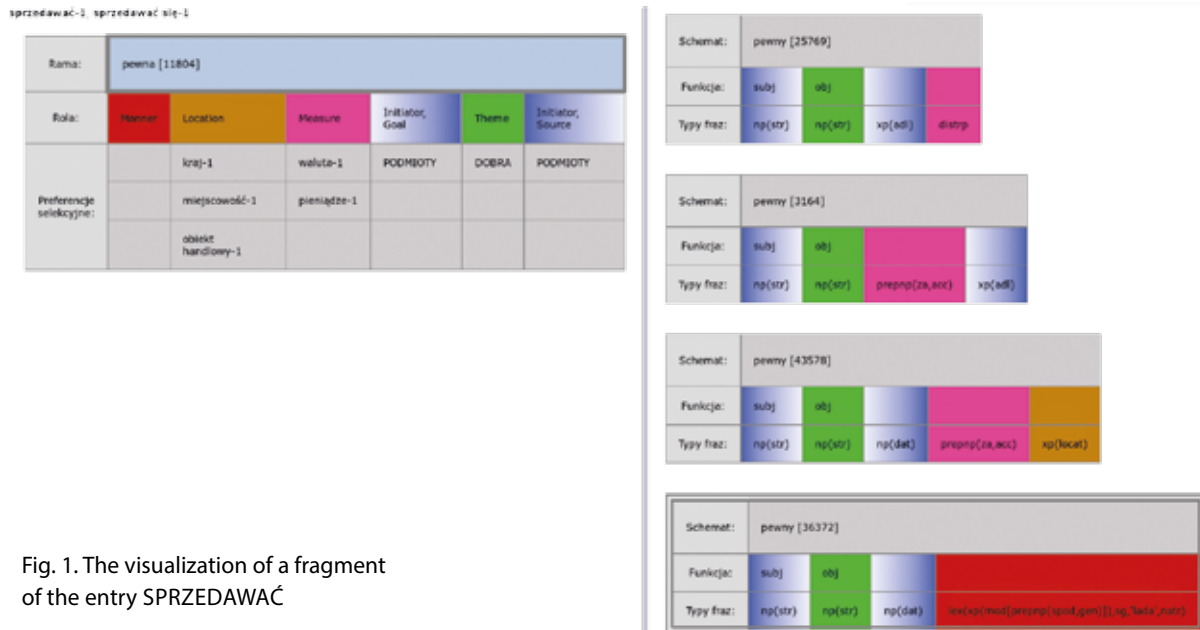


Fig. 1. The visualization of a fragment of the entry SPRZEDAWAĆ

Walenty is a comprehensive valence dictionary of Polish developed at the PAS Institute of Computer Science. It is currently the largest and most precise valence dictionary of Polish, containing about 83,000

valency schemata for 15,000 entries (12,000 verbs, 2,000 nouns, 950 adjectives, and 200 adverbs). *Walenty* covers 99.8% verb occurrences in a balanced collection of Polish texts containing 300 million words (from the National Corpus of Polish). Furthermore, *Walenty* introduces a range of innovative linguistic features, situating it on the forefront of the current studies on valence. The dictionary is both human- and machine-readable; it is available online on an open source licence.

Valence dictionaries provide information about how predicates (e.g. verbs) combine with their arguments – for example, the verb SPRZEDAWAĆ [sell] combines with up to four arguments: *ktos sprzedaje coś komuś za ileś* [somebody sells something to somebody for some price], as in Fig. 1. In *Walenty*, valence information is specified at two levels. At the syntactic level, SPRZEDAWAĆ selects for a nominal subject in nominative case (*ktos*), nominal object in structural case (*coś*), nominal phrase in dative (*komuś*) and a prepositional phrase (*za ileś*). At the level of semantics, arguments are identified by

	Initial Group	Accompanying Group	Ending Group
Main Roles	<ul style="list-style-type: none"> Initiator Stimulus 	<ul style="list-style-type: none"> Theme Experiencer Factor Instrument 	<ul style="list-style-type: none"> Recipient Result
Auxiliary Roles	<ul style="list-style-type: none"> Condition 	<ul style="list-style-type: none"> Attribute Manner Measure Location Path Time Duration 	<ul style="list-style-type: none"> Purpose
Attributes	<ul style="list-style-type: none"> Source 	<ul style="list-style-type: none"> Foreground Background 	<ul style="list-style-type: none"> Goal

Fig. 2. The set of semantic roles in *Walenty*

semantic roles (Fig. 2): with SPRZEDAWAĆ, an Initiator sells a Theme to a Recipient for a Measure. Furthermore, it is possible to impose additional semantic constraints (called selectional preferences) on these roles: a person sells some goods to another person for some amount of money. Formally, such semantic arguments are represented as pairs (semantic role, selectional preferences); together they form a so-called semantic frame. Additionally, each frame is assigned a meaning from PIWordNet.

Walenty is created using a dedicated tool, *Slowal*, which supports the manual work of lexicographers, checking the correctness and coherence of the entries. To ensure high quality of the dictionary, valence information provided in *Walenty* is supported by numerous authentic examples (mostly from the National Corpus of Polish). Moreover, the tool is also used for making *Walenty* available to the public in a convenient way – the syntactic and semantic layers of entries can be browsed, searched, and filtered according to various criteria. Alternatively, the dictionary can be downloaded in a range of output formats: plain text, TEI XML and PDF.

The dictionary has been deployed in applications – it is currently used by two parsers producing automatic syntactic analyses of Polish sentences. This is possible due to the fact that its entries have a strictly defined formal structure.

Walenty exhibits a number of features which are rare or absent in other valence dictionaries. First, it is explicit about what counts as an argument: if two syntactically different phrases may be coordinated in an argument position, they are different realisations of the same argument. This concerns the verb TŁUMACZYĆ [explain], e.g. in *Musiąłem im tłumaczyć najprostsze zasady i dlatego trzeba je stosować* [I had to explain to them the most basic principles and why they should be adhered to], involving a coordinated phrase in the object position consisting of a nominal phrase: *najprostsze zasady* [the most basic principles] and an interrogative clause: *dlaczego trzeba je stosować* [why they should be adhered to].

The dictionary explicitly identifies the subject position – understood as the argument that drives verbal agreement, regardless of its category, so it takes into account non-canonical subjects – and the object – defined as the argument which can become the subject under passive voice, so the passivisable object, regardless of its category (and case marking, if it happens to be a nominal). *Walenty* provides information about the fact that an argument requires structural case – together with information about the grammatical function of the argument and information about the syntactic context, this makes it possible for grammar to resolve the appropriate value of case.

witać (..., imperf):

Schemat:	archaiczny [23020]			✔
Funkcja:	subj	obj		
Typy fraz:	np(str)	np(str)	lex(preppnp(w,loc),pl,'siansada',natr)	

Schemat:	pewny [22527]			✔
Funkcja:	subj	obj		
Typy fraz:	np(str)	np(str)	xp(mod)	
	lex(preppnp(z,inst),pl,XOR('ramię', 'reka'),natr1((lex(adjp(agr),agr,egr,pos,'otwarty',atr1((lex(advp(mod),pos,'szeroko',natr))))))))			

Identyfikator:	Przykład:	Źródło:	Ocena:
224936	My tu wszystkich witamy z otwartymi rękami.	pełny NKJP (1800M segmentów)	dobry
224937	Przyjeźdźnych witamy z szeroko otwartymi ramionami, akceptujemy pracowników z całego świata.	pełny NKJP (1800M segmentów)	dobry
330788	My również witamy Cię serdecznie i z otwartymi ramionami.	własny	dobry

Fig. 3. The exemplary schema with a lexicalized argument for the verb WITAĆ [welcome]

The formalism makes it possible to describe phenomena such as *control* and *raising*. For example, although PROMISE and ORDER require the same arguments – they combine with a nominal subject, a nominal object and an infinitival phrase, e.g., *John promised/ordered Tom to come* – they differ in their control properties: with *promised*, the understood subject of *to come* is *John*, while with *ordered* – it is *Tom*.

Next, the dictionary introduces a new class of arguments defined by their semantics rather than category, e.g. those expressing location, time or manner, as in LIVE (somewhere), LAST (some time) or BEHAVE (in some way). For each of such phrase types, there is a defined list of its realizations (mainly selected adverbial and prepositional phrases), which results in an economic, readable and coherent representation.

Finally, probably the most innovative feature of *Walenty* is its powerful formalism for describing phraseology (Fig. 3). It includes special notation for various types of lexicalized arguments, ranging from completely fixed (given as a string) to almost freely modifiable – in a recursive way.

For reasons described above, it is hoped that the formalism of *Walenty*, a state-of-the-art resource for Polish, will set a new standard in the creation of valence dictionaries.

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SURDAT 3 – a database of physicochemical properties of alloys

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Experimental studies of the physical properties of lead-free solders were initiated at the PAS Institute of Metallurgy and Materials Science in 1998. The solders investigated belonged to the type used in the process of replacing the traditional but more toxic Sn-Pb solders. These lead-free solders were based mainly on the Sn-Ag and Ag-Sn-Cu eutectics with additions of In, Bi, or Sb. By 2007, enough data had been determined for surface tension, density, and molar volume of pure metals, binary alloys, and selected



multi-component alloys to justify organization into a database.

The initial form of this database is now known as SURDAT 1 and was made accessible online free of charge. The experimental values of physicochemical properties presented in SURDAT were obtained during the implementation of the COST 531 program and the ELFNET network, in which members of the Associated Phase Diagram and Thermodynamics Committee took part, as well as research

programs, projects and networks in which the Institute participated. The research was conducted in cooperation with the industrial institutes – Tele and Radio Research Institute in Warsaw and the Institute of Non-Ferrous Metals in Gliwice.

In 2006, the SURDAT database was presented at the 16th Symposium on Thermophysical Properties, Boulder (Colorado, USA), and interest in the database was shown by personnel of the National Institute of Standards and Technology in Boulder (NIST). After the issuing of the monograph in 2007, the database was presented at the 2nd International Scientific and Technology Conference “Progress in Soldering Technologies” in Wrocław. Since 2007, the studies developing the database were continued within the scope of a research program (project MSWN 4582/BT08/2007/33), and modifications of the database were published and presented at foreign and local conferences.

As a result of a cooperation between the authors of SURDAT and the team from NIST, the SURDAT and NIST databases were combined in new editions – SURDAT 2 (in Polish, 2012) and SURDAT 3 (in English, currently being prepared for release).

SURDAT 3 has also been expanded by adding elaborated software for the modeling of surface tension and viscosity of multi-component alloys with the application of their thermodynamic properties as well the physical properties of pure metals. New models have been developed at the Institute, which allow for the obtaining of a better correlation with experimental values than the correlation previously obtained. The SURDAT 3 database was supple-

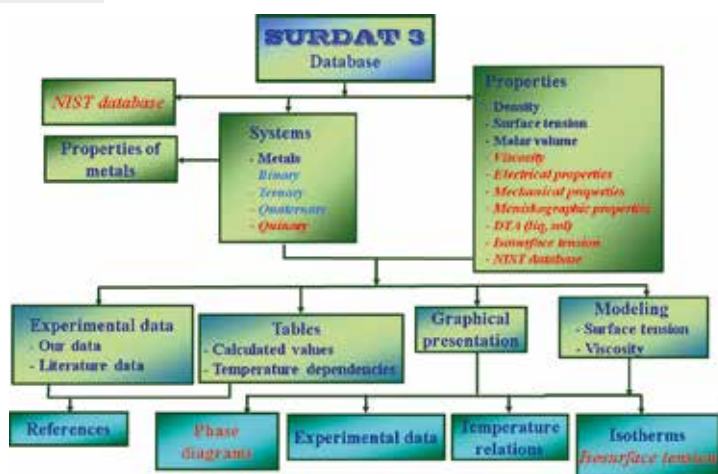


Fig. 1. Scheme of the options available in the SURDAT 3 database



Fig. 2. Viscosity isotherms calculated from different models compared with experimental data of [1953Geb1] at 1273 K for Ag-Sn system

mented by the new test results obtained during the implementation of the COST MP0602 – HISOLD – Advanced Solder Materials for High Temperature Applications program, as well as by wettability test results for the Sn-Zn eutectic alloys with Bi, Sb and Li additions.

In the option scheme of SURDAT 3 presented in Fig. 1, the new physicochemical properties which were not present in the SURDAT base published in 2007, are marked in red.

SURDAT 3 includes data for metals, binary, ternary, quaternary, and quinary alloys. A window selection system and the viscosity of the experimental data obtained by using 12 models for the Ag-Sn system are shown in Fig. 2. The database is updated periodically in order to increase the number of systems and properties.

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Medical Sciences

The Academy's Division V (Medical Sciences) represents the medical scientific and academic community in Poland (including universities, institutes, and respective academic schools), promotes research in medicine, pharmacy, physical training and health education as well as supervises research activity at the PAS institutes affiliated with the Division. Prof. Witold Rużyłło (corresponding member of the Academy), a pioneer of modern methods of interventional cardiology in Poland, is the Dean of Division V. Prof. Tomasz Brzozowski (corresponding member of the Academy), a specialist in physiology and pharmacology of gastrointestinal tract and endocrinology is the Chair of the Division's Council of Provosts; Prof. Grzegorz Opolski (corresponding member of the Academy), a specialist in cardiology and internal medicine, is the Deputy Chair of the Division's Council of Provosts.

At the end of 2015, Division V comprised 38 national members (19 ordinary members and 19 corresponding members) as well as 25 foreign members. One ordinary member of the Academy – Professor Irena Hausmanowa-Petrusewicz – passed away in 2015.

Two plenary sessions of the Division took place in 2015. At the first session, on 9 April, opinions on the candidate for the position of Dean were exchanged. The President of the Chapter of the Śniadecki Medal was also appointed and the Committee of the Jan Steffen Award was chosen for the 2015–2018 term. At the second session, on 5 November, Dr. Cezary



From left: Prof. Stanisław Czuczwar (Vice-President of the Polish Academy of Sciences), Prof. Witold Rużyłło (Dean of Division V), Prof. Jacek Moll (honored with the Śniadecki Medal in 2015)

Kęпка from the Institute of Cardiology in Anin delivered a speech entitled *Modern diagnosis of coronary artery disease – computed tomography. Is this the method of choice?* The Division discussed the report of the external audits of public funds allocated for science institutes subordinate to the Faculty and the results of the audit at the Institute of Immunology and Experimental Therapy, commissioned by the Polish Academy of Sciences. The Division also awarded its scientific awards and prizes in 2015.

The Śniadecki Medal was awarded to Prof. Jacek Moll from the Department of Cardiac Surgery, Polish Mother's Memorial Hospital Research Institute in Łódź, for outstanding achievements in the field of pediatric cardiac surgery. The Collective Jędrzej Śniadecki Scientific Prize was awarded to Prof. Piotr Podolec, Asst. Prof. Grzegorz Kopeć, and Asst. Prof. Lidia Tomkiewicz-Pająk from the Department of Cardiac and Vascular Diseases, Jagiellonian University, and the Medical College Faculty of Medicine in Cracow for a series of publications on *The pathophysiology of pulmonary hypertension and pulmonary Fontan*. The Division's Collective Scientific Awards were awarded to Prof. Krzysztof Selmaj, Asst. Prof. Marcin Mycko, Dr. Agata Walczak, Dr. Mariola Świderek-Matysiak from the Department of Neurology, Medical University of Łódź for a series of



From left: Prof. Piotr Podolec, Prof. Witold Rużyłło, Asst. Prof. Lidia Tomkiewicz-Pająk, Asst. Prof. Grzegorz Kopeć

papers on research in the field of neuroimmunology, in particular the search for new methods of therapy for multiple sclerosis (sclerosis multiplex, SM). The honorary prizes for medical students – the Waclaw Mayzel Medical Laurels – were awarded as follows: to Anna E. Płatek, graduate of the Faculty of Medicine of the Warsaw Medical University and student of the Faculty of Health Science, Medical University of Warsaw, for her work entitled *Usefulness of the D-Dimer Concentration as a Predictor of Mortality in Patients With Out-of-Hospital Cardiac Arrest*; to Kornelia Czaja, student of the Faculty of Pharmacy, K. Marcinkowski Medical University in Poznań for her work entitled *On the interactions of indazole derivative with nucleosides – Toward modeling the cytotoxic activity mechanism*; to Mateusz K. Hołda and Mateusz Koziej, students of the Faculty of Medicine at the Jagiellonian University Medical College in Cracow for their work on *Anatomical variations of the coronary sinus valve (Thebesian valve): implications for electrocardiological procedures*. The Jan Steffen Prize for an outstanding doctoral thesis in the field of experimental and clinical oncology was awarded to Dr. Eng. Magdalena Milczarek from the Hirszfeld Institute of Immunology and Experimental Therapy in Wrocław for her study *Vitamin D analogs enhance the anticancer activity of 5-fluorouracil in colon cancer model*.

There are five research institutes affiliated with the Medical Division: the Mossakowski Medical Research Centre in Warsaw, the Hirszfeld Institute of Immunology and Experimental Therapy in Wrocław, the Institute of Pharmacology in Cracow, the Institute of Human Genetics in Poznań, and the Institute of Medical Biology in Łódź.



From left: Prof. Krzysztof Selmaj, Asst. Prof. Marcin Mycko, Dr. Agata Walczak, Dr. Mariola Świderek-Matysiak

Four scientific journals are published by these medical institutes: *Archivum Immunologiae et Therapiae Experimentalis*, *Folia Neuropathologica*, *Polish Journal of Pharmacology*, and *Postępy Higieny i Medycyny Doświadczalnej* [Advances in Hygiene and Experimental Medicine]. The Division also supports the *Polish Journal of Food and Nutrition Sciences*, co-edited by the PAS Committee on Human Nutrition affiliated with the Division.

The Division supervises the activity of 12 scientific committees (together comprising over 300 members), representing the medical sciences in Poland. The chairpersons of these committees, mostly non-members of the Academy, may participate in the plenary sessions of the Division, and enjoy equal rights with the Academy members, except with regard to electing candidates to become new members of the Academy. The committees organized or co-organized several Polish and international conferences in 2015.

There are 4 national committees affiliated with the Division: the National Committee for Cooperation with the International Union of Physiological Sciences (IUPS), the National Committee for Cooperation with the International Union of Nutrition Sciences (IUNS), the National Committee for Cooperation with the International Council on Laboratory Animal Science (ICLAS), and the International Medical Panel (IAMP).

Members of the Division published a total of 273 papers in 2015, primarily in high-standard international scientific journals, and were organizers and active participants of many meetings and conferences during the year.



From left: Mateusz K. Hołda, Anna E. Płatek, Kornelia Czaja, Mateusz Koziej

Immunogenetic factors related to the risk, course, and symptomatology of schizophrenia

L. Karabon | E. Pawlak-Adamska | A. Tomkiewicz | A. Partyka | Hirsfeld Institute of Immunology and Experimental Therapy | Polish Academy of Sciences
D. Frydecka | B. Misiak | A. Pawlak | P. Sedlaczek | M. Szewczuk-Bogusławska | M. Zawadzki | A. Kiejna | J.A. Beszlej | Wrocław Medical University

The study of genetic determinants of complex diseases

The development of molecular biology techniques enables for the expansion of research on genetic background of complex disorders. Two different approaches are used in disease association studies. In the first one, called *genome wide association study* (GWAS), the associations between genetic susceptibility and disease are investigated in the entire genome. This approach is hypothesis-free and allows for finding new, unexpected disease-associated genes. The second approach, called *gene-specific candidate-driven studies*, is based on the results of GWAS and on the knowledge of the pathophysiology of the disease.

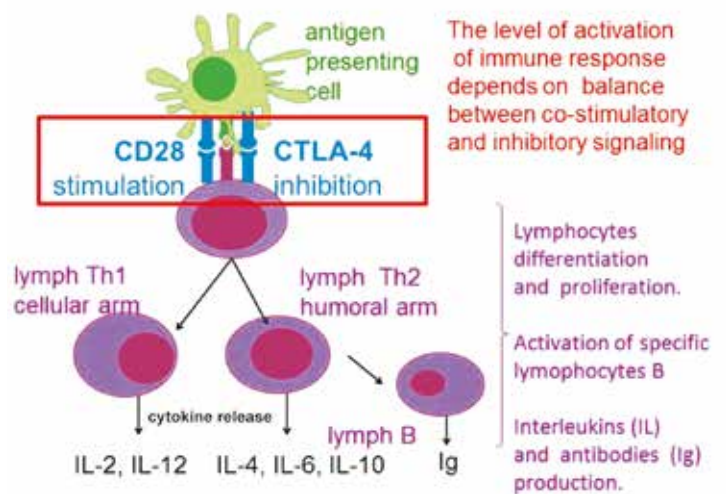
The latter approach was applied in our studies describing the association of polymorphisms in genes encoding the molecules involved in the regulation of immune response with the risk, clinical onset, and psychopathological symptoms of schizophrenia.

Schizophrenia – pathophysiological mechanisms

Schizophrenia is one of the chronic mental disorders with the prevalence of about 0.5–1.5%



D. Frydecka MD, PhD



Signals for T cell activations

of population, characterized by heterogeneous psychopathological symptoms and clinical course. The pathophysiological mechanisms leading to disease are still unclear, yet the influence of genetic and environmental factors on the risk of onset and disease phenotype has been proven. In particular, researchers suggested that dysregulation of immune system plays a role in the onset of this disorder.

The activation of the naive T cells plays the key role in initiations of the immune response. This process requires two specific signals. The first one is delivered by recognition of an antigen by the T-cell receptor (TCR/CD3) present on the surface of T lymphocyte, and the second signal is provided by binding of co-stimulatory molecule CD28 with its ligand. The full activation of T lymphocytes leads to T-cells proliferation, differentiation and cytokine secretion, i.e., interleukins (including IL-2, IL-4, IL-8, IL-13) and interferon- γ (IFN- γ). Cytotoxic T lymphocyte associated antigen-4 (CTLA-4) is a co-inhibitory molecule, which appears on the surface of T cell upon stimulation.



The laboratory work of the team of the Laboratory of Immunopathology, Hirsfeld Institute of Immunology and Experimental Therapy, PAS (from left: A. Partyka, MSc, A. Witkiewicz, MSc, A. Tomkiewicz, MSc, E. Pawlak-Adamska, PhD)

Cytokines are signaling proteins that play an important role in the regulation of immune response. Cytokines may cross the brain-blood barrier or be produced intrathecally by central nervous system (CNS) cells. Cytokines are involved in the development of CNS, influence neurotransmission and act as neurotransmitters. They also are responsible for proper cognitive functioning. All these functions may directly or indirectly influence the risk of schizophrenia onset and its course.

In our studies, we analyzed the association between polymorphisms of selected genes encoding molecules involved in the regulation of immune response and the risk of schizophrenia and their impact on psychopathological symptoms of this disorder.

The association between polymorphisms in genes encoding cytokines and molecules regulating T-cell activity with psychopathological symptoms in schizophrenia

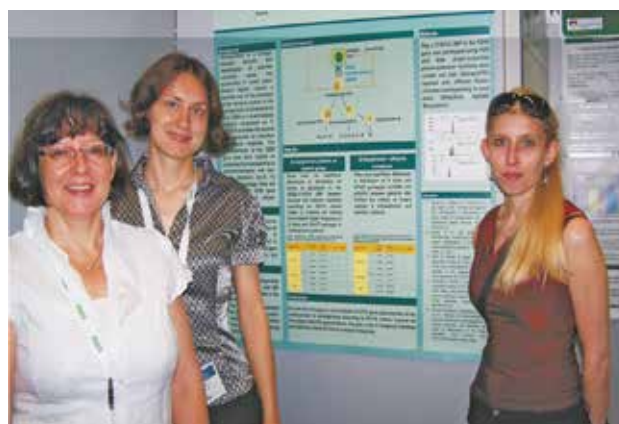
As a result of our previous studies, the association between polymorphism +869T>C (rs1800470) in gene encoding a cytokine-transforming growth factor 1 (TGFB1) and polymorphism 17+3T>C (rs3116496) in *CD28* gene with the risk of schizophrenia was described for the first time.

In further studies, we investigated the association between polymorphisms of genes encoding cytokines (*IL6* and *TGFB1*) and genes encoding co-signaling molecules (*CTLA4* and *CD28*) as well as a lifetime of schizophrenia symptomatology. All patients were evaluated using Operational Criteria Checklist for Psychotic Illness (OPCRIT), which consists of 90 items allowing for the description of occurrence and severity of core psychotic and affective symptoms, as well for recording of additional clinical and demo-

graphic data, such as the main risk factors, the course of disorder, or family history of psychiatric illnesses.

The results of our studies have not shown the association between the lifetime symptomatology and *IL6* gene polymorphism -174G>C (rs1800795) or with *TGFB1* gene polymorphisms: +869T>C and +916G>C (rs1800471). However, we have found a significant difference in the age of psychosis onset in female schizophrenia patients with respect to the *TGFB1* +869T>C gene polymorphism. Moreover, we have shown that there is a significant association between co-occurrence of affective and psychotic symptoms in the course of schizophrenia with polymorphisms +49A>G (rs231775) and -319C>T (rs5742909) in *CTLA4* gene as well as with polymorphism 17+3T>C in *CD28* gene.

Our studies also described the importance of polymorphisms in genes encoding cytokines on cognitive functioning in schizophrenia patients. We



Presentation of the project results during the 24th European Immunogenetics and Histocompatibility Conference in Florence, Italy (from left: L. Karabon DSc, A. Partyka MSc, E. Pawlak-Adamska PhD)

showed that T allele carriers (TT and CT genotype) for *TGFB1* +869T>C polymorphism performed significantly worse in tasks measuring psychomotor speed and letter fluency than individuals with CC genotype. In our study we did not find an association between polymorphism -174G>C (rs1800795) in *IL6* gene with cognitive functioning in schizophrenia patients, although we have shown that higher IL-6 serum level in schizophrenia patients is associated with significantly worse cognitive functioning.

In conclusion, our studies showed the association of the polymorphisms in genes encoding molecules regulating the immune response with the risk and age of onset, as well as with the profile of clinical symptoms and cognitive function in schizophrenia.

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Transcriptional response of interferon-stimulated genes (*Mx1*, *OAS1* and *PKR*) to HCV infection and interferon-based therapy in chronic hepatitis C

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Hepatitis C virus (HCV) infection is a global health problem, affecting approximately 130–170 million people worldwide. In Poland, the number of people with antibodies against HCV is about 730,000, including about 230,000 individuals with active HCV replication. Chronic hepatitis C (CHC) is considered a leading cause of liver fibrosis, cirrhosis, and hepatocellular carcinoma.

It is known that HCV infection activates host immune response that results in the induction of a number of genes, including those responsible for the production of interferon (IFN). It was demonstrated that IFN stimulates the transcription of many genes, the products of which exhibit antiviral and immunomodulatory activity, known as interferon-stimulated genes (ISGs). Among them are *Mx1*

(MX dynamin like GTPase 1), *OAS1* (2'-5'-oligoadenylate synthetase 1), and *PKR* (double-stranded RNA-activated protein kinase; *EIF2AK2*, eukaryotic translation initiation factor 2 alpha kinase 2) genes.

The aim of our study was to examine the transcriptional response of the *Mx1*, *OAS1* and *PKR* (*EIF2AK2*) genes to HCV infection as well as to pegylated IFN α and ribavirin treatment in patients with CHC infected with HCV genotype 1.

Sixty-five patients diagnosed with CHC (HCV genotype 1a and/or 1b) and fifty gender- and age-matched healthy blood donors were included in the study. All of the patients were not previously treated. The exclusion criteria included HBV and/or HIV co-infection as well as other chronic liver diseases. Patients received a course of the standard doses of pegylated IFN α 2a/2b combined with ribavirin. Blood samples were obtained before treatment as well as at week 4 and 12 of treatment. Serum HCV RNA level was determined using a commercially available kit. Genomic RNA was isolated from peripheral blood mononuclear cells (PBMCs) and immediately reverse transcribed into cDNA. Gene expression was quantified by real-time polymerase chain reaction using hydrolysis (TaqMan) probes. *ACTB* (β -actin) was selected as reference gene for normalization of gene expression data. Reactions were run in triplicate. Gene expression (before and during treatment) was given in relative quantification

$$RQ = 2^{-\Delta\Delta Ct} = 2^{-[(Ct \text{ gene} - Ct \text{ ACTB})_{\text{patient}} - (Ct \text{ gene} - Ct \text{ ACTB})_{\text{calibrator}}]}$$

polled cDNA from healthy controls was used as a calibrator). The fold change between week 4 of treatment and baseline was calculated using the formula:

$$RQ = 2^{-\Delta\Delta Ct} = 2^{-[(Ct \text{ gene} - Ct \text{ ACTB})_{\text{week4}} - (Ct \text{ gene} - Ct \text{ ACTB})_{\text{baseline}}]}$$

It was found that the pretreatment level of *Mx1*, *OAS1* and *PKR* mRNA expression was significantly upregulated in CHC patients compared with healthy donors ($p < 0.0001$; Fig. 1).

Moreover, expression of all studied genes was found to be significantly upregulated at week 4 of treatment ($p < 0.0001$). The highest median increase (fold change) of expression after initiation of IFN-based therapy was observed for the *Mx1* gene, indicating that this gene is the strongest induced gene among all analyzed. Expression of the genes measured at week 12 was also significantly higher compared to baseline level ($p < 0.0001$). A significant

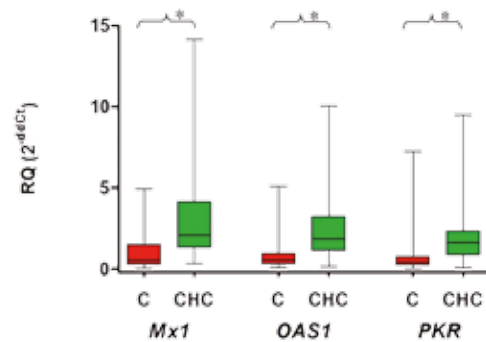


Fig. 1. *Mx1*, *OAS1* and *PKR* (*EIF2AK2*) gene expression in peripheral blood mononuclear cells of healthy controls (red) and chronic hepatitis C patients prior to the initiation of antiviral treatment (green). The horizontal lines represent (from the top) the maximum, the third quartile, the median, the first quartile and the minimum. C – healthy controls, CHC – chronic hepatitis C patients, RQ – relative quantification, * $p < 0.0001$ (Mann-Whitney U-test)

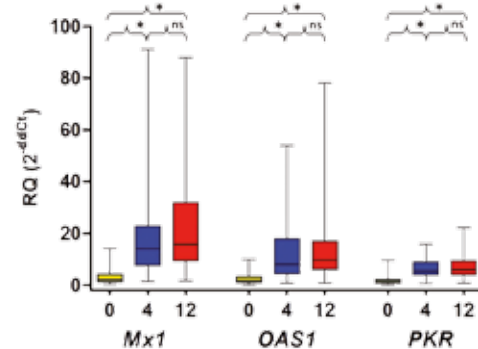


Fig. 2. *Mx1*, *OAS1* and *PKR* (*EIF2AK2*) gene expression in peripheral blood mononuclear cells from chronic hepatitis C patients prior to the initiation (yellow) and during antiviral treatment: week 4 (blue) and week 12 (red). The horizontal lines represent (from the top) the maximum, the third quartile, the median, the first quartile and the minimum. 0 – baseline (week 0), 4 – week 4, 12 – week 12, RQ – relative quantification, * $p < 0.0001$, ns – non-significant (Wilcoxon matched-pair signed-rank test)

change in the levels of the genes between week 4 and 12 was not observed (Fig. 2).

Furthermore, the association between expression of the studied genes and HCV viral load as well as biochemical and histopathological parameters was examined. It was found that the pretreatment viral load is not related to baseline expression level of the studied genes. Moreover, statistically significant correlation between the expression levels and HCV RNA level at week 4 and 12 of treatment was not observed. Also, changes in expression of the genes (fold change) measured during the treatment were not associated

with corresponding changes in HCV RNA level. Furthermore, no statistically significant relationship was found between baseline level of expression of the studied genes and baseline level of alanine aminotransferase, aspartate aminotransferase, total bilirubin, gamma-glutamyltransferase, alpha-fetoprotein, as well as degree of hepatic inflammation and fibrosis.

In summary, the results obtained indicate that HCV infection and IFN-based therapy induce transcriptional response of *Mx1*, *OAS1* and *PKR (EIF2AK2)* gene in PBMCs of CHC patients infected with HCV genotype 1. Upregulation of expression of these genes induced by endogenous and exogenous IFN confirms their antiviral activity against HCV. It cannot be excluded that we would have observed association between expression of the studied genes and HCV viral load as well as biochemical and histopathological parameters if we had analyzed the expression in the liver of CHC patients.

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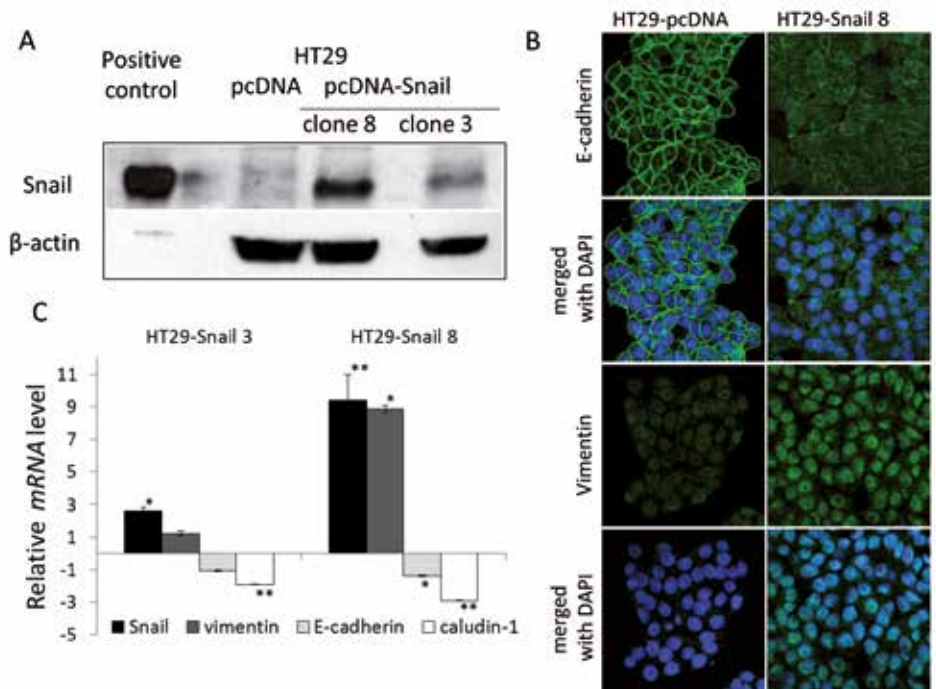
New players in the early stages of colon cancer metastasis – transcriptional changes orchestrated by SNAIL

P. Przygodzka | I. Papiewska-Pajak | J. Kryczka | M.A. Kowalska | J. Boncela |
Institute of Medical Biology | Polish Academy of Science

Colorectal cancer (CRC) is the third most common cancer worldwide with 1.36 million new cases described in 2012. Despite the progress in diagnostics and therapy, metastasis and tumor recurrence are two critical processes influencing the survival rate for CRC, which is only 67% within a 5-year period. Molecular knowledge of the metastatic process is limited, but systematic studies comparing gene expression in primary tumors and their metastases re-

vealed the cellular and biochemical cascades activated during tumor spread. One of the first steps of local dissemination from solid tumors and the subsequent evolution of metastasis is the epithelial-mesenchymal transition program (EMT), which contributes to the phenotypic transformation of epithelial carcinoma into mesenchymal-like cells. The emerging consensus in the field suggests that the transcription factor Snail is an early core regulator of the EMT

Fig. 1. HT29 cells overexpressing Snail have partial EMT phenotype characteristics. (A) Immunoblotting of Snail expression in HT29 clones. Lysate of 293T-cells overexpressing Snail was used as a positive control. (B) Representative confocal images of E-cadherin and vimentin (green) immunofluorescence staining in HT29-pcDNA and HT29-Snail clone 8 (DAPI nuclear stain: blue). The images represent one confocal section at a medial position in the cells (40x objective). (C) Total mRNA was isolated from HT29 clones, and the relative mRNA expression of Snail, vimentin, E-cadherin and claudin-1 was analyzed through real-time PCR. $N \geq 5$, mean \pm SEM, * $p < 0.02$; ** $p < 0.01$



that functions through the repression of E-cadherin and other epithelial markers, but also through the up-regulation of mesenchymal, pro-invasive genes.

In our study, we generated CRC cells stably overexpressing Snail (HT29-Snail) and showed that it induces EMT in the CRC cells (Fig. 1), but its overexpression is not sufficient to completely elicit it. HT29 cell line with Snail-stable overexpression showed intermediate epithelial pheno-

type conversion with increased mobility *in vitro* (Fig. 2A).

Genome-wide transcriptomic analysis and subsequent functional enrichment with Ingenuity Pathway Analysis (IPA) software show that a significant number of differentially expressed genes in cells stably expressing Snail is associated with cellular movement, cell death and survival, and cellular development (Fig. 2B, 2C). Moreover, these observations indicate that Snail affects not only epithelial

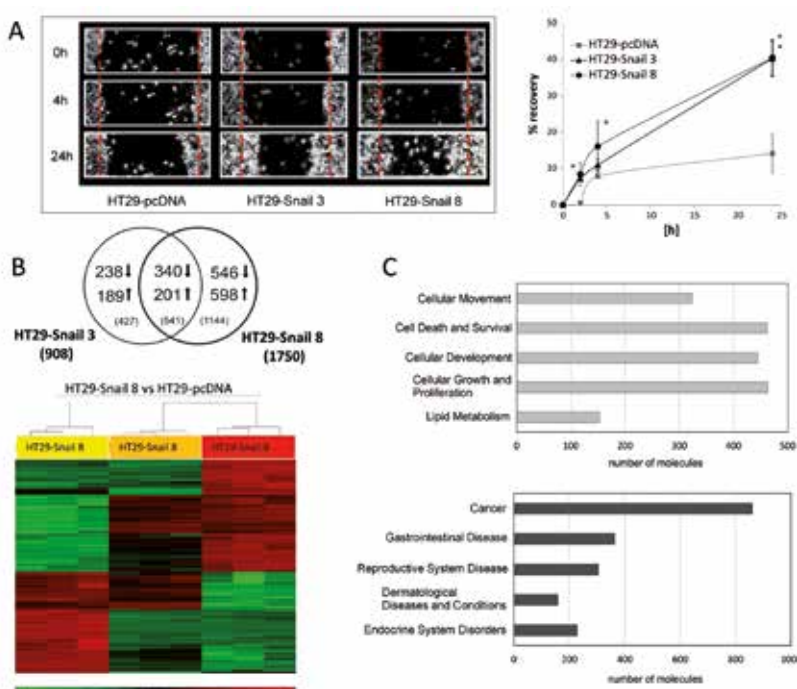


Fig. 2. The functional effects and transcriptome changes induced by Snail overexpression in HT29 cells. (A) Representative image of cell migration to the wounded area (left). Percent of recovery (right) calculated for each clone at 2, 4 or 24 hours after wounding; $N=3$, mean \pm SD, * $p < 0.001$ vs. control HT29-pcDNA. (B) Total mRNA from HT29 clones was subjected to microarray analysis. The Venn diagram (left) shows differentially expressed genes between two clones overexpressing Snail (clone 3 and 8) and HT29-pcDNA. Hierarchical clustering on the differentially expressed genes between HT29-Snail clone 8 and HT29-pcDNA occurs. The rows represent genes, while the columns represent three repeats for each sample. The colors in the heatmap represent the fold-changes in gene expression. The dendrogram shows the hierarchy of clusters. (C) The results of microarray analysis were interposed onto the Ingenuity database using Ingenuity Pathway Analysis software containing information about gene functions. Molecular and cellular functions (upper chart) p -value = 5.42×10^{-11} – 4.10×10^{-3} . Top diseases and disorders (lower chart): p -value = 1.39×10^{-15} – 4.16×10^{-3}

Tab. 1. Selected genes (fold change > 20 and/or $p < 2 \times 10^{-8}$), which are differentially expressed in HT29-Snail vs. HT29-pcDNA associated by IPA with cellular movement

<i>Gene symbol</i>	<i>Gene Title</i>	<i>Fold-change</i>	<i>p-value</i>
		<i>HT29-Snail vs. control</i>	
FN1	fibronectin 1	87.776	5.06×10^{-11}
NMU	neuromedin U	58.966	8.22×10^{-7}
TNC	tenascin C	55.722	1.61×10^{-5}
MGP	matrix Gla protein	45.666	2.85×10^{-7}
TUBA1A	tubulin, alpha 1a	38.822	1.28×10^{-8}
PALLD	palladin	36.419	1.68×10^{-7}
TACSTD2	tumor-associated calcium signal transducer 2	34.644	1.32×10^{-7}
MAGI2	membrane associated guanylate kinase	34.266	3.53×10^{-7}
WNT11	wingless-type MMTV integration site family, member 11	33.099	4.63×10^{-6}
CXCR4	chemokine (C-X-C motif) receptor 4	27.103	4.38×10^{-7}
LGALS1	lectin, galactoside-binding, soluble, 1	22.927	1.06×10^{-5}
TGFB111	transforming growth factor beta 1 induced transcript 1	17.917	1.62×10^{-9}
FAS	Fas (TNF receptor superfamily)	14.682	2.91×10^{-9}
FYN	FYN oncogene	11.661	1.49×10^{-8}
LYN	v-yes-1 Yamaguchi sarcoma viral related oncogene homolog	4.24	8.00×10^{-9}
SERPINE1	serpin peptidase inhibitor, clade E (plasminogen activator inhibitor type 1)	2.315	8.87×10^{-9}
MAP3K5	mitogen-activated protein kinase kinase kinase 5	-2.75	1.85×10^{-8}
EGF	epidermal growth factor	-7.495	1.93×10^{-8}

phenotype conversion, but also tumor microenvironment modulation.

There is a strong need for new, sensitive and specific biomarkers to identify patients with early CRC and those at risk of recurrence and/or metastasis and for the stratification of appropriate therapy. Our present results identified, among others, many genes associated with cellular movement that might serve as a new potential biomarkers for colorectal cancer (Tab. 1).

One of them is neuromedin U (NMU), a secreted neuropeptide with widespread distribution throughout the body, expression of which increased over 50 times in Snail overexpressing cells. NMU has been associated with a myriad of different functions, but limited evidence exists connecting NMU with cancer. So far, the reported findings have been

contradictory and dependent on cancer type. To our knowledge, NMU has not previously been associated with colon cancer or Snail transcription factor activity. In consistence with Snail-dependent high *NMU* mRNA expression in cells (Fig. 3A), we also detected *NMU* mRNA abundance in HT29-Snail – but not in HT29-pcDNA – conditioned medium suggesting that *NMU* is not only overexpressed but also secreted from HT29-Snail cells. Those observations correlate with protein level in culture medium; HT29-Snail cells secrete more NMU than control cells (Fig. 3B).

Our present results imply that further analysis of mRNA and NMU protein expression in tumors and CRC patient serum will shed more light on the potential function of these molecules as regulators or independent markers of the early stages of the EMT process.

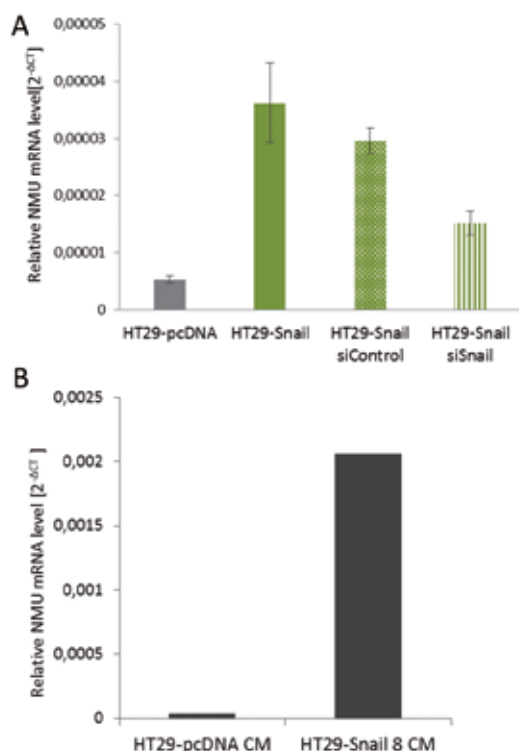


Fig. 3. HT29 with elevated Snail show increased NMU transcription and secretion. (A) Relative mRNA expression of NMU was detected through quantitative real-time PCR; N=7, mean (B) NMU mRNA was detected after 48 hours in conditioned medium (CM) from HT29-Snail cell culture. Relative mRNA expression of NMU was detected through quantitative real-time PCR; N=3 mean

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Structural tools for G Protein-Coupled Receptors

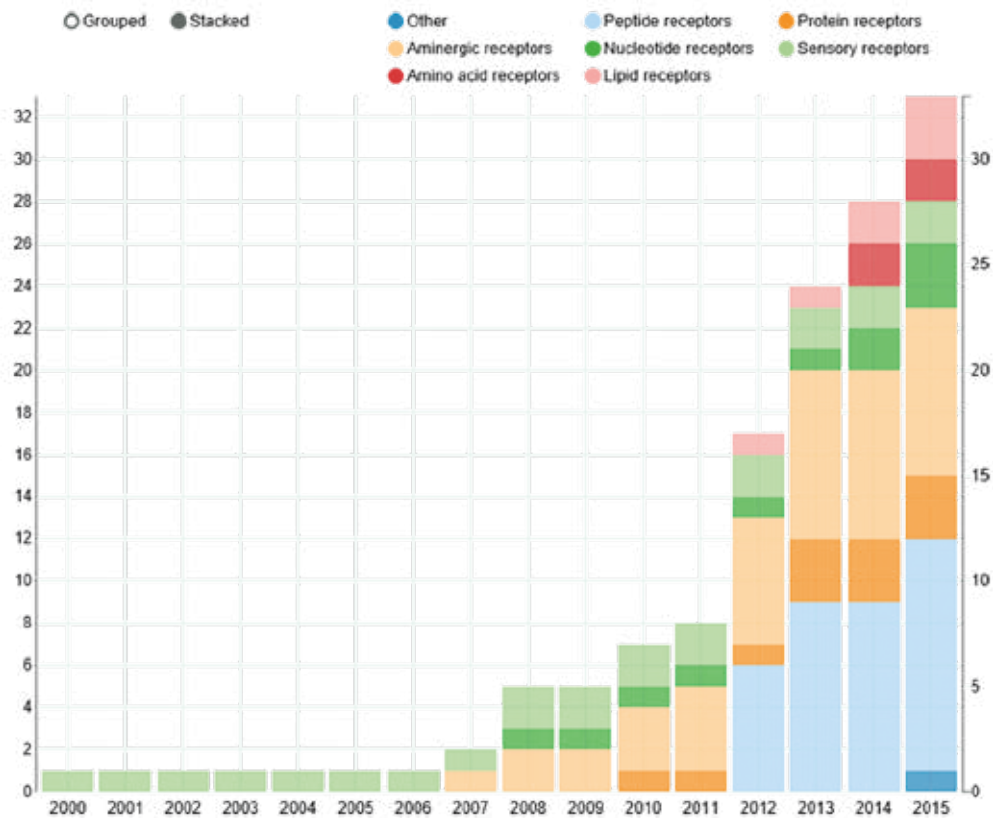
S. Mordalski | K. Rataj | A.J. Bojarski | Institute of Pharmacology | Polish Academy of Sciences

G Protein-Coupled Receptors (GPCRs) comprise a large superfamily of signaling proteins (c. 800 receptors), which are involved in a number of physiological processes, such as mood and behavior regulation, perception of pain, autonomic nervous system transmission, inflammation, regulation of immune system, etc. This functional diversity and importance of GPCRs for homeostasis makes them an attractive therapeutic target for various diseases; approximately 30% of marketed drugs target G Protein-Coupled Receptors. So far, 59 members of the superfamily have been drugged with small molecules (antihistamines, opioids, alpha and beta-blockers, serotonergics, or dopaminergics), aiming at treating, among

others, allergy, pain, high blood, pressure, depression, schizophrenia, and bipolar disease. Importance of GPCR research field was emphasized with the Nobel Prize in chemistry in 2012 for the discovery and functional and structural characterization of G Protein-Coupled Receptors.

The two common classifications of GPCRs divide the superfamily into six classes A–F or five families: Glutamate, Rhodopsin, Adhesion, Frizzled/Taste2 and Secretin (GRAFS). Rhodopsin family (Class A) is the largest and the most studied one. Although there is very little sequence homology between families, all of the GPCRs share a common topology of seven transmembrane helices and

A Unique crystal structures per year



B All available crystal structures per year

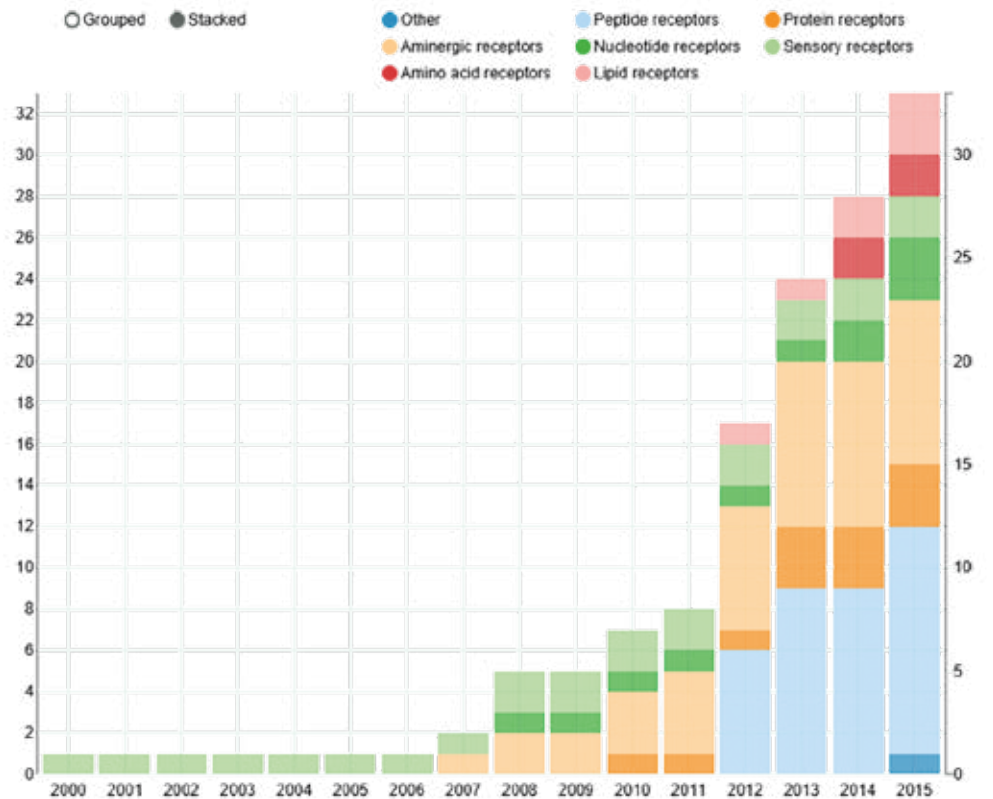


Fig. 1. Statistics on the numbers available unique (A) or all (B) crystal structures of GPCRs available per anni (GPCRdb.org)

the activation mechanism by either G protein or β -arrestin.

Due to being membrane proteins, G Protein-Coupled Receptors are challenging targets for crystallization, and until 2007 the only available crystal structure of GPCR was Rhodopsin. The first non-rhodopsin structure solved was β_2 -adrenergic receptor, and the number of available crystal structures of GPCRs has been constantly increasing, reaching 32 unique protein targets and 134 crystal structures in total (Fig. 1). This growing number of structures along with sequence and biological data induces a need for tools for its management and analysis, and it has been fulfilled by GPCRdb.org service, providing sequence alignments, mutagenetic data, and annotation of structures for G protein coupled receptors for over 20 years. Despite its established position within the GPCR community, the arsenal of tools and data available via GPCRdb is constantly improved. In 2013, the stewardship of GPCRdb was transferred to the David Gloriam group at the University of Copenhagen, backed up by an international team from the EU COST Action "GLISTEN."

The latest release of the GPCRdb introduced a number of tools codeveloped by the Department of Medicinal Chemistry, PAS Institute of Pharmacology, including:

- **Structure browser** – collection of annotated structural data of GPCRs. The tool allows for filtering, sorting, sequence alignment, and downloading selected substructures of the available crystals. Global statistics of crystal structures are also available.
- **Structure-based sequence alignments** – the sequence alignments are based on available structural data (annotated with generic residue positions), and receptors without solved three dimensional structure are projected on the most homologous crystal available. There is a number of visualization tools available, including residue tables, sequence snake plots, and phylogenetic trees.
- **Generic residue numbers** – the tool allows for detection and annotation of the user-submitted structure with GPCRdb generic residue positions, and the visualization scripts for Maestro and PyMol allow convenient work with the generic positions (Fig. 2).

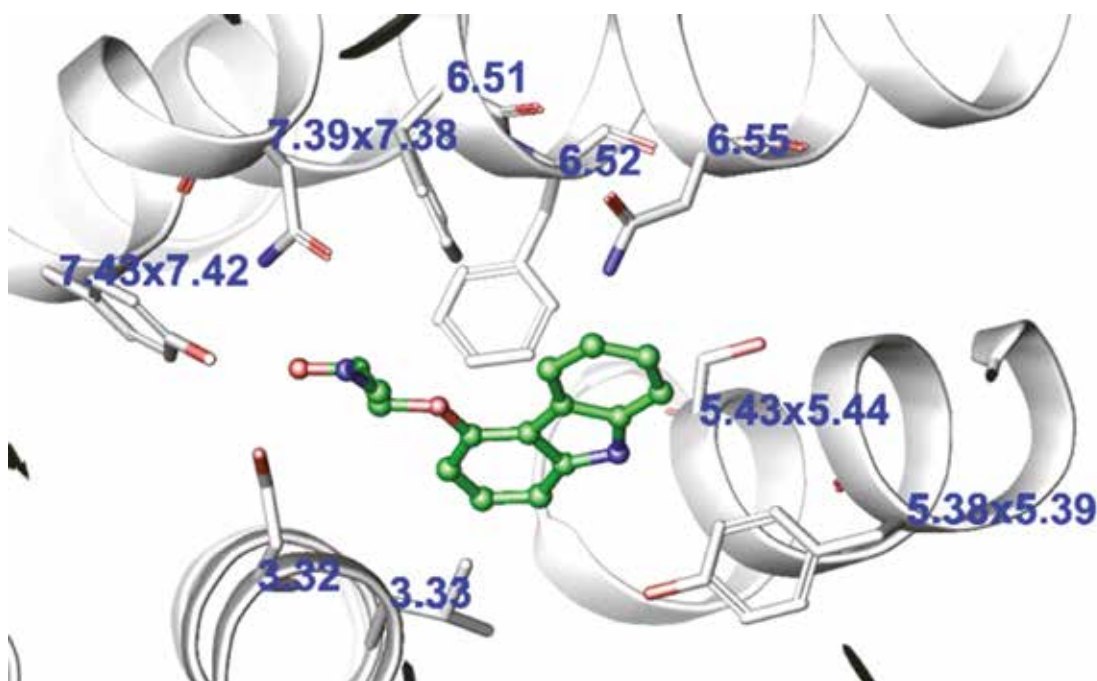


Fig. 2. Display of generic residue numbers inserted into a pdb file and visualized with the Maestro visualization tool

- **Binding sites** – ligand interactions have been annotated for all of the crystal structure complexes, and the GPCRdb.org allows for depicting the interactions within the binding site. In addition, there is a profiling tool available, providing the utility to search binding sites matching specified criteria (specific residues or residue properties).

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Obesity is associated with a decrease in expression but not with the hypermethylation of thermogenesis-related genes in adipose tissues

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Increasing energy expenditure by activation of thermogenesis is an attractive therapeutic strategy in obesity treatment, especially since there is evidence from epidemiological and animal studies showing that disturbances of thermogenesis-related pathways may play a role in the development of obesity. However, until now, little was known about the physiological changes in thermogenesis-related pathways in adipose tissue of obese humans. Therefore, we decided to analyze the expression of several thermogenesis-related genes in visceral (VAT) and subcutaneous (SAT) adipose tissues obtained from 58 obese patients (BMI > 40 kg/m²) during bariatric surgery and in 50 control tissues collected from normal-weight patients (BMI: 19–24 kg/m²) undergoing elective cholecystectomy (VAT) or op-

erated for inguinal hernia (SAT). The expression of these genes on mRNA level was measured by real-time PCR.

The genes investigated in this study formed three groups. The first one consisted of genes encoding β-adrenergic receptors (*ADRB*) crucial for the cold-induced activation of lipolysis and thermogenesis in white and brown adipocytes, respectively (Fig. 1). Analysis of *ADRB2* (Fig. 2A) and *ADRB3* (Fig. 2B) showed that their mean mRNA levels were significantly lower in adipose tissues of obese patients than in the tissues of normal-weight controls, both in VAT and in SAT. Furthermore, in obese patients expression of *ADRB2* and *ADRB3* was significantly lower in VAT than in SAT, while in normal-weight individuals no difference between VAT and SAT

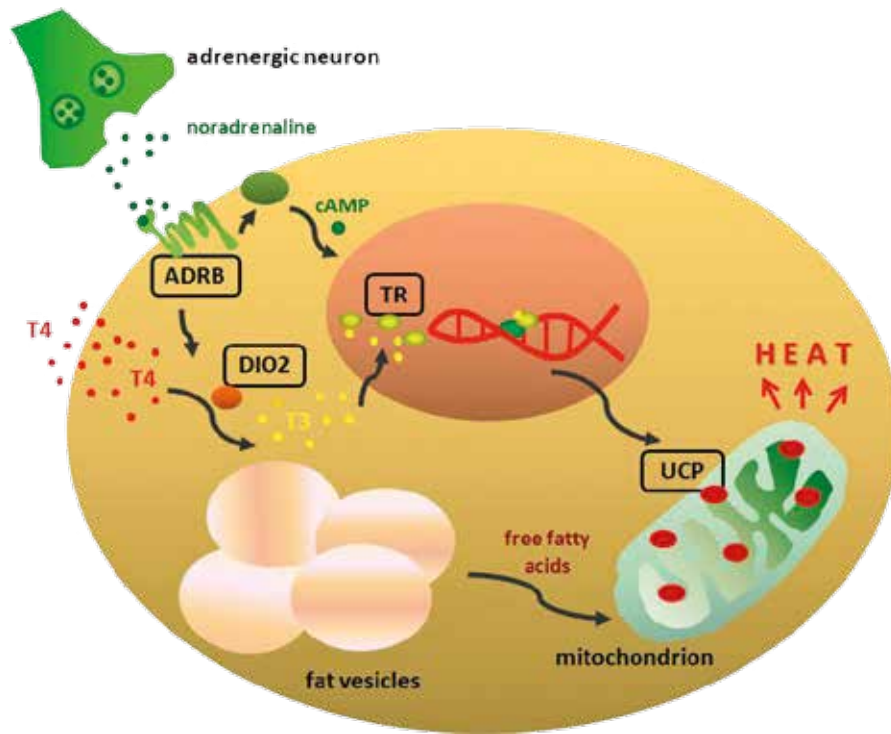


Fig. 1. A simplified drawing showing the role of adrenergic receptors β (ADRB), type 2 5'-iodothyronine deiodinase (DIO2) and thyroid hormones receptors (TR) in activation of thermogenesis in brown adipocytes. Exposure to cold leads to increased noradrenaline release and subsequent stimulation of various subtypes of ADRB resulting in the local activation of DIO2 which catalyzes conversion of thyroxin (T4) to T3 (triiodothyronine). Subsequently, T3 acting by its TR α and TR β nuclear receptors increases the expression of various genes, including the genes for uncoupling proteins (UCP) responsible for dissipation of oxidation energy as heat in mitochondria

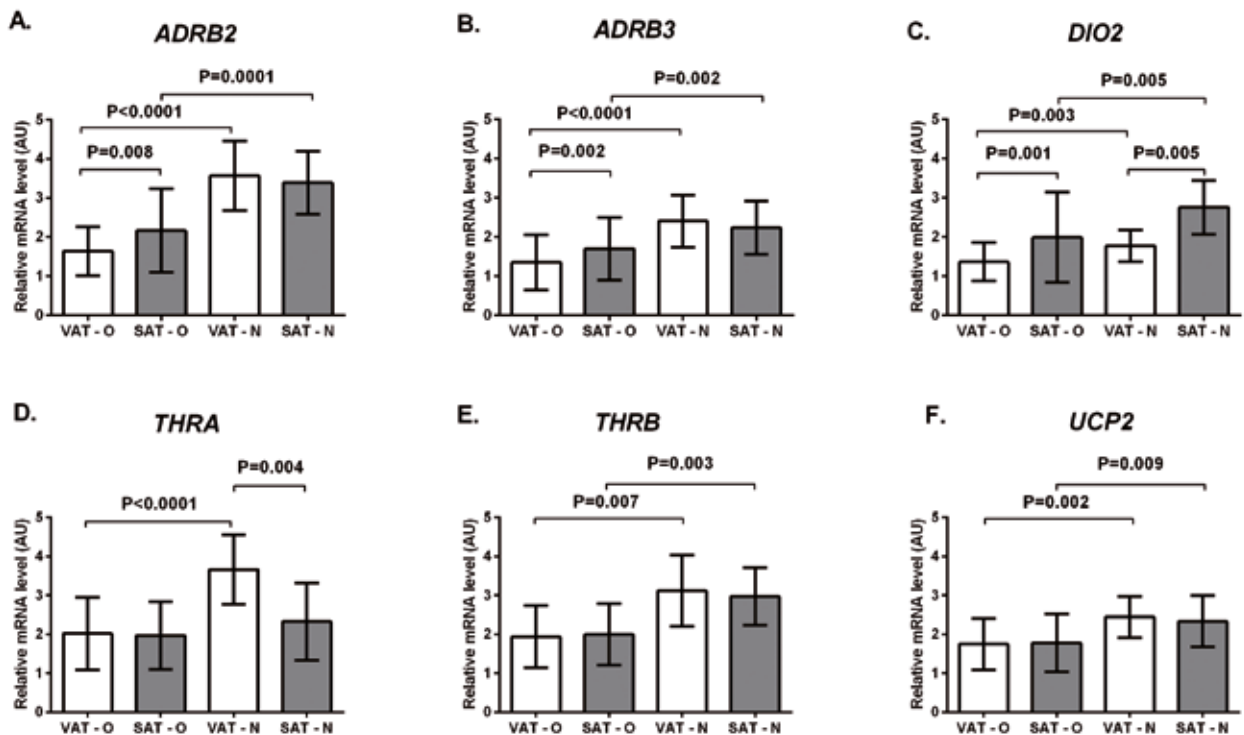


Fig. 2. Comparison of the expression of *ADRB2* (A), *ADRB3* (B), *DIO2* (C), *THRA* (D), *THRB* (E) and *UCP2* (F) genes in the visceral (VAT) and subcutaneous (SAT) adipose tissues of obese (O) and normal-weight (N) individuals. Results, normalized against the expression of the reference gene – β -actin, are shown as the mean \pm standard deviation

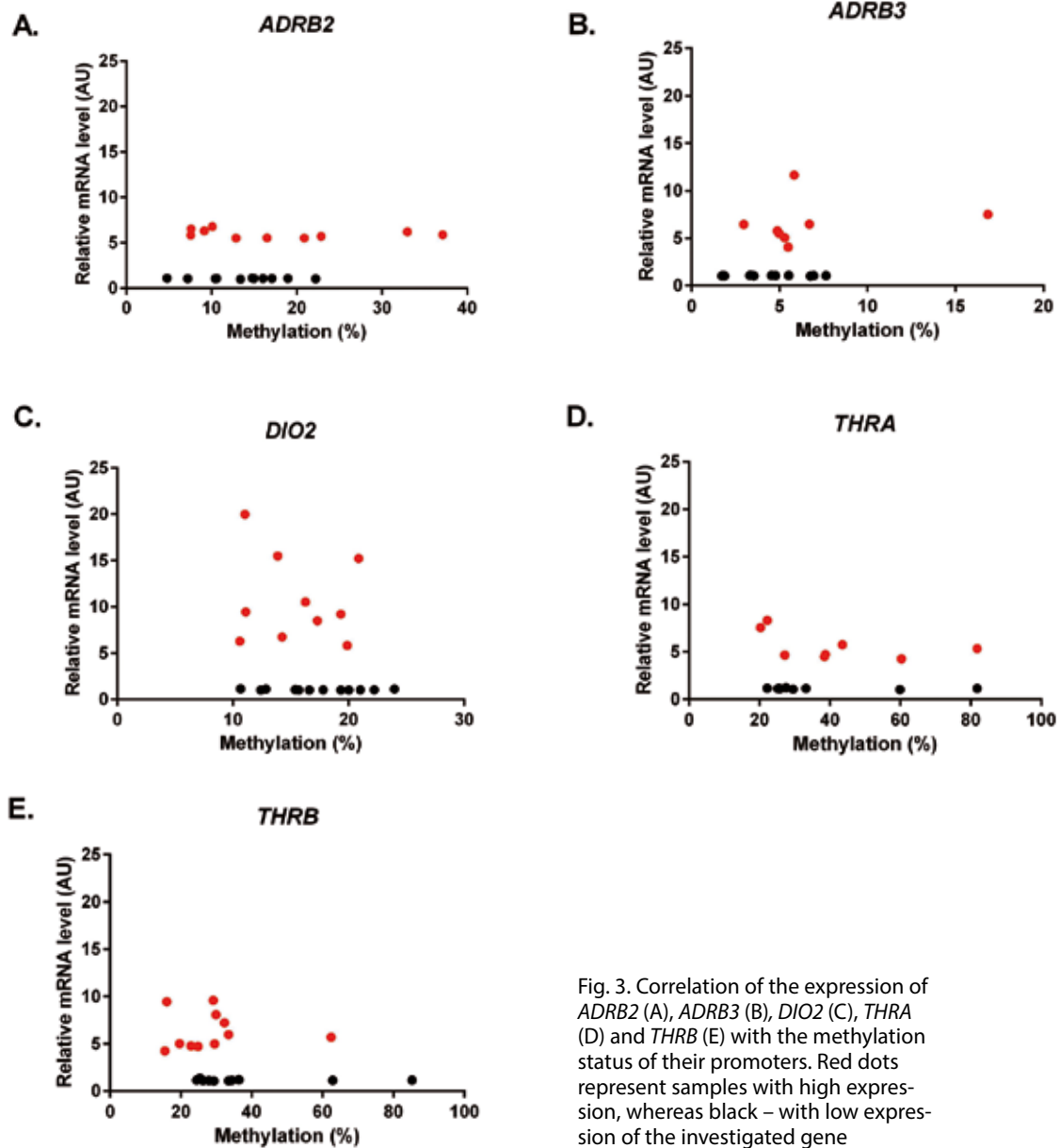


Fig. 3. Correlation of the expression of *ADRB2* (A), *ADRB3* (B), *DIO2* (C), *THRA* (D) and *THRB* (E) with the methylation status of their promoters. Red dots represent samples with high expression, whereas black – with low expression of the investigated gene

was detected. Therefore, one can assume that the decreased expression of *ADRB2* and *ADRB3* in adipose tissues of obese subjects can contribute to the development of obesity and presage a lower effectiveness of ADRB-stimulating compounds in the treatment of this condition.

Cold-induced noradrenergic stimulation of brown adipocytes results in the local activation of the type 2 5'-iodothyronine deiodinase (*DIO2*), which catalyzes conversion of the thyroid hormone, thyroxin (T₄), to its active form – T₃. Subsequently, act-

ing by its α and β nuclear receptors (TR α and TR β , respectively), T₃ increases the expression of various genes, including the genes for uncoupling proteins (UCP) responsible for dissipation of oxidation energy as heat in adipocyte mitochondria (Fig. 1). Therefore, the second analyzed group consisted of genes encoding proteins involved in the metabolism (*DIOs*) and function (*THRA* and *THRB* encoding TRs) of thyroid hormones, while the third – of genes encoding UCPs (*UCPs*). The mean expression of *DIO2* (Fig. 2C) was significantly lower in adipose

tissues of obese patients than in the control group, and the difference concerned both VAT and SAT. In obese patients, the mean *DIO2* expression was significantly lower in VAT than in SAT, and a similar observation was made in normal-weight controls. The mean expression of *THRA* (Fig. 2D) was significantly lower in adipose tissues of obese patients than in those of normal-weight individuals, but the difference was detected only in VAT. In addition, in obese patients the expression of *THRA* was similar in VAT and SAT, while in controls it was higher in VAT than in SAT. The mean expression of *THRB* (Fig. 2E) was significantly lower in adipose tissues of obese patients than in the control subjects, and the difference concerned both VAT and SAT. Given their important role in adipocyte metabolism, low expression of *DIO2*, *THRA* and *THRB* in adipose tissues of obese individuals might then be one of the mechanisms related to the progression of obesity, difficulties in weight loss and resistance to the therapies targeting this pathway. The mean expression of *UCP2* (Fig. 2F) was significantly lower in obese patients than in normal-weight individuals and the difference was observed in both VAT and SAT. In turn, an unchanged expression of *UCP1* and *UCP3* (despite decreased levels of mRNA for *DIO2*, *THRA* and *THRB*) suggests that T3 is not the most important molecule controlling the activity of these genes in adipose tissues of obese subjects.

Out of many mechanisms regulating gene expression in adipose tissue, epigenetic modifications (e.g. DNA methylation) are of special interest. Since diet is the chief factor influencing methylation, we decided to investigate whether the changes regarding the expression of thermogenesis-related genes in diet-induced obesity can be related to the methylation status of their regulatory regions. The methylation status of *ADRB2*, *ADRB3*, *DIO2*,

THRA and *THRB* genes was studied by the methylation-sensitive digestion/real-time PCR method. However, we found no differences in methylation between normal-weight and obese subjects. In addition, the methylation level of the investigated genes was not related to the level of their expression (Fig. 3). This result suggests that methylation may not be the chief mechanism involved in the regulation of activity of these genes, but further studies using other analytical methods are needed to verify this hypothesis.

In summary, in our work we showed that adipocytes of obese individuals are characterized by a decreased expression of the key genes involved in the activation of thermogenesis that may result in their lower responsiveness to hormonal and adrenergic stimuli and, therefore, lower thermogenic activity than in lean subjects. We also showed that, most possibly, this phenomenon is not associated with the increased methylation of promoters of the analyzed thermogenesis-related genes.

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Polish Young Academy

Chairman:



Jakub Fichna, PhD, DSc

Department of Biochemistry, Faculty of Medicine, Medical University of Łódź, Poland

Pharmacist, pharmacologist and gastroenterologist. In 2014 he was appointed Head of the Department of Biochemistry at the Medical University of Łódź, Poland. He authored more than 160 peer-reviewed publications, focusing principally on novel pharmacological targets for the treatment of functional and inflammatory diseases of the gastrointestinal tract. Former Young Committee Member of United European Gastroenterology (UEG) National Societies Committee and leader of the UEG Young Talent Group. Recipient of the President of the Polish Academy of Sciences Scientific Award and the UEG Rising Star 2016 Award.

Deputy Chairman:



Beata Hasiów-Jaroszevska, PhD, Associate Professor

Department of Virology and Bacteriology, Institute of Plant Protection, National Research Institute, Poznań, Poland

Plant Virologist. Since 2014 associate professor at the Department of Virology and Bacteriology in the Institute of Plant Protection, National Research Institute in Poznań. Her scientific interests are connected with molecular evolution of viruses, host-pathogen interactions and development of new, innovative products for plant protection. Member of the Association of TOP500 Innovators. Author of more than 80 peer-reviewed publications and principal investigator of several scientific projects. Her PhD thesis was awarded a prize of the Prime Minister. Recipient of the scholarships of Ministry of Science and Higher Education and Foundation for Polish Science. Awarded the Silver Cross of Merit by the President of Poland.



Monika Kaczmarek, PhD, DSc

Molecular Biology Laboratory and Department of Hormonal Action Mechanisms, Institute of Animal Reproduction and Food Research, Olsztyn, Poland
Department of Large Animal Diseases with Clinic, Faculty of Veterinary Medicine, Warsaw University of Life Sciences, Poland

Over the last decade, her interests were mainly focused on the molecular aspects of reproductive endocrinology. In 2011 she was appointed Head of Molecular Biology Laboratory at the PAS Institute of Animal Reproduction and Food Research. She authored over 50 peer review publications, focused mainly on the embryo- and neonate-maternal communication. Recipient of prestigious fellowships from, e.g., Fulbright Commission, Alexander von Humboldt Foundation, Hertie Foundation, Foundation for Polish Science, and the Polish Ministry of Science and Higher Education. Active member of several commissions of trusts, e.g., review panels, editorial boards, and scientific committees.



Michał Wierzchoń, PhD

Institute of Psychology, Jagiellonian University, Cracow, Poland

Psychologist, cognitive scientist. Since 2009, leader of the Consciousness Lab at the Institute of Psychology, Jagiellonian University. He authored two books and over 50 other peer-review publications. His research interests and theoretical investigations are focused on consciousness, including the studies on subjective measures of consciousness, implicit learning, binocular rivalry and sensory substitution. Secretary and Committee Member of the European Society for Cognitive Psychology. Recipient of several grants and awards, including the Polityka Magazine Award for Young Scholars, Foundation for Polish Science Scholarship, and the Malewski Award given by the PAS Committee on Psychology.

Members:

Marcin Bizukojć | Janusz Marek Bujnicki | Michał Chmielewski |
Sławomir Dinew | Dominik Dorosz | Andrzej Dziembowski | Adrian Gleń |
Sławomir Gruszczyński | Tomasz Guzik | Dariusz Jemielniak |
Bartosz Karaszewski | Adrian Kosowski | Jarogniew Łuszczki |
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Ireneusz Weymann | Maciej Wojtkowski | Borys Wróbel | Michał Zatoń

Polish Young Academy

J. Fichna | Polish Young Academy



Discussion panel at the conference “What our universities and Polish science should become” organized by the Ministry of Science and Higher Education (Warsaw, 24 June 2015). PYA was represented by Prof. Janusz Bujnicki and Jakub Fichna, PhD, DSc

Thirty five members of the Polish Young Academy (PYA) represent almost each and every discipline in science and are affiliated in Polish universities and research institutes. In 2015, there were two General Meetings of PYA, during which current activities, planned projects and international co-operations were discussed.

In the beginning of 2015, PYA together with its European counterparts signed two letters addressed to the President of the Council of the European Union concerning the policy of the EU towards research and science.

On 9 March 2015, PYA co-organized a session entitled “Recent Developments in Photonics,” which accompanied the opening of the Laboratory of Optical Fiber Technology at the Białystok University of Technology. The session was originally designed and created by Dominik Dorosz, PhD, DSc, a PYA member under the auspices of the President of the Białystok University of Technology and the President of the Polish Academy of Sciences. Honorable

speakers in this session included, among others, representatives of the PAS: Prof. Marek Chmielewski, Vice-President of the Polish Academy of Sciences and Prof. Antoni Rogalski, Dean of the Engineering Sciences Division.

Members of PYA became involved in the preparation of the “Pact for Science,” announced in April 2015, which is currently one of the main documents used by the Ministry of Science and Higher Education in the policy making process and in building new trends for development of the Polish science. Upon publication the document was widely discussed during several meetings with politicians and other policy makers, as well during a debate at the University of Warsaw (Warsaw, 16 June 2015), where PYA was represented by Michał Wierzchoń, PhD, DSc. On 24 June the Ministry of Science and Higher Education organized the conference “What our universities and Polish science should become,” during which PYA was represented by Prof. Janusz Bujnicki and Jakub Fichna, PhD, DSc.

PYA co-organized a pan-European competition “Who gets carried away by Europe?.” The winners of this competition were announced in Berlin in June 2015.

PYA involvement in the actions for the science in Poland resulted in the organization of an international conference Polish Scientific Networks, held on 24–26 June, 2015 in Warsaw, in cooperation with the Ministry of Science and Higher Education and the Foundation for Polish Science Scholars Association. Monika M. Kaczmarek, PhD, DSc and Prof. Janusz Bujnicki became the heads of Organizing and Scientific Committees, respectively. The aim of the conference was, on the one hand, to encourage Polish citizens residing abroad to move back and continue their scientific activity in Poland, in particular by accommodating in newly established laboratories and research centers, and on the other hand to stimulate international collaborations between Polish and foreign researchers. The idea behind the conference was to create a network of contacts that would enrich science in Poland, as well as to promote international mobility among Polish scientists. One of the visible outcomes of the conference was a list of recommendations for changes in the Polish academia that would turn the “brain drain” into “brain circulation.” Among others, the encouragement for collaboration between academia and industry was recommended. Consequently, a new edition of the Polish Scientific Networks conference, planned for 2016, will focus on presenting examples of such collaboration and benefits of thereof in Poland and abroad. Directions that need to be undertaken to improve the flow of ideas from academia to industry will be also discussed.

Members of PYA actively engage in discussions on career in science and academia, including the relations between senior and junior scientists, possible career pathways and mentoring in science. This has been evidenced through meetings and debates organized in 2014 and 2015 in Łódź under the title “Conflict or relay of generations,” and initiated by Jakub Fichna, PhD, DSc. During the second debate (Łódź, 4 November 2015), possible career models were discussed; moreover, the relations between the “master” and “apprentice” in Poland and abroad have been defined. Particularly important for the organization of these debates was the collaboration between PYA with members of the Polish Academy of Sciences representing its Presidium and the Chapter of the Young Academy, as well as local scientific milieu in Łódź.

With initiative of the PYA members Michał Wierchoń, PhD, DSc, Prof. Janusz Bujnicki, Beata Hasiów-Jaroszewska, PhD, DSc, and Konrad Osajda, PhD, several activities of PYA aimed at the mobility of Polish scientists. Their main goal was to indicate, study and discuss the benefits as well as to identify the barriers in researchers’ mobility. Within the frame of these actions, which resulted in the organization of a number of symposia and a sociological study, PYA collaborated with the members of the movement Citizens of Science and the initiative Science is a Human Thing. The main outcome of these actions was a document containing an in-depth analysis of the mobility of the Polish scientists within the country and abroad, published in December 2015.

In 2015, PYA organized its first Summer School “Hotbed of Young Talents” (Mądralin, 26–28 June 2015). The addressees of HYT were young researchers, mainly PhD students at the beginning of their scientific carrier, active in the field of mathematics, biology as well as medical and agricultural sciences. The aim of the school was to improve the skills of these young fellows in publication writing, oral presentations, data processing and much more. Hotbed of Young Talents was a chance for young researchers to meet, share their scientific interests, discuss problems which they experience daily, and most of all – for networking and building interdisciplinary co-operations.

Since the very beginning, PYA engages in popularization and dissemination of science. In 2015, PYA participated in the Science Picnic of Polish



A. BIELEC

Debate “Conflict or relay of generations” (Łódź, 4 November 2015)

Flying Science Cafés – Monika Kaczmarek – “DNA: memory hidden in our cells?” (Olsztyn, 20 November 2015)



Z. RELISZKO

Radio and the Copernicus Science Centre (Warsaw, 9 May 2015), Lublin Science Festival (19–25 September 2015) and Fusion Night (Olsztyn, September 25, 2015). PYA has also organized four Flying Science Cafés, addressed mainly at younger students. These meetings allow a more personal approach and encourage young people to gain interest in research and maybe even become scientists.

In the end of 2015, PYA, together with the Young Scientists Council undertook the organization of the meeting “The young in science.” The debate on the paths and direction for the science in Poland will be

held in Warsaw on 16 March 2016 and will gather the most notable policy makers in the country.

The year 2015 was very fruitful as regards personal achievements of the members of PYA. Among others, Prof. Janusz Bujnicki (recommended by PYA) was appointed member of the High Level Group of Scientific Advisors of the EC Scientific Advice Mechanism; Katarzyna Marciniak, PhD, DSc obtained the ERC Consolidator Grant; Prof. Dariusz Jemielniak has become a member of the Wikimedia Foundation Board of Trustees; finally, Jakub Fichna, PhD, DSc received the President of the Polish Academy of Sciences Scientific Award.

Research report on the mobility of Polish scientists

One of the main aims of the Polish Young Academy is to review the Polish science policy from the young scientist’s perspective. Following this mission, the Academy members recently decided to take a closer look at the research mobility of Polish scientists. Over last two years the Academy organized two symposia and a panel discussion at the Polish Scientific Networks conference dedicated to this problem. In cooperation with the members of the initiative

“Science is a Human Thing,” the Academy has also run two surveys questioning over 1,000 Polish scientists about the issue. When the collected material was analyzed and discussed, the Academy decided that it seems to be worth sharing with a wider audience. The members of the Academy hope that the document will encourage discussion on how to support the mobility of Polish researchers and attract them to return to the country after gaining experience abroad.

SUGGESTED CHANGES

Financing mobility

PROGRAMS SUPPORTING MOBILITY



- for academics without permanent contracts
- short-term mobility opportunities for scientists at different career stages
- virtual mobility
- mobility without age constraints
- trans-border cooperation



PROGRAMS ENCOURAGING VISITING POLAND



- grants helping scientists from abroad to come to Poland
- reduction of the formalities
- adjustment of the application forms to the needs of foreigners (information in English)
- providing administrative assistance in completing the forms
- using the "early stage career scientist" instead of the "young scientist" category

PROGRAMS SUPPORTING RETURN TO POLAND



- addressed to scientists of Polish descent
- addressed only to the best candidates (substantial funding for the limited number of scientists)
- supporting returns to research institutions other than parent universities
- funding for the settlement and organization of the research team in Poland
- reduction of teaching and administrative duties
- helping scientists, who live abroad, but are planning to return to the country

SUGGESTED CHANGES

Comprehensive support for scientists employed in Poland

SUPPORTING MOBILITY THROUGH



- providing information on possible forms of mobility (and information about funding)
- making the competitions for academic positions more open and accessible
- supporting student mobility
- supporting the bilateral exchange
- academic teachers mobility
- introducing mobility at a system level (shared schedules of planned classes and activities)
- administrative support in organizing mobility
- financial incentives for institutions supporting mobility of their employees
- development of virtual mobility
- clear regulations about scholarship tax policy
- favouring mobility when granting academic degrees and titles
- taking into account the mobility when assessing research entities
- active support policy for women and scientists from smaller research centres
- reduction of the teaching time during graduate studies

SUPPORTING RETURN TO POLAND



- standardizing the recruitment policy for academic positions
- organizing social campaigns promoting returning to Poland
- arranging active aid in the settlement in new place
- providing financial assistance during the time when a person is applying for a grant
- giving a one-time acclimatization bonus
- reducing teaching duties
- providing an opportunity to use knowledge gained while staying at another research centre to raising the level of investigation in the parent unit

INCREASING INCOMING MOBILITY



- adapting the system to receive employees from abroad
- establishing procedures for hiring foreigners
- reducing bureaucracy
- publishing all the work offers in one place (in Polish and English version)
- presenting employment in Poland as an opportunity for scientific development
- organizing international campaigns promoting competitions organized by NCN and NCBiR
- analysing the technological potential of Polish research centres (listing all the available apparatus, projects, etc.)
- organizing intercultural competencies trainings for Polish scientists
- searching for high-profile specialists and inviting them to Poland

The results of discussions and questionnaires clearly show that the majority of the scientific community supports scientific mobility and perceive it as a necessary condition of the successful research career. The results also indicate that mobility should be supported at all stages of research career. However, some negative consequences of the research mobility were also listed. The respondents noted that those negative consequences may be observed both at the level of individual research careers and at the level of Polish research institutions. The studies also aim to identify barriers of mobility. The results indicate that there is a need of a holistic system aiming to support and increase the mobility of Polish researchers. Respondents noted that the current system supports the mobility of a relatively small group of researchers. However, the results suggest that only general solutions influencing the Polish science policy could support the mobility of the majority of Polish scientists, and thus supporting the mobility of those who really need it. Importantly, the respondents noted that possible systemic solutions should be developed and implemented taking into account the differences between different scientific disciplines.

The authors of the research report describing the effects of the studies conducted propose that the formulation of the policy aiming to support the

mobility of Polish academics should begin with defining the intended, ideal state of the issue. It was also proposed that in order to support the mobility of Polish scientist one should: minimize outgoing mobility of good scholars from small research centres to stronger centers in large cities and abroad; avoid supporting the mobility of researchers, who use the mobility in order to avoid real work; focus on mobility that raises the competence of scientists; foster the application of the competence acquired thanks to the mobility in the Polish scientific institutions; support mobility aiming to foster regional, national and international cooperation; support the mobility aiming to increase the role of Polish science at the international level; attract and employ very good (also foreign) scientists in Polish research centres; provide sufficient funding; provide access to available research infrastructure.

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The International Relations of the Polish Academy of Sciences

PAS authorities' visits in Paris and Munich

A. Rusiecka | J. Krześniak | Office of International Relations | Polish Academy of Sciences

PAS delegation in front of the headquarters of the Max Planck Society in Munich – from left: Prof. Stanisław J. Czuczwar, Prof. Paweł Rowiński, Prof. Jerzy Duszyński, Prof. Elżbieta Frąckowiak, Prof. Edward Nęcka, Dr. Urszula Wajcen – former Director of the Office of International Relations of the PAS, Prof. Stefan Malepszy



M. KOTWICA

On 27–29 October 2015, the President of the Polish Academy of Sciences Prof. Jerzy Duszyński and the Vice-Presidents: Prof. Stanisław J. Czuczwar, Prof. Elżbieta Frąckowiak, Prof. Stefan Malepszy, Prof. Edward Nęcka, and Prof. Paweł Rowiński paid a visit to Paris, where they attended a series of meetings at the following French research institutions: the French National Institute of Health and Medical Research (INSERM), the High Council for Evaluation of Research and Higher Education

(HCERES), the Ministry for National Education, Higher Education and Research (MENESR), and the National Center for Scientific Research (CNRS).

The most significant issues discussed in Paris were the following: supporting researchers in applying for EU research grants, evaluating research units and research groups, and international cooperation. Information on the advanced support systems functioning at the MENESR and at the CNRS proved to be especially valuable for the PAS delegation.



M. KOTWICA

PAS authorities at the CNRS – from left: Prof. Stanisław J. Czuczwar, Prof. Jerzy Duszyński, Dr. Sébastien Reymond – Attaché For Science, Technology and Academic Cooperation at the French Embassy in Warsaw, Dr. Patric Nédellec – Director of the Office of International Relations of the CNRS, Prof. Paweł Rowiński, Prof. Edward Nęcka



CNRS

PAS delegation and the French participants of the meeting at the CNRS in front of the CNRS headquarters in Paris

French researchers who wish to participate in EU research programs (e. g. Horizon 2020) as well as in grant competitions organized by the European Research Council can receive professional help at various stages of the application process, also at the very beginning of it, when the application is being prepared. Increasing the rate of the participation of French researchers and scientific institutions in EU research projects and ERC grant competitions is at present one of the elements of the CNRS international strategy. The MENESR also perceives this issue as one of its key challenges.

During the Paris visit, the PAS President also met the Ambassador of the Republic of Poland in France Dr. Andrzej Byrt. Besides, Prof. Duszyński and Prof. Rowiński took part in the meeting of the President of Poland Andrzej Duda with representatives of the scientific milieu and the Polish commu-

nity in France. The meeting took place at the Polish Embassy in Paris.

On 19 November, the PAS authorities visited the headquarters of the Max Planck Society in Munich. The discussions held there focused, among others, on the scientific staff selection procedures of the MPG, the mobility of researchers, and the evaluation of research institutes and researchers. Another issue on the agenda of the meeting in Munich were the various aspects of the proper public relations policy of a public research institution.

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M. KOTWICA

Meeting at the CNRS – from left: Prof. Patrick Netter, Advisor for Europe to the President and the Director General for Science, CNRS; Dr. Guido Pintacuda, Senior Researcher, CNRS; Dr. Patric Nédellec, Director of the Office of International Relations of the CNRS; Laura Sedaine, ERC National Contact Point; Prof. Edward Nęcka; Prof. Paweł Rowiński; Prof. Jerzy Duszyński; Prof. Stanisław J. Czuczwar; Prof. Stefan Malepszy

Cooperation of the Institute of Philosophy and Sociology with China

A. Rychard | A. Kościński | Institute of Philosophy and Sociology | Polish Academy of Sciences

The cooperation of the PAS Institute of Philosophy and Sociology with both the Chinese Academy of Social Sciences (CASS) and the Shanghai Academy of Social Sciences (SASS) already has a ten-year history. The main scientific partners of the Institute are research units widely recognized in social sciences, but the most intensive scientific cooperation is related to the Institute's relationship with Chinese sociological institutes. This cooperation is not limited to the partnership units of PAS, but extends to universities closely cooperating with CASS and SASS, of which the most important are: the Department of Sociology, Qinghua University in Beijing, the Institute of Sociology of Beijing University, departments of sociology at the Shanghai University and Fudan University (Shanghai).

Over 2015 and 2014, the scientific cooperation of the Institute with its Chinese partners was significantly intensified and expanded. In September 2014, the Institute hosted a scientific conference on the theme "Between Tradition and Modernity: Social Inequalities in Times of Transition – Chinese, Polish, Czech and Hungarian Experiences," which was a very important event in the community researching social changes in the countries of Central and Eastern Europe and Mainland China. In April 2015 the Institute organized a conference on "Social Change and Social Governance in Poland and China," which was attended by the presidents of PAS and CASS: Prof. Jerzy Duszyński and Prof. Wang Weiguang. In the same year, in October, it

held a conference organized by the partners of the CASS in Shanghai on "Social Changes of the Silk Road Economic Belt Countries."

Chinese partners directly reported the need to continue the "new opening" in bilateral research relations, which enables mutual learning processes of social change, those that took place in Poland after 1989 and those currently taking place in China. Intensive cooperation with China can be supported through scholarship programs offered by the Chinese side and the intensification of the bilateral funding and individual research projects dealing with issues of social change, transformation of the social development of the market economy, liberalization of political life and civil society development. These projects should be comparative in nature and involve basic issues from the perspective of transformational change in both countries.

In 2016, the PAS Institute of Philosophy and Sociology will be the co-author of a volume on social change in post-communist countries and China, the first book in the Chinese publishing market addressing this topic.

Substantive participation of the Institute in the preparation and implementation of cross-cultural research programs involving partners from China proves the high position of the Institute, developed by its researchers in the course of this cooperation. Chinese sociologists agree that for the Chinese Academy of Social Sciences, PAS is currently a more valuable partner for research cooperation than the

The conference on
"Social Change and
Social Governance in
Poland and China,"
April 2015, PAS
Institute of Philosophy
and Sociology, Warsaw



A. KOŚCIŃSKI



A. KOŚCIĄŃSKI

The study visit at Fudan University, Social Change Research Team directed by Professor Liu Xin, June 2015, Fudan University, Shanghai

Western research institutions from countries that were not subject to such changes as the post-socialist political systems. The current role of China in the world and the uniqueness of the Chinese transformation should be the subject of analysis of the Polish social sciences.

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The first Poland – U.S. Science Award goes to Jaskólski and Wlodawer

M. Jaskólski | Institute of Bioorganic Chemistry | Polish Academy of Sciences
A. Wlodawer | National Cancer Institute, USA

A new prestigious scientific prize established jointly by the Foundation for Polish Science (FNP) and the American Association for the Advancement of Science (AAAS) awards the most successful collaboration between scientists from these two countries. The first award, presented in April 2015 in the headquarters of the AAAS in Washington, D.C., went to two macromolecular crystallographers in recognition of their joint structural studies of several proteins with high relevance to medicine, through contribution to the development of successful therapies for combating, inter alia, AIDS, and leukemia. The laureates, selected from among over 50 nominations, were Prof. Mariusz Jaskólski of A. Mickiewicz University and the Institute of Bioorganic Chemistry, Polish Academy of Sciences in Poznań, Poland, and Dr. Alexander Wlodawer from the National Cancer Institute, USA. Both are very well known in the world-wide community of structural biologists for their high-impact publications, services on various scientific bodies, and presentations at many conferences and meetings.

Their collaboration started almost 30 years ago, when Jaskólski joined the laboratory of Wlodawer at the National Cancer Institute in Frederick, Maryland, and made an important contribution to the so-

lution of the crystal structures of retroviral proteases from the avian Rous sarcoma virus and human HIV-1 virus. Their work paved the way to the development of successful AIDS drugs by several pharmaceutical companies, within record-setting time of less than seven years. As a result, HIV infection and AIDS are no longer a death sentence and a lethal disease.

After returning to Poland, Jaskólski established in 1994 the first macromolecular crystallography



Mariusz Jaskólski (right) and Alexander Wlodawer (left) during the conference on Multi-Pole Approach to Structural Biology, which they co-organized in Warsaw in 2011

laboratory in Central Europe, and his collaboration with Wlodawer, now on two different continents, continues to this day. Among a number of collaborative accomplishments, of note is their structure solution of L-asparaginase, a target in the therapy of acute lymphoblastic leukemia.

Wlodawer and Jaskólski have not only collaborated on a variety of research projects, but also published jointly a number of educational and instructive papers on crystallographic methodology and techniques. Together they co-authored 40 publications which so far have accumulated over 2,500 cita-

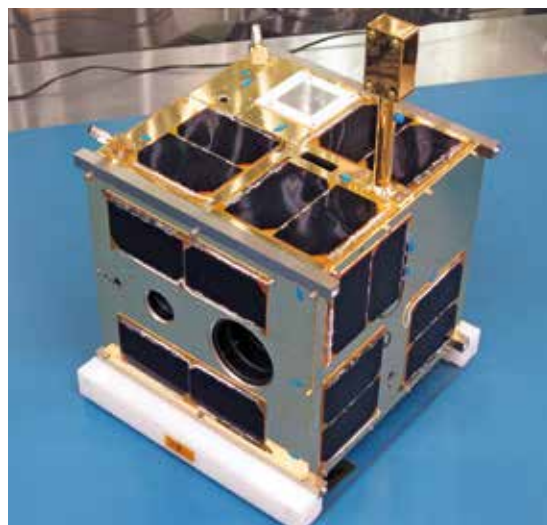
tions. The first FNP – AAAS award for outstanding Poland–U.S. science collaboration also emphasizes the importance of biocrystallography and structural biology for the human society.

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BRITE-Constellation – the first Polish scientific space mission

G. Handler | Copernicus Astronomical Center | Polish Academy of Sciences

The BRITE mission consists of six practically identical nanosatellites – cubes of 20 x 20 x 20 cm (Fig.) that are designed to obtain accurate measurements of the light radiated by the brightest stars in the sky. BRITE stands for BRiGht Target Explorer; the concept of the mission and the abbreviation of its name originate from Prof. Sławomir Ruciński from the University of Toronto. The satellites were built by a consortium in three partner countries, Austria, Canada, and Poland, two in each country. They were launched into orbit between February 2013 and August 2014. The Polish BRITEs are named Lem and Heweliusz and are the first Polish scientific satellites. The technical work has been carried out at the PAS Space Research Center, and the Copernicus Astronomical Center hosts the ground station that operates Lem and Heweliusz in orbit. To date, approximately 300 stars have been observed for a duration of up to half a year each. The first measurements have been distributed to scientists in early 2015, and are now periodically released on a three-monthly basis. The main aim of the mission is to study variability in the light output of bright stars of high mass. This variability is caused by physical processes in the star, which can now be studied and constrained. In this way, knowledge about the interior structure of the stars, but also their rate of rotation, the presence of binary companions, circumstellar material etc. can be obtained. Of course, we are only at the beginning



One of the six BRITE nanosatellites in the laboratory before launching

of these scientific explorations, but the first few interesting results have already been obtained. Due to the high quality of these measurements, as they are taken outside of the Earth's atmosphere, first results that would not be obtainable otherwise have been obtained. These comprise the unexpected discovery of many long-period oscillations in some stars, a better understanding of rapidly rotating hot stars and their interaction with circumstellar material, and a type of binary stars so far only known at much lower mass. The initial scientific results of BRITE-Constellation

were presented at a conference in Gdańsk-Sobieszewo on 14–18 September 2015, with 60 international delegates from about 15 countries participating. A second BRITE science conference will take place in Austria in August 2016. The mission is clearly living up to its creators' expectations.

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From computational engineering to biomedical issues – international research activity of the Institute of Fundamental Technological Research

M. Ekiel-Jeżewska | T. Lipniacki | S. Stupkiewicz | A. Pręgoska | Institute of Fundamental Technological Research | Polish Academy of Sciences

The Polish Academy of Sciences attaches great importance to international cooperation. Since its inception the mission of the Institute of Fundamental Technological Research has been a comprehensive pursuit of all research areas of particular interest to world science and industry. High-quality research and development activities are conducted in wide cooperation with renowned research centers as well as industrial partners, both in Poland and abroad. The result of these joint activities are numerous international, multidisciplinary projects and research, active scientist exchange, and a large number of publications in prestigious journals. Some of the key lines of research conducted in close international cooperation are briefly presented below.

Dynamics and transport properties of nano- and micro-particles systems moving in fluids are analyzed theoretically and numerically at the PAS Institute of Fundamental Technological Research by two teams guided by Prof. Ekiel-Jeżewska and Prof. Wajnryb, in close collaboration with physicists from Warsaw University, Ecole Polytechnique (Palaiseau) and LIMSI (Orsay) in France, Texas Tech University (Lubbock) and Princeton University in USA, RWTH Aachen University in Germany, and Tel Aviv University in Israel. In 2015, the dynamics of a long flexible fiber in shear flow was investigated,

and it was shown that the flow can tie a knot on it. Moreover, modes of the fiber dynamics were classified, depending on flexibility. For systems of many microparticles settling under gravity, new families of periodic relative motions were found and their importance was demonstrated. The structure of layers formed by sedimenting nanoparticles close to the bottom wall was analyzed (Fig. 1). In their research the teams extensively used a unique software package developed at the Institute, HYDRO MULTIPOLE.

Another high priority field pursued at the Institute is research on advanced materials such as composites, multifunctional materials, shape memory alloys, and ultrafine-grained metals. Development and computer implementation of efficient numerical algorithms constitutes an important part of the research carried out at the PAS Institute of Fundamental Technological Research and focused on modelling of advanced materials. Prof. Stanisław Stupkiewicz in cooperation with Prof. Jože Korelc from University of Ljubljana (Slovenia) develops advanced computational algorithms, in particular the AceGen/AceFEM package authored by Prof. Korelc. This package provides advanced tools for automation of complex and time-consuming tasks associated with the use of the finite element method in nonlinear solid mechanics.

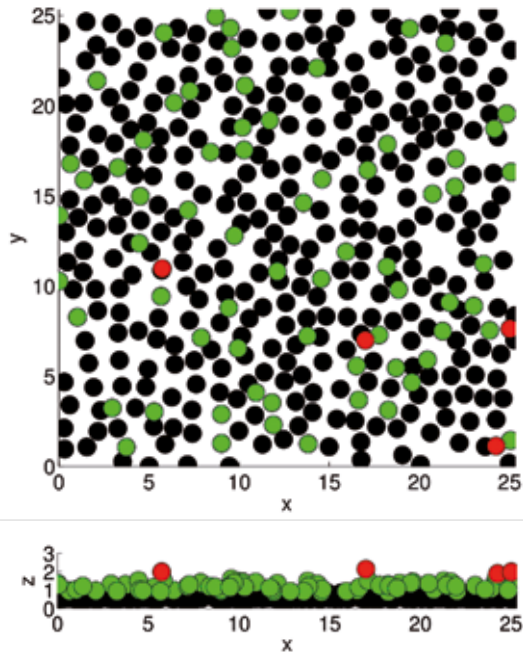


Fig. 1. Structure of layers of sedimented nanoparticles: top and side views (Sonn-Segev, Bławdziewicz, Wajnryb, Ekiel-Jeżewska, Diamant, Roichman, *J. Chem. Phys.* 2015)

The Institute is also dynamically engaged in biomedical and bioengineering research. The specific research areas include mathematical modeling of biological signaling processes, microfluidic techniques, optimization of electrospun nanofibers for drug delivery, dressing materials and stents design, ultrasound medical diagnostics and optical forceps used to manipulate biomolecules. In the Laboratory of Modeling in Biology and Medicine managed by Prof. Tomasz Lipniacki, the mechanisms of cell responses to stress are analyzed by combining stochastic mathematical modeling with experimental techniques. In collaboration with partners from Rice University, University of Texas Medical Branch, Los Alamos National Laboratory and ETH Zürich, comprehensive mathematical models of signaling pathways associated with innate immune response, cancer, autophagy, and growth factor signaling were built (Fig. 2).

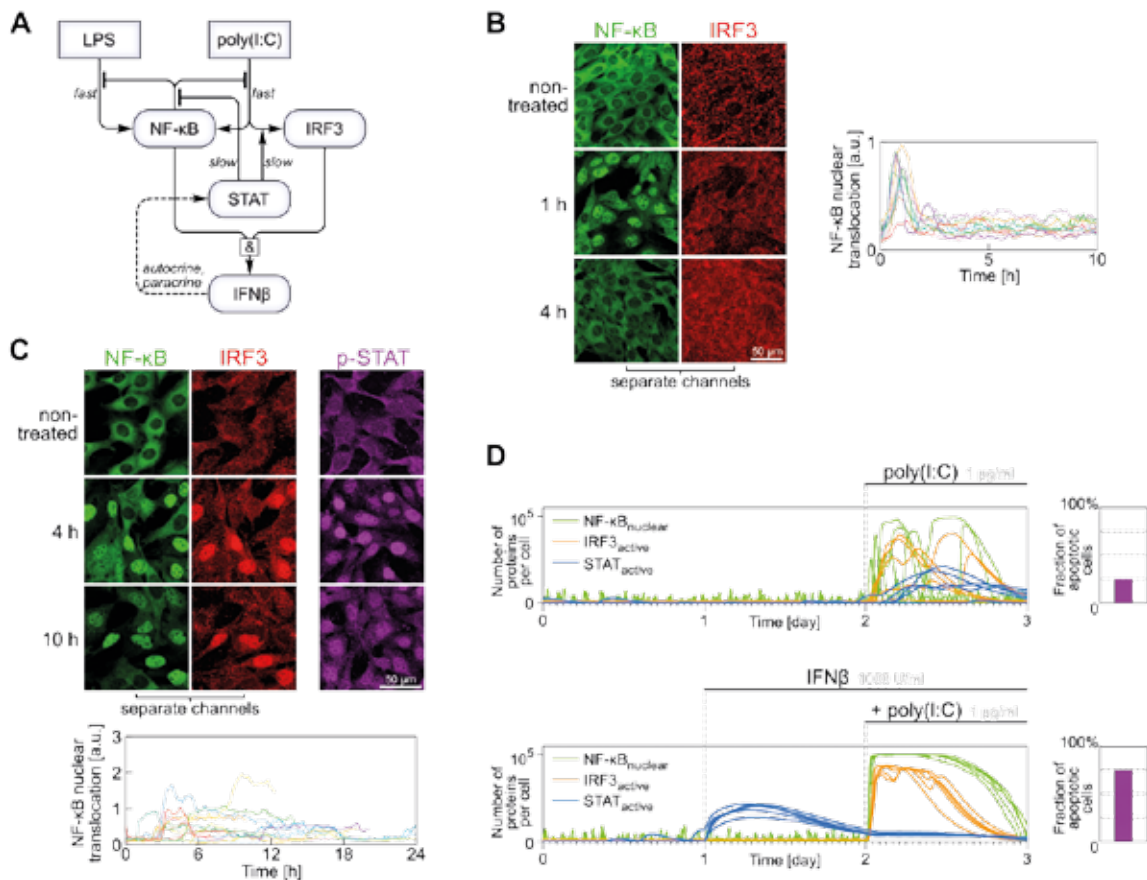


Fig. 2. **A.** Schema of the pathway. Arrow and hammer headed lines denote positive and negative interactions, respectively. Negative feedback loops mediated by NF- κ B are compromised by IFN β -STAT signaling. **B.** Immunostaining and live-images show pulse-like NF- κ B activation in responses to LPS. **C.** Switch-like binary activation NF- κ B and IRF3 in response to poly(I:C) is stabilized by STAT paracrine signaling. **D.** Mathematical model simulations. 24 hour-long IFN β prestimulation increases the strength of NF- κ B and IRF3 activation and apoptosis

These are only a few examples of the international research cooperation that the Institute is involved in. Not only does the PAS Institute of Fundamental Technological Research have extensive experience in international cooperation, but it has also been the initiator of the Brussels-based European Virtual Institute of Knowledge-based Multifunctional Materials (KMM-VIN AISBL) and now plays a key role in its management. KMM-VIN currently brings together 70 research institutions and industrial companies from 15 countries, cooperating

intensively in the field of new groundbreaking materials and technologies.

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International cooperation of the Mossakowski Medical Research Centre

A. Ziemia | Mossakowski Medical Research Centre | Polish Academy of Sciences

1. The Biotechnology Centre of Oslo, University of Oslo; Norwegian University of Science and Technology, Trondheim (Norway) in cooperation with the Department of Neurotoxicology, Mossakowski Medical Research Centre.

The role of glutamine transport in hepatic encephalopathy-related occurrence of cerebral edema and disturbance to glutaminergic synapse function (financed by the National Centre for Research and Development within the "CORE" Polish-Norwegian Research Programme).

The research included the analyses of: 1) changes of the expression of cortical pre- and post-synaptic proteins, 2) electrophysiological changes in cerebral cortex specimens. An increase in the synthesis of certain pre- and post-synaptic proteins was identified, which may be interpreted as a compensatory reaction to synaptic function impairment.

A decrease in all elements of electrophysiological response to stimulation was observed. The results indicated that at the biochemical level, the compensatory mechanism did not result in the effective compensation of the function. The analyses of the role Gln transporters of system N (SN1 and SN2 proteins) play in the glutamine release in cultured mice brain cortex astrocytes and the cellular metabolism regulation were completed. The study revealed that active Gln ejection from cells and undisturbed glucose and acetate metabolism are dependent on

both transporters' activity. It was also identified that ammonia made the cells strongly dependent on system N transporters.

2. Institut Klinické a Experimentální Medicíny, Prague (Czech Republic) in cooperation with the Department of Renal and Body Fluid Physiology, Mossakowski Medical Research Centre.

The study on the role of epoxide hydrolase (sEH) and endothelin in renal function and hypertension.

The analyses involved the study of the mechanisms responsible for hypertension development (systemic and pulmonary) and concomitant renal and cardiac pathologies.

The analyses were conducted on Goldblatt hypertension rats (2K, 1C) in Ren-2 genetic model and on rats on high-sodium diet in hypoxia and aortocaval fistula-related "volume overload" conditions. It was proven that epoxyeicosatrienoic acids (EETs), arachidonic acid metabolites, play a significant, but not predominant, pathophysiological role in the inhibition of hypertension and hypertension-like conditions and abnormalities, which also resulted from the observation of enhanced endogenous EETs synthesis and its synthetic analog application. A significant impact of newfound vasodilator axis of renin-angiotensin system (ACE2/Ang1-7/receptor Mas) on the reduction of systemic and pulmonary hyperten-



Mossakowski Medical Research Centre in Warsaw

sion in genetically hypertensive rats (Ren-2 model) undergoing hypoxia was also described.

3. Russell H. Morgan Dept. of Radiology and Radiological Science, Division of MR Research, Johns Hopkins University School of Medicine, Baltimore (Maryland, USA), Fraunhofer Institute for Cell Therapy and Immunology c/o Max-Bürger Forschungszentrum, Leipzig (Germany), Dept. of Neurobiology and Neurology, A. I. Virtanen Institute for Molecular Sciences, University of Eastern Finland, Kuopio (Finland) in cooperation with the Neuro-Repair Department, Mossakowski Medical Research Centre.

The impact of increased implementation of genetically-modified mesenchymal stem cells in post-stroke cerebral areas on functional improvement in transplant recipients-preclinical study.

Adhesion and migration of human bone marrow mesenchymal stem cells (hBM-MSC) mRNA-transfected for alpha4 integrin (ITGA4) was analyzed *in vivo* and *in vitro* in the stages:

- 1) Transfection in order to obtain augmented expression of adhesion cells VLA-4.
- 2) Assessment of functional adhesion of ITGA4-transfected hBM-MSC studied *in vitro*. The

preliminary conclusion was that more cells migrated towards the brain cell homogenate than to serum-free medium. The results may indicate enhanced adhesion and migration properties of the hBM-MSCs with increased expression of $\alpha 4$ -subunit of integrin VLA-4.

- 3) *In vivo* visualization of further life of ITGA4-transfected human hBM-MSC following their intravascular transplantation in rat brain stroke model.

MRI demonstrated reduction of hBM-MSCs number in recipients' brains. It was preliminarily stated that a signal loss within the first 24 hours after the transplantation of hBM-MSC was weaker in the cells with overexpression of $\alpha 4$ -subunit of integrin VLA-4 than in native cells. The presence of transplanted cells in rat brain after 24 and 48 hours after transplantation was also initially confirmed.

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Educational and Promotional Activity within the Polish Academy of Sciences

Committee on Oriental Studies of the Polish Academy of Sciences

M. Mejer | Committee on Oriental Studies | Polish Academy of Sciences

Oriental studies are deeply set in the international academia due to the very field of research which are different languages and cultures of Asia and Africa.

The members of the Committee cooperate individually or in teams with international academic institutions, pursue projects in frames of international grants, carry out field research in Asia and Africa according to specialization, attend international conferences and seminars, offer lectures at the leading universities, publish the results with internationally acknowledged publishers and journals, are members of international academic societies, etc. The members of the Committee inform about their achievements during regular meetings of the Committee.

Since 2008, the Committee organizes cyclical international conferences on oriental studies which gather together specialists from different academic centres of the world. So far four such conferences were held (2008–2014):

- 8–9 December 2008, Warsaw: “55 years of the Committee of Oriental Studies of the Polish Academy of Sciences (1952–2007);”
- 22–23 November 2010, Warsaw: “International Conference of Oriental Studies – Oriental Stud-

ies – Past and Present,” co-organized by the Faculty of Oriental Studies, University of Warsaw;

- 15–17 November, 2012, Cracow: “Exploring Languages and Cultures of Asia. Professor Władysław Kotwicz (1872–1944) in Memoriam,” co-organized by the Polish Academy of Arts and Sciences;
- 24–25 November 2014, Warsaw: “The 4th International Conference of Oriental Studies: Manuscript and Book Cultures in Asia and Africa,” co-organized by the Faculty of Oriental Studies, University of Warsaw.

Papers presented at the conferences have been published in the special issues of the Polish journal of Oriental research *Rocznik Orientalistyczny*, which is edited by the Committee.

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Botanical Garden of the Polish Academy of Sciences in Powsin – 45 years of activity

J. Puchalski | Polish Academy of Sciences Botanical Garden – Center for Biological Diversity Conservation in Powsin

In 2015, the Polish Academy of Sciences Botanical Garden in Powsin celebrated its 45th anniversary of activity and the Silver Jubilee marking the 25th anniversary of its opening to the public, which took

place on 12 May 1990. That day was the culmination of nearly 60 years of Warsaw botanists' efforts to open a large modern botanical garden in the southern part of the capital. PAS Botanical Garden in its 45-year



K. STOLARZEWICZ

Visitors at the PAS Botanical Garden in Powsin during the Garden Festival "Garden for Warsaw" (16–24 May 2015)

history systematically developed its research potential. It undertakes broad research and popularization activities and supports conservation in the area of biodiversity. The main area of research concerns the *ex situ* plant conservation of endangered species of Polish natural flora, which is achieved by cultivation of plants and seed cryo-conservation in liquid nitro-

gen vapor for long-term storage. For over 40 years, researches have engaged in the maintenance of gene banks for plants important to agriculture, especially rye and apple trees. The main area of biotechnology works for more than 30 years has been the somatic embryogenesis in cultures *in vitro* and deep freezing of tissues and cell suspensions in liquid nitrogen, which has a great potential in the preservation of plant genetic diversity. An equally important area of the Garden's activity is to popularize awareness of natural sciences, especially regarding the threat to biological diversity and the role of plants in human life. For this purpose, plant collections including almost 10,000 different species and varieties are exposed on an approximate area of 30 hectares of land and in greenhouses holding the collections of tropical and sub-tropical plants. Since its opening to the public in 1990, the PAS Botanical Garden in Powsin was visited by ca. 2.7 million people with the average 100 thousand visitors per year. On Jubilee Day, the 15 May 2015, a monument was unveiled – "Tree of Remembrance" commemorating four professors in recognition of their services to the PAS Botanical Garden: Roman Kobendza – who initiated and made the first plans for this new botanical garden and its



Z. GROMADZKI

The jubilee session for the celebration of 45th anniversary of the PAS Botanical Garden's activity (15 May 2015)



Z. GROMADZKI

The unveiling of the monument “Tree of Remembrance” commemorating professors who contributed to the development of the PAS Botanical Garden (15 May 2015)

location, Bogusław Molski – the first director of the Garden (1974–1989), Szczepan Pieniążek and Emil Nalborczyk – both chairmen of the PAS Botanical Garden Scientific Council. Later the Jubilee session entitled “Botanical Garden of the Polish Academy of Sciences in Powsin – 45 years of activity for sci-

ence and environment and 25 years for society” attended by ca. 300 guests invited for this celebration, was held. Next, on 16–24 May 2015 the PAS Botanical Garden in Powsin organized many events for Garden public visitors, especially for Warsaw inhabitants, in the framework of Garden Festival “Garden for Warsaw.” It included a presentation of PAS Botanical Garden research achievements in form of lectures entitled “Garden Academy,” as well as a presentation of garden plant collections entitled “Open Garden Forum for Plants and Gardens Lovers.” These events were accompanied by nature and art exhibitions as well as outdoor concerts of piano and chamber music.

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A new, permanent exhibition: “From the geological past of the Earth” at the PAS Museum of the Earth

E. Nosowska | Polish Academy of Sciences Museum of the Earth in Warsaw

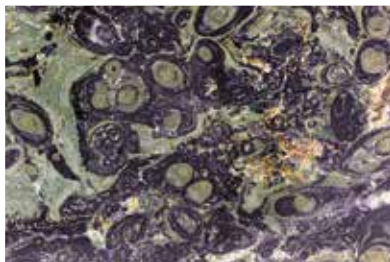


Ammonite from Łuków

This exciting journey in time was made possible by the passionate work of innumerable geologists and naturalists in the decades starting from the beginnings of the nineteenth century. Modern methods of analysis of different types of rocks, minerals and fossils allow us to understand the structure and history of different parts of the Earth. This knowledge enables us to reconstruct the intriguing picture of our planet in successive stages of its history. This picture can be grasped on geological maps, computer screens and wall-boards with reconstructed organisms that lived in the distant past. Thanks to them, one can follow the changes in the disposition of continents and oceans, the development of plants and animals, and the fascinating journey through the lost worlds.



2.4 billion-year-old
biosedimentary
structures from
Madagascar



D. NAST

The history of Earth was reconstructed thanks to the remains and tracks of extinct organisms, fossilized by chemical and physical processes in the rocks. One can find the explanation of the processes leading to the formation of different types of fossils.

Among the traces of ancient life presented at the exhibition, the oldest belong to 2.4 billion-year-old biosedimentary structures made by cyanobacteria. Other fossils document the evolution of life on Earth through geologic ages and emergence of successive waves of animals and plants, first in the ocean, then also on land. Special attention is paid to the exquisitely preserved mollusk shells from the famous site of mid-Jurassic black shales from Łuków. Fossils play an important role in determining the environment of the formation of sedimentary rocks and reconstructing the conditions of the ancient lands and oceans.

One of the most geologically interesting regions of Europe are the Holy Cross Mountains (Góry Świętokrzyskie) in central Poland. Their long and complicated history is illustrated with a map, geologic sections, samples of the most common rocks and fossils and pictures of the most important sites (which are often natural preserves) enriched with

comments explaining their role in understanding processes that led to their formation.

The exposition is addressed to a wide range of visitors and responds to the great interest in the history of our distant past. Its creators hope it will meet the demands of both those beginning their fascination with geology and those already experienced in it.

Exhibition "From the geological past of the Earth"

Curator: Ewa Nosowska

Scenario: Rafał Kowalski, Cezary Krawczyński, Wojciech Macioszczyk, Dariusz Nast, Ewa Nosowska, Marcin Ryszkiewicz, Barbara Studencka, Ryszard Szczęsny

Design and graphics: Jan Żabko-Potopowicz, Michał Żabko-Potopowicz

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International Centre of Biocybernetics – sustained contribution to fostering co-operation and disseminating knowledge on biomedical engineering

P. Ładyżyński | Institute of Biocybernetics and Biomedical Engineering | Polish Academy of Sciences

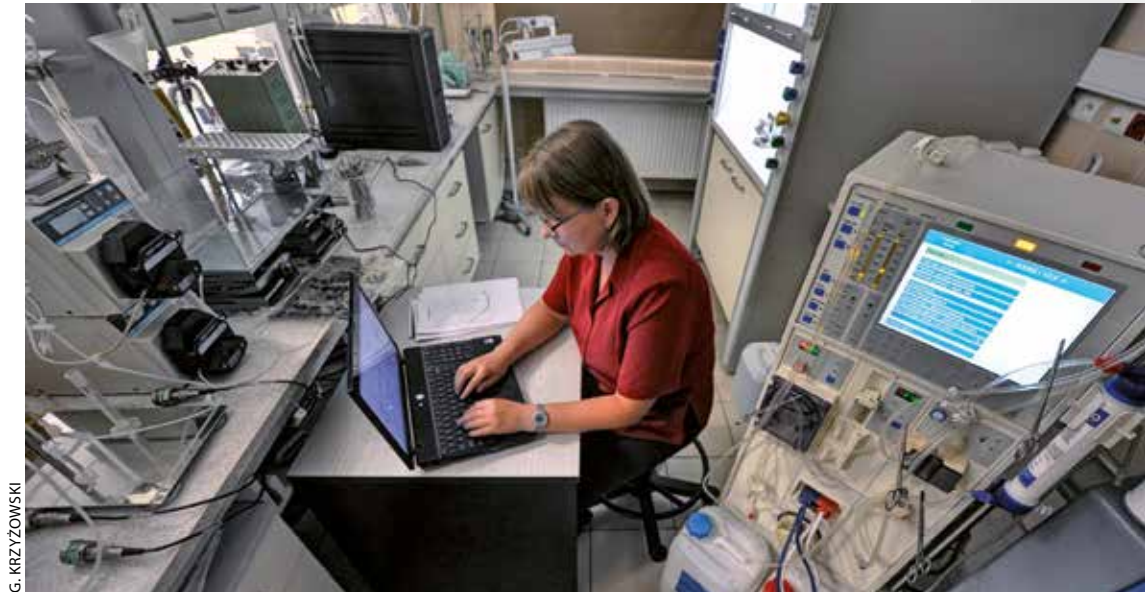
The International Centre of Biocybernetics (ICB) at the PAS Institute of Biocybernetics and Biomedical Engineering, Polish Academy of Sciences is a multi-national association of scientific institutions, which was established in 1988. The main objectives of the ICB are: exchange of scientific experience, improvement of professional qualifications and facilitation of research and applications in the field of biomedical engineering. To achieve these objectives, the ICB organizes scientific meetings in the form of seminars, workshops, summer schools and conferences facilitating and encouraging research and development and disseminating relevant information in the field of biomedical engineering. The ICB has co-organized

3 international conferences and 146 other events so far, which gathered over 2,500 foreign experts from 47 countries and more than 6,000 Polish scientists, engineers, physicians and students.

Five events were organized in the framework of the ICB in 2015. In February, Polish scientists had an opportunity to get acquainted with "Grants and opportunities of scientific career development under the Horizon 2020 Programme" during an open meeting with experts from the National Contact Point.

In the same month, Prof. Maria Piotrkiewicz (Poland) and Prof. Mamede de Carvalho (Portugal) chaired an inauguration meeting of the Consortium of the JPND project ONTWebDUALS, i.e.,

Fig. 1. Dr. Małgorzata Dębowska, one of the speakers of the ERA-EDTA CME Course works on a mathematical model of dialysis. An artificial kidney is visible on the right side of the picture



G. KRZYŻOWSKI

“ONTology-based Web Database for Understanding Amyotrophic Lateral Sclerosis” (ALS). The second working meeting of the ONWebDUALS consortium was organized in November. During these gatherings, experts were planning research on an application of the modern information and computer technologies in facilitating better understanding of ALS, which is a rapidly progressing, invariably fatal neurological disease that attacks neurons responsible for controlling voluntary muscles.

Two other events chaired by Prof. Jacek Waniewski (Poland) and Prof. Bengt Lindholm (Sweden) took place in April and were devoted to dialysis. First of them was a Continuing Medical Education Course on “Dialysis Adequacy and Kinetic Modeling” accredited by the European Renal

Association – European Dialysis and Transplant Association (ERA-EDTA), offering medical educational credits to 32 foreign participants. Welcome address was given by Prof. Andrzej Więcek, President of ERA-EDTA. During the course, 14 experts delivered lectures dedicated to dialysis adequacy, kinetic modeling of dialysis, peritoneal dialysis and general problems of dialysis (Fig. 1).

Participants could not only learn from experts, but also take part in discussions and present results of own research during the poster session. The ERA-EDTA CME Course was followed by a workshop for experts devoted to “Peritoneal Transport Modeling.” The meeting gathered 15 distinguished scientists of the older and the younger generations, who conducted pioneering research on peritoneal dialysis. It is noteworthy that participants represented both scientific and clinical institutions.

Apart from workshops and seminars, in 2016 the ICB will co-organize the Annual Congress of the European Society for Artificial Organs for the third time (Fig. 2).



P. FOLTYŃSKI

Fig. 2. A poster advertising the 43rd Annual Congress of the European Society for Artificial Organs co-organized by the International Centre of Biocybernetics

Institute of Biocybernetics and
Biomedical Engineering
ul. Księcia Trojdena 4, 02-109 Warszawa
phone: 48 (22) 659 91 43
fax: 48 (22) 659 70 30
e-mail: ibib@ibib.waw.pl
www.ibib.waw.pl

The Institute of Pharmacology organized the 32nd Winter School on pharmacology of cannabinoids

K. Starowicz-Bubak | Institute of Pharmacology | Polish Academy of Sciences

One of the goals of the PAS Institute of Pharmacology is training young scientists in the framework of PhD Studies. In pursuing this objective, PhD students from the Institute (44 participants) took part in the Institute's Winter School "Pharmacology of Cannabinoids." During the annual Winter School, PhD students and young representatives of science from Polish academic centers (47 people) were acquainted with the latest research results from both basic research and clinical mechanisms of action of endocannabinoid system. The school's program included lectures presenting the latest findings on cannabinoid pharmacology, cannabinoid signaling in glial cells as well as the role of cannabinoid receptors in the treatment of pain, addiction and epilepsy. The

role of the endocannabinoid system in the regulation of insulin secretion and myocardial infarction was also discussed. An important topic was the potential for therapeutic applications of cannabinoids in diseases of the gastrointestinal tract and for the relief of cancer pain, their usefulness in palliative care and finally for the treatment of multiple sclerosis.

Institute of Pharmacology
ul. Smętna 12, 31-343 Kraków
phone: 48 (12) 662 32 20
fax: 48 (22) 637 45 00
e-mail: ifpan@if-pan.krakow.pl
www.if-pan.krakow.pl

The Ludwik Hirszfeld Year at the PAS Institute of Immunology and Experimental Therapy in Wrocław

J. Łukasiewicz | Hirszfeld Institute of Immunology and Experimental Therapy | Polish Academy of Sciences



By resolution of the Council of the City of Wrocław of 22 May 2014, the period from May 2014 until May 2015 was declared "The Ludwik Hirszfeld Year" in acknowledgement of his contribution to the development of science. The celebration was accompanied by a range of events including the 60th anniversary of the Institute of Immunology and Experimental Therapy and the International Scientific Conference "Blood tests or 'blood madness'? The activity of Ludwik Hirszfeld in a historical context," organized on 23–24 May 2015 in Berlin in co-operation with the PAS

Commemorating plate placed on the house where L. Hirszfeld and his wife lived in 1944–1954



The painting
"Machina Wratislavia"
by Małgorzata
Stanielewicz.
A gift from the
Wrocław City Office
to the Institute

Center for Historical Studies, the PAS Institute of Immunology and Experimental Therapy and the Institute for the History of Medicine and Ethics in Medicine Charité in Berlin under the Honorary Patronage of the Foundation for Polish-German Cooperation. Under the patronage of the president of Serbia, Tomislav Nikolić, a symposium commemorating Hirsfeld took place in Belgrade, organized together with the Polish Embassy and the Serbian Medical Association. The year was

crowned on 8 October 2015 with the celebration of the Ludwik Hirsfeld Day.

Hirsfeld Institute of Immunology
and Experimental Therapy
ul. Rudolfa Weigla 12, 53-114 Wrocław
phone: 48 (71) 337 11 72
fax: 48 (71) 337 21 71
e-mail: secretary@iitd.pan.wroc.pl



Celebrating the 60th anniversary of the creation of the PAS Institute of Immunology and Experimental Therapy in Wrocław

The FNP Prizes for 2015

The prizes awarded by the Foundation for Polish Science (FNP) in 2015 were won by Prof. Jerzy Jedlicki, Prof. Stanisław Penczek, and Prof. Kazimierz Rzażewski. The FNP Prizes, widely recognized as Poland's top-ranking and most prestigious scientific awards, are given every four years to Polish scholars in recognition of scientific achievements in four separate areas. They are awarded to distinguish research and discoveries that shift the boundaries of human understanding, open new research perspectives, contribute significantly to the advancement of civilization and culture in Poland, and help ensure that the country will take a prominent position in coping with the most ambitious challenges of the modern world.



T. POŹNIAK

Professor Jerzy Jedlicki from the Institute of History, Polish Academy of Sciences, received the 2015 FNP Prize in humanities and social sciences for studies in history of Polish intelligentsia.

Prof. Jedlicki (born in 1930) spent his entire academic career working at the PAS Institute of History as a disciple and, later, collaborator and follower of Professor Witold Kula. His chosen field of research was initially social and economic history of Polish lands in the nineteenth century. Kula encouraged his doctoral students to seek an answer to the question of how the capitalist system developed in a backward agricultural country, in which feudal relations still dominated. Thus Jedlicki tried to discover factors which had given rise to early

commercial and industrial establishments and had stimulated their development in such unfavorable environment. He soon found that not only hard economic factors (e.g. lack of capital, poor infrastructure etc.), but also cultural conditions were responsible for long stagnation.

From that time on, his interests were focused on people's motivations and will to change their environment. It seemed especially important to find out what pattern of civilization was attractive to the educated class in Eastern Europe. About 1848, the educated class in Poland, Russia and other countries of that region started to call itself the intelligentsia of the nation to underline its leading role in the society. Thus the intelligentsia's views and ideas created peculiar conditions stimulating or, on the contrary, restraining the social and economic development of a country. Polish intelligentsia, for instance, was heterogeneous, composed of doctors, lawyers, teachers, scientists, writers and other professions, and because of a lack of Polish universities in the middle of the nineteenth century – except Cracow in the Austrian partition – many of them went for education either to Russia, Prussia, or, if they could afford it, further to the West, mainly to France or Switzerland. The class being formed this way was ready to take Western developed countries as models for a future Poland, should the country regain independence. However, the idea of Westernization and industrialization often collided with the

native tradition, with old morals and customs, while preserving them was also regarded by members of intelligentsia as their duty.

A moral and ideological conflict of this kind has been typical for less developed European countries, and in some of them is visible even today. So Prof. Jedlicki decided to make it the core of *A History of the Polish Intelligentsia* (J. Jedlicki, ed., 3 vols., Warszawa 2008; English edition: Frankfurt am Main 2014), and his two co-authors willingly followed this directive. Consequently, the history of intelligentsia from the late eighteenth century to 1918 became a synthesis of a social history of ideas that combines a quasi-sociological analysis of a class

with intellectual and political history of a nation. Such an approach was appreciated by reviewers and gained a high prize from the Foundation for Polish Science.

Besides, Jedlicki was writing extensively on history of mentality in the nineteenth- and twentieth-century Europe. Some of his books were translated to English and German (e.g., *A Suburb of Europe: Nineteenth-century Polish Approaches to Western Civilization*, Budapest, CEU Press, 1999; *Die entartete Welt: Die Kritiker der Moderne, ihre Angste und Urteile*, Frankfurt am Main, Suhrkamp, 2007). His essays appeared in periodicals and joint volumes in many languages.

Professor Stanisław Penczek from the Centre for Molecular and Macromolecular Studies, Polish Academy of Sciences, received the 2015 FNP Prize in chemistry and material sciences for the *Theory of the Ring-Opening Polymerization and its application for the synthesis of biodegradable polymers*.

Prof. Penczek (born in 1934, Warsaw), an organic and polymer chemist, conducted research mostly at the PAS Centre for Molecular and Macromolecular Studies in Łódź. An ordinary member of the Polish Academy of Sciences, corresponding member of the Polish Academy of Arts and Sciences (PAU), he was also elected member of the German (NordRhein) Akademie der Wissenschaften und der Kunst. He received numerous awards, including the Maria Skłodowska-Curie Prize of the Polish Academy of Sciences, Personal Medal of the French Academy of Sciences, Palmes Academiques (from the Prime Minister of France), Otto Warburg Prize in Germany, Personal Medal of the Japan Polymer Society, International Prize of Belgian Society of Science and Technology. Prof. Penczek has published over 300 research papers, cited 6800 times. He also authored



several monographs including: *Models of Biopolymers by Ring-Opening Polymerization* (CRC), *Cationic Ring-Opening Polymerization* (Springer) and, more recently (2012, together with R.H. Grubbs), *Ring-Opening Polymerization* (Elsevier), encompassing 39 chapters. He also coauthored a textbook (in three volumes) *Chemia Polimerów* [Polymer Chemistry] together with Z.J. Florjańczyk. Professor Penczek

is Doctor *honoris causa* of the Sorbonne (now Pierre and Marie Curie University) in Paris and of the Russian Academy of Sciences. He holds the title of Honorary Professor of the Jagiellonian University.

Theory of Ring-Opening Polymerization encompasses thermodynamics, kinetics and mechanisms of polymerization of cyclic compounds-monomers. Professor Penczek, together with his collaborators, mostly PhD candidates (five of them later became full professors) established – for several classes of these compounds – influence of the ring size and position of substituents on the thermodynamic potentials, namely enthalpy and entropy of polymerization.

Besides, he showed that the same cyclic monomer, depending on conditions can be polymerized as enthalpy or entropy driven (with R. Szymański). He also solved the long-time controversy on the actual structure of macromolecules formed by ring-opening polymerization, establishing, in contrast to the existing views, that polymerization proceeds on linear species and not by ring expansion (with P. Kubisa). Important contribution with further impact on the whole polymer chemistry is related to the first kinetic description of the novel elementary reaction in the polymerization processes, namely reversible deactivation of the propagation step (with K. Matyjaszewski).

Professor Kazimierz Rzążewski from the Center for Theoretical Physics, Polish Academy of Sciences, received the 2015 FNP Prize in mathematical, physical and engineering sciences for his pioneering study of dipolar interactions.

Prof. Rzążewski's research interests include quantum optics, atom optics, and fundamental problems of quantum mechanics. In early work, he studied the thermodynamics of atoms interacting with light. As a result, he proved that the superradiant phase transition is incompatible with the gauge invariance of quantum electrodynamics. Then he turned his attention to interaction of very strong light fields with matter. In particular he worked on the application of Thomas Fermi models to multielectron ionization of atoms, molecules, and clusters.

Since mid-nineties, Prof. Rzążewski has worked mostly on the problems of cold, quantum degenerate gases, most notably Bose-Einstein condensation. Together with his coworkers, he found exact asymptotic results for the fluctuations of a trapped ideal Bose gas according to the microcanonical ensemble. This led to developing a classical field approximation for temperature effects in Bose-Einstein condensate. With the help of this method, Prof. Rzążewski's team has recently found spontaneously generated solitons in quasi one-dimensional Bose gas.



At the end of the last century, Prof. Rzążewski together with the experimentalist Tilman Pfau initiated studies on the role of long distance dipole-dipole forces in the condensate. They noted that those forces lead to a deformation of the atomic cloud. The researchers also estimated the boundaries of stability of such a condensate. Their theoretical predictions were later verified by experiments with chromium condensate. This study of the role of dipolar interactions was honored with the 2015 Award of the Foundation for Polish Science.

Selected Statistics for 2015

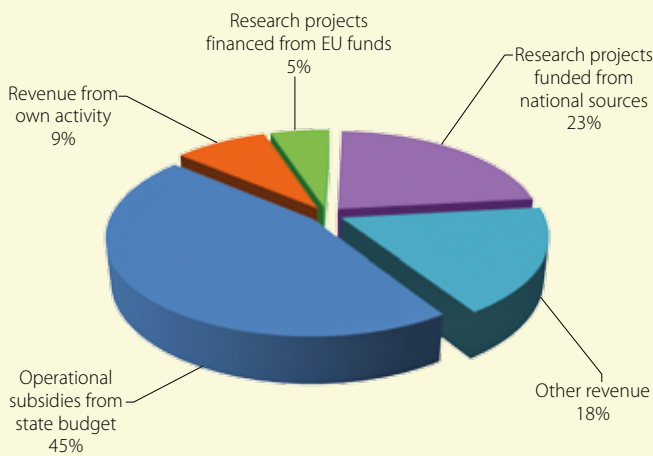
Sources of funding for the Academy and its organizational units

The basic source of funding for the activity of the Polish Academy of Sciences and its various organizational units, including its research institutes, was state budgetary funding provided in the form of operational subsidies and as national and foreign

funding allocated under research project agreements. The operational subsidies taken in as revenue by the Academy institutes in 2015 came to a total of 633,237,000 PLN. The operational subsidy utilized by the Academy itself (allocated in specific to funding the activity of the Academy's central institutions, its elected bodies of members, and foreign research cooperation) and its research units without autonomous legal status came to 72,099,000 PLN.

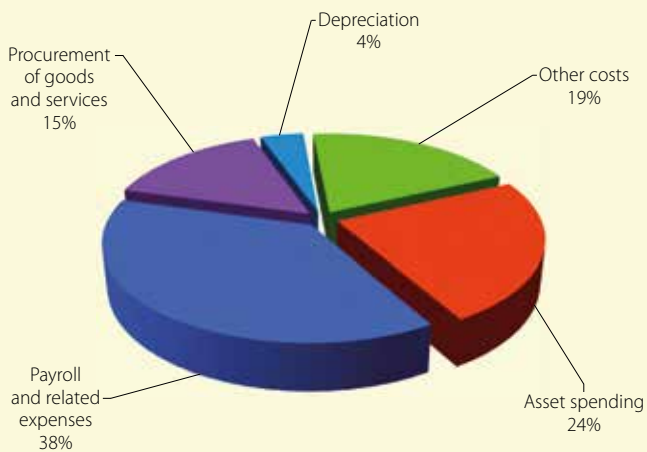
The Academy's revenue in 2015, by source

(total: 1,703,520,000 PLN)



The Academy's revenue in 2015, by type

(total: 1,703,520,000 PLN)



Staff employed at the Academy

All told, there were approx. 9,500 individuals employed by the Polish Academy of Sciences in 2015. More than 8,700, or 91%, of them were employed at PAS institutes, including approx. 3,700 research staff members. Another approx. 800 individuals, or the remaining 10%, were employed at other PAS organizational units, including independent research libraries, archives, the Museum of the Earth, research units without autonomous legal status, and experimental facilities.

Breakdown of staff at PAS research institutes in 2015



Activities of the PAS committees in 2015

Conferences	422
Conference participants	66 611
Lectures, conference reports, articles	21 522
Expert's reports	99
Journal titles	128

Scientific degrees and titles granted by PAS in 2015 (division of the Academy)

	Scientific degrees and titles		
	Doctorate degrees	DSc (habilitation) degrees	Professorship nominations
Division I	14	23	7
Division II	25	27	7
Division III	65	33	22
Division IV	28	11	10
Division V	18	12	2
Total	150	106	48

Didactic activity of PAS scholars in institutions of higher education in 2015 (by PAS division)

	The number of people teaching in universities
Division I	610
Division II	516
Division III	601
Division IV	266
Division V	113
Total	2106

Foreign Scientific Centers

■ **CENTER FOR HISTORICAL RESEARCH OF THE POLISH ACADEMY OF SCIENCES IN BERLIN**
ZENTRUM FÜR HISTORISCHE FORSCHUNG BERLIN DER POLNISCHEN AKADEMIE DER WISSENSCHAFTEN

Majakowskiring 47, D-13156 Berlin
phone: 49 (30) 486 285 40
fax: 49 (30) 486 285 56
e-mail: info@cbh.pan.pl
www.cbh.pan.pl
Director: Robert Traba

■ **POLISH ACADEMY OF SCIENCES SCIENTIFIC CENTER IN KIEV**

Bohdana Kmel'nyts'koho 49/4, 01044 Kiev, Ukraine
phone: 38 0968532681
e-mail: Henryk.Sobczuk@pan.pl
www.panukraina.pl
Director: Henryk Sobczuk

■ **POLISH ACADEMY OF SCIENCES SCIENTIFIC CENTER IN MOSCOW**
ПОСТОЯННЫЙ ПРЕДСТАВИТЕЛЬ ПОЛЬСКОЙ АКАДЕМИИ НАУК В МОСКВЕ

Klimaszkina 4, 123557 Moskwa
phone: 7 (495) 231 17 11
fax: 7 (495) 231 17 11
e-mail: Leslaw.Nowak@pan.pl
www.moskwa.pan.pl
Director: Marek Pałkciński

■ **POLISH ACADEMY OF SCIENCES SCIENTIFIC CENTER IN PARIS**
ACADÉMIE POLONAISE DES SCIENCES
CENTRE SCIENTIFIQUE À PARIS

74 rue Lauriston, 75116 Paris
phone: 33 156 90 18 34
fax: 33 147 55 46 97
e-mail: sekretariat.parispan@free.fr
www.academie-polonaise.org
Director: Marek Więckowski

■ **POLISH ACADEMY OF SCIENCES SCIENTIFIC CENTER IN ROME**
ACCADEMIA POLACCA DELLE SCIENZE, BIBLIOTECA E CENTRO DI STUDI A ROMA

vicolo Doria 2, 00187 Roma
phone: 39 06 679 21 70
fax: 39 06 679 40 87
e-mail: accademia@rzym.pan.pl
www.rzym.pan.pl
Director: Piotr Salwa

■ **POLISH ACADEMY OF SCIENCES SCIENTIFIC CENTER IN VIENNA**
POLNISCHE AKADEMIE DER WISSENSCHAFTEN
WISSENSCHAFTLICHES ZENTRUM IN WIEN

Boerhaavegasse 25, 1030 Wien
phone: 43 (1) 713 59 29
fax: 43 (1) 713 59 29 550
e-mail: office@viennapan.org
www.viennapan.org
Director: Bogusław Dybaś

■ **POLISH SCIENCE CONTACT AGENCY "POLSCA" SCIENTIFIC CENTER OF THE POLISH ACADEMY OF SCIENCES IN BRUSSELS**

Rue du Trône 98, B-1050 Bruxelles
phone: 32 (0) 2 213 41 60
fax: 32 (0) 2 213 41 69
e-mail: polsca@polsca.be
www.polsca.eu
Director: Jan Krzysztof Frąckowiak

Research Units and Branches of the Polish Academy of Sciences



- BRANCHES
- RESEARCH UNITS
- AUXILIARY RESEARCH UNITS SUPERVISED BY DIVISIONS
- OTHER UNITS

Research Units

Division I: Humanities and Social Sciences

- **Institute for the History of Science**
(Warszawa)
e-mail: ihn@ihnpaw.waw.pl
www.ihnpaw.waw.pl
 - **Institute of Archaeology and Ethnology**
(Warszawa)
e-mail: director@iaepan.edu.pl
www.iaepan.edu.pl
 - **Institute of Art**
(Warszawa)
e-mail: ispan@ispan.pl
www.ispan.pl
 - **Institute of Economics**
(Warszawa)
e-mail: inepan@inepan.waw.pl
www.inepan.waw.pl
 - **Institute of History** (Warszawa)
e-mail: ihpan@ihpan.edu.pl
www.ihpan.edu.pl
 - **Institute of Law Studies**
(Warszawa)
e-mail: inp@inp.pan.pl
www.inp.pan.pl
 - **Institute of Literary Research**
(Warszawa)
e-mail: ibadlit@ibl.waw.pl
www.ibl.waw.pl
 - **Institute of Mediterranean and Oriental Cultures**
(Warszawa)
e-mail: sekretariat@iksio.pan.pl
www.iksio.pan.pl
 - **Institute of Philosophy and Sociology**
(Warszawa)
e-mail: secretar@ifispan.waw.pl
www.ifispan.pl
 - **Institute of Political Studies**
(Warszawa)
e-mail: politic@isppan.waw.pl
www.isppan.waw.pl
 - **Institute of Psychology**
(Warszawa)
e-mail: sekretariat@psych.pan.pl
www.psych.pan.pl
 - **Institute of Rural and Agricultural Development**
(Warszawa)
e-mail: irwir@irwirpan.waw.pl
www.irwirpan.waw.pl
 - **Institute of Slavic Studies**
(Warszawa)
e-mail: sekretariat@ispan.waw.pl
www.ispan.waw.pl
 - **Institute of the Polish Language**
(Kraków)
e-mail: ijp@ijp-pan.krakow.pl
www.ijp-pan.krakow.pl
- Auxiliary research units supervised by Division I
- **Polish Academy of Sciences Archives in Warsaw**
(Warszawa)
e-mail: archiwum@apan.waw.pl
www.apan.waw.pl
 - **Polish Academy of Sciences Library in Gdańsk**
(Gdańsk)
e-mail: bgpan@bgpan.gda.pl
www.bgpan.gda.pl
 - **Polish Academy of Sciences Library in Kórnik**
(Kórnik)
e-mail: bkpan@bkpan.poznan.pl
www.bkpan.poznan.pl

Division II: Biological and Agricultural Sciences

- **European Regional Centre for Ecohydrology of the Polish Academy of Sciences** (Łódź)
e-mail: erce@erce.unesco.lodz.pl
www.erce.unesco.lodz.pl
- **Institute for the Agricultural and Forest Environment** (Poznań)
e-mail: isrl@isrl.poznan.pl
www.isrl.poznan.pl
- **Institute of Agrophysics** (Lublin)
e-mail: sekretariat@ipan.lublin.pl
www.ipan.lublin.pl
- **Institute of Animal Physiology and Nutrition** (Jabłonna)
e-mail: office@ifzz.pan.pl
www.ifzz.pl
- **Institute of Animal Reproduction and Food Research** (Olsztyn)
e-mail: institute@pan.olsztyn.pl
www.pan.olsztyn.pl
- **Institute of Biochemistry and Biophysics** (Warszawa)
e-mail: secretariate@ibb.waw.pl
www.ibb.waw.pl
- **Institute of Bioorganic Chemistry** (Poznań)
e-mail: ibch@ibch.poznan.pl
www.ibch.poznan.pl
- **Institute of Botany** (Kraków)
e-mail: ibpan@botany.pl
www.botany.pl
- **Institute of Dendrology** (Kórnik)
e-mail: idkornik@man.poznan.pl
www.idpan.poznan.pl
- **Institute of Genetics and Animal Breeding** (Jastrzębiec)
e-mail: sekretariat@ighz.pl
www.ighz.edu.pl
- **Institute of Nature Conservation** (Kraków)
e-mail: sekretariat@iop.krakow.pl
www.iop.krakow.pl
- **Institute of Paleobiology** (Warszawa)
e-mail: paleo@twarda.pan.pl
www.paleo.pan.pl
- **Institute of Parasitology** (Warszawa)
e-mail: iparpas@twarda.pan.pl
www.ipar.pan.pl
- **Institute of Plant Genetics** (Poznań)
e-mail: office@igr.poznan.pl
www.igr.poznan.pl
- **Institute of Plant Physiology** (Kraków)
e-mail: ifr@ifr-pan.edu.pl
www.ifr-pan.edu.pl
- **Institute of the Systematics and Evolution of Animals** (Kraków)
e-mail: office@isez.pan.krakow.pl
www.isez.pan.krakow.pl
- **Mammal Research Institute** (Białowieża)
e-mail: mripas@ibs.bialowieza.pl
www.ibs.bialowieza.pl
- **Museum and Institute of Zoology** (Warszawa)
e-mail: sekretariat@miiz.waw.pl
www.miiz.waw.pl

- **Nencki Institute of Experimental Biology**
(Warszawa)
e-mail: dyrekcja@nencki.gov.pl
www.nencki.gov.pl

Auxiliary research units supervised by Division II

- **Polish Academy of Sciences Anthropology
Unit in Wrocław** (Wrocław)
e-mail: maria.skubis@antropologia.pan.pl
www.antropologia.wroclaw.pl

- **Polish Academy of Sciences
Botanical Garden – Center for Biological
Diversity Conservation in Powsin**
(Warszawa)
e-mail: ob.sekr@obpan.pl
www.ogrod-powsin.pl

- **Polish Academy of Sciences Ichthyobiology
and Aquaculture Unit in Gołysz**
(Gołysz)
e-mail: zigr@golysz.pan.pl
www.golysz.pan.pl

Division III: Mathematics, Physics, Chemistry, and Earth Sciences

- **Centre of Polymer and Carbon Materials**
(Zabrze)
e-mail: secretariat@cmpw-pan.edu.pl
www.cmpw-pan.edu.pl

- **Center for Theoretical Physics**
(Warszawa)
e-mail: cft@cft.edu.pl
www.cft.edu.pl

- **Centre for Molecular and Macromolecular
Studies** (Łódź)
e-mail: cbmm@cbmm.lodz.pl
www.cbmm.lodz.pl

- **Copernicus Astronomical Center**
(Warszawa)
e-mail: camk@camk.edu.pl
www.camk.edu.pl

- **Haber Institute of Catalysis and Surface
Chemistry** (Kraków)
e-mail: ncikifp@cyf-kr.edu.pl
www.ik-pan.krakow.pl

- **Institute of Geological Sciences** (Warszawa)
e-mail: ingpan@twarda.pan.pl
www.ing.pan.pl

- **Institute of Geophysics** (Warszawa)
e-mail: office@igf.edu.pl
www.igf.edu.pl

- **Institute of High Pressure Physics**
(Warszawa)
e-mail: dyrekcja@unipress.waw.pl
www.unipress.waw.pl

- **Institute of Low Temperature
and Structure Research**
(Wrocław)
e-mail: intibs@int.pan.wroc.pl
www.intibs.pl

- **Institute of Mathematics** (Warszawa)
e-mail: im@impan.pl
www.impan.gov.pl

- **Institute of Molecular Physics** (Poznań)
e-mail: office@ifmpan.poznan.pl
www.ifmpan.poznan.pl

- **Institute of Nuclear Physics**
(Kraków)
e-mail: dyrektor@ifj.edu.pl
www.ifj.edu.pl

- **Institute of Oceanology** (Sopot)
e-mail: office@iopan.gda.pl
www.iopan.gda.pl

- **Institute of Organic Chemistry**
(Warszawa)
e-mail: icho-s@icho.edu.pl
www.icho.edu.pl

■ **Institute of Physical Chemistry** (Warszawa)

e-mail: sekn@ichf.edu.pl
www.ichf.edu.pl

■ **Institute of Physics** (Warszawa)

e-mail: director@ifpan.edu.pl
www.ifpan.edu.pl

■ **International Laboratory of High Magnetic Fields and Low Temperatures**

(Wrocław)
e-mail: int.lab@ml.pan.wroc.pl
www.ml.pan.wroc.pl

■ **Space Research Centre**

(Warszawa)
e-mail: sekretariat@cbk.waw.pl
www.cbk.waw.pl

Auxiliary research units supervised
by Division III

■ **Polish Academy of Sciences Museum of the Earth in Warsaw**

(Warszawa)
e-mail: sekretariat@mz.pan.pl
www.mz.pan.pl

Division IV: Engineering Sciences

■ **Institute of Biocybernetics and Biomedical Engineering**

(Warszawa)
e-mail: ibib@ibib.waw.pl
www.ibib.waw.pl

■ **Institute of Chemical Engineering**

(Gliwice)
e-mail: secret@iich.gliwice.pl
www.iich.gliwice.pl

■ **Institute of Computer Science**

(Warszawa)
e-mail: ipi@ipipan.waw.pl
www.ipipan.waw.pl

■ **Institute of Environmental Engineering**

(Zabrze)
e-mail: ipis@ipis.zabrze.pl
www.ipis.zabrze.pl

■ **Institute of Fluid-Flow Machinery**

(Gdańsk)
e-mail: imp@imp.gda.pl
www.imp.gda.pl

■ **Institute of Fundamental Technological Research**

(Warszawa)
e-mail: director@ippt.gov.pl
www.ippt.gov.pl

■ **Institute of Geography and Spatial Organization** (Warszawa)

e-mail: igipzpan@twarda.pan.pl
www.igipz.pan.pl

■ **Institute of Hydroengineering** (Gdańsk)

e-mail: sekr@ibwpan.gda.pl
www.ibwpan.gda.pl

■ **Institute of Metallurgy and Materials Science**

(Kraków)
e-mail: office@imim.pl
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■ **Institute of Theoretical and Applied Informatics** (Gliwice)

e-mail: office@iitis.pl
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■ **Mineral and Energy Economy Research Institute** (Kraków)

e-mail: centrum@min-pan.krakow.pl
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■ **Strata Mechanics Research Institute** (Kraków)

e-mail: biuro12@img-pan.krakow.pl
www.img-pan.krakow.pl

■ **Systems Research Institute** (Warszawa)

e-mail: ibs@ibspan.waw.pl
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Division V: Medical Sciences

- **Hirsfeld Institute of Immunology and Experimental Therapy** (Wrocław)
e-mail: secret@iitd.pan.wroc.pl
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- **Institute of Human Genetics** (Poznań)
e-mail: igcz@man.poznan.pl
www.igcz.poznan.pl
- **Institute of Medical Biology** (Łódź)
e-mail: aobidowska@cbm.pan.pl
www.ibmpan.pl
- **Institute of Pharmacology** (Kraków)
e-mail: ifpan@if-pan.krakow.pl
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- **Mossakowski Medical Research Centre** (Warszawa)
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Branches

- **Polish Academy of Sciences Branch in Gdańsk** (Gdańsk)
e-mail: gdansk@pan.pl
www.gdansk.pan.pl
- **Polish Academy of Sciences Branch in Katowice** (Katowice)
e-mail: katowice@pan.pl
www.katowice.pan.pl
- **Polish Academy of Sciences Branch in Kraków** (Kraków)
e-mail: krakow@pan.pl
www.krakow.pan.pl
- **Polish Academy of Sciences Branch in Lublin** (Lublin)
e-mail: lublin@pan.pl
www.pan-ol.lublin.pl
- **Polish Academy of Sciences Branch in Łódź** (Łódź)
e-mail: lodz@pan.pl
www.lodz.pan.pl
- **Polish Academy of Sciences Branch in Olsztyn and Białystok** (Olsztyn)
e-mail: olsztyn@pan.pl
www.olsztyn.pan.pl
- **Polish Academy of Sciences Branch in Poznań** (Poznań)
e-mail: Katarzyna.Kunert@pan.pl
www.pan.poznan.pl
- **Polish Academy of Sciences Branch in Wrocław** (Wrocław)
e-mail: wroclaw@pan.pl
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Other units

- **Frąckiewicz Center for Laser Technologies of Metals Kielce Technical University and the Polish Academy of Sciences** (Kielce)
e-mail: zbigwes@eden.tu.kielce.pl
www.tu.kielce.pl
- **International Institute of Molecular and Cell Biology in Warsaw** (Warszawa)
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Scientific and Task-Force Committees

Task-Force Committees

Committees affiliated with the Presidium of the Academy

- **The Committee on Bioethics**
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e-mail: j.rozynska@uw.edu.pl
- **The Committee on Energy**
Politechnika Śląska,
Instytut Maszyn i Urządzeń Energetycznych
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- **The Committee on Polar Research**
Instytut Geofizyki PAN
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e-mail: kbp@igf.edu.pl
- **The Committee on Space and Satellite Research**
Centrum Badań Kosmicznych PAN
ul. Bartycka 18a, 00-716 Warszawa
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- **The Committee on Spatial Economy and Regional Planning**
Pałac Kultury i Nauki, 00-901 Warszawa
e-mail: kpsz@pan.pl
- **The “Poland 2000 Plus” Forecast Committee**
Pałac Kultury i Nauki, 00-901 Warszawa
e-mail: komprog@pan.pl
- **The Council for Scientific Societies**
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e-mail: tadeusz.majsterkiewicz@pan.pl
- **The Council for the Polish Language**
ul. Nowy Świat 72, 00-330 Warszawa
e-mail: rjp@pan.pl
- **The Council for the Promotion of the Public Understanding of Science**
Instytut Biochemii i Biofizyki PAN
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- **The Committee on Ethics in Science**
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- **The Research Committee on Human Migration Research**
Uniwersytet Warszawski,
Ośrodek Badań nad Migracjami
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- **The Committee on Science Studies**
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Instytut Meteorologii i Gospodarki Wodnej
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Committees affiliated with Division I

Committees affiliated with Division IV

Scientific Committees at the Divisions of the Academy

Division I: Humanities and Social Sciences

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Pl. Defilad 1, 00-901 Warszawa
e-mail: jan.kwapisz@uw.edu.pl
- **The Committee on Art Studies**
Instytut Sztuki PAN
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- **The Committee on Cultural Studies**
Pałac Kultury i Nauki,
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skr. poczt. 24
e-mail: eugeniusz.wilk@uj.edu.pl
- **The Committee on Demographic Studies**
Szkoła Główna Handlowa
Instytut Statystyki i Demografii
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- **The Committee on Economic Sciences**
Pałac Kultury i Nauki,
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e-mail: knepan@inepan.waw.pl
- **The Committee on Ethnological Sciences**
Uniwersytet im. A. Mickiewicza
ul. Umultowska 89 D, 61-614 Poznań
e-mail: irakabat@amu.edu.pl
- **The Committee on Financial Sciences**
Pałac Kultury i Nauki,
Pl. Defilad 1, 00-901 Warszawa
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e-mail: tczerwinska@wz.uw.edu.pl
- **The Committee on Historical Sciences**
Instytut Historii UAM
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- **The Committee on the History of Science and Technology**
Instytut Historii Nauki PAN
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- **The Committee on Labor and Social Policy Sciences**
Instytut Pracy i Spraw Socjalnych
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- **The Committee on Legal Sciences**
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- **The Committee on Linguistics**
Pałac Kultury i Nauki,
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- **The Committee on Literature Studies**
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- **The Committee on Organizational and Management Sciences**
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- **The Committee on Oriental Studies**
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ul. Krakowskie Przedmieście 26/28,
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- **The Committee on Pedagogical Sciences**
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- **The Committee on Theological Sciences**
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Division II: Biological and Agricultural Sciences

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Katedra Nauk o Środowisku Glebowym,
Wydział Rolnictwa i Biologii
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e-mail: jan_labetowicz@sggw.pl
- **The Committee on Forestry Sciences and Wood Technology**
Szkoła Główna Gospodarstwa Wiejskiego
Katedra Urządzania Lasu, Geomatyki
i Ekonomiki Leśnictwa, Wydział Leśny
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- **The Committee on Biotechnology**
Instytut Chemii Bioorganicznej PAN
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e-mail: twardows@ibch.poznan.pl
- **The Committee on Molecular Biology of the Cell**
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Wydział Biologii
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e-mail: grzegorz.wegrzyn@biol.ug.edu.pl
- **The Committee on Environmental and Evolutionary Biology**
Uniwersytet Warszawski Zakład Filogenetyki
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- **The Committee on Organismal Biology**
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e-mail: bogjack@amu.edu.pl
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Wydział Nauk o Żywności
ul. Nowoursynowska 159c, 02-776 Warszawa
e-mail: andrzej_lenart@sggw.pl
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Zwierząt z Kliniką, Wydział Medycyny Weterynaryjnej
ul. Oczapowskiego 14, 10-719 Olsztyn
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■ **The Committee on Zootechnics and Aquaculture**

Szkoła Główna Gospodarstwa Wiejskiego
Katedra Szczegółowej Hodowli Zwierząt,

Wydział Nauk o Zwierzętach

02-786 Warszawa, ul. Ciszewskiego 8
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Division III: Mathematics, Physics, Chemistry and Earth Sciences

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e-mail: bbusz@chem.umk.pl

■ **The Committee on Geophysics**

Uniwersytet Warszawski,
Wydział Fizyki, Instytut Geofizyki
ul. Pasteura 7,
02-093 Warszawa
e-mail: malina@igf.fuw.edu.pl

■ **The Committee on Astronomy**

Uniwersytet Warszawski, Obserwatorium
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■ **The Committee on Maritime Research**

Instytut Oceanologii PAN
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■ **The Committee on Chemistry**

Instytut Chemii Organicznej PAN
ul. Kasprzaka 44/52, 01-224 Warszawa
e-mail: andrzej.konowal@icho.edu.pl

■ **The Committee on Mathematics**

Instytut Matematyczny PAN
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■ **The Committee on Crystallography**

Instytut Niskich Temperatur
i Badań Strukturalnych
im. Włodzimierza Trzebiatowskiego PAN
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■ **The Committee on Mineralogical Sciences**

Instytut Nauk Geologicznych PAN
ul. Twarda 51/55, 00-818 Warszawa
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■ **The Committee on Geographical Sciences**

Instytut Geografii i Przestrzennego
Zagospodarowania im. S. Leszczyckiego PAN
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■ **The Committee on Physics**

Politechnika Warszawska, Wydział Fizyki
ul. Koszykowa 75, 00-662 Warszawa
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■ **The Committee on Geological Sciences**

Akademia Górniczo-Hutnicza im. S. Staszica,
Wydział Geologii, Geofizyki i Ochrony Środowiska
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■ **The Committee on Quaternary Research**

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Division IV: Engineering Sciences

■ **The Committee on Acoustics**

Instytut Podstawowych
Problemów Techniki PAN
ul. Pawińskiego 5b, 02-106 Warszawa
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■ **The Committee on Architecture
and Town Planning**

Politechnika Warszawska, Wydział Architektury
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- **The Committee on Automatic Control and Robotics**
Uniwersytet Zielonogórski
Instytut Sterowania i Systemów Informatycznych
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- **The Committee on Biocybernetics and Biomedical Engineering**
Instytut Biocybernetyki i Inżynierii Biomedycznej
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- **The Committee on Chemical and Process Engineering**
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- **The Committee on Civil Engineering and Hydroengineering**
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Wydział Inżynierii Lądowej
Instytut Materiałów
i Konstrukcji Budowlanych
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- **The Committee on Electrical Engineering**
Politechnika Warszawska,
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e-mail: tskoz@itc.pw.edu.pl
- **The Committee on Electronics and Telecommunication**
Wojskowa Akademia Techniczna,
Wydział Elektroniki
ul. gen. Sylwestra Kaliskiego 2,
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- **The Committee on Environmental Engineering**
Wydział Inżynierii Środowiska
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e-mail: l.pawlowski@pollub.pl
- **The Committee on Geodesy**
Wojskowa Akademia Techniczna w Warszawie
Wydział Inżynierii Lądowej i Geodezji
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e-mail: iewiak@wat.edu.pl
- **The Committee on Informatics**
Instytut Informatyki Politechnika Poznańska
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- **The Committee on Machine Building**
Akademia Górniczo-Hutnicza w Krakowie
Al. Mickiewicza 30 paw. B-2, pok. 104 30-059 Kraków
e-mail: kbm-pan@agh.edu.pl;
- **The Committee on Mineral Economy Sustainable Development**
Instytut Gospodarki Surowcami Mineralnymi
i Energią PAN
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- **The Committee on Materials Science**
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- **The Committee on Mechanics**
Instytut Podstawowych Problemów Techniki PAN
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- **The Committee on Metallurgy**
Akademia Górniczo-Hutnicza im. S. Staszica
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- **The Committee on Metrology and Research Equipment**
Akademia Górniczo-Hutnicza w Krakowie
Katedra Metrologii i Elektroniki
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- **The Committee on Mining**
Instytut Mechaniki Górnotworu PAN
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■ **The Committee on Production Engineering**

Polskie Towarzystwo Zarządzania Produkcją
ul. Katowicka 65/5, 45-061 Opole
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■ **The Committee on Thermodynamics and Combustion**

Politechnika Koszalińska
Katedra Techniki Ciepłej i Chłodnictwa
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■ **The Committee on Transport**

Politechnika Warszawska Wydział Transportu
ul. Koszykowa 75, 00-662 Warszawa
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Division V: Medical Sciences

■ **The Committee on Clinical Sciences**

Międzynarodowe Centrum Słuchu i Mowy
Kajetany, ul. Mokra 17, 05-830 Nadarzyn
e-mail: sekretariat@ifps.org.pl

■ **The Committee on Human Development**

Uniwersytecki Szpital Dziecięcy
Klinika Endokrynologii i Diabetologii Dziecięcej
ul. Prof. Antoniego Gębali 6, 20-093 Lublin
e-mail: l.szewczyk@wp.pl

■ **The Committee on Human Genetics and Molecular Pathology**

Instytut Genetyki Człowieka PAN
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e-mail: slomski@up.poznan.pl

■ **The Committee on Human Nutrition Science**

Uniwersytet Warmińsko-Mazurski,
Katedra Żywienia Człowieka
ul. Słoneczna 45f, 10-718 Olsztyn
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■ **The Committee for Immunology and Etiology of Human Infections**

Gdański Uniwersytet Medyczny,
Katedra i Zakład Fizjopatologii
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e-mail: jawit@gumed.edu.pl

■ **The Committee on Medical Physics, Radiobiology, and X-Ray Diagnosis**

Centralny Szpital Kliniczny MSWiA
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■ **The Committee on Neurobiology**

Zakład Neurofizjologii i Chronobiologii
Instytut Zoologii Uniwersytetu Jagiellońskiego
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■ **The Committee on Neurological Sciences**

Centrum Medyczne Kształcenia
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■ **The Committee on Physiological and Pharmacological Sciences**

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■ **The Committee of Public Health**

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■ **The Committee for Rehabilitation, Physical Education and Social Integration**

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■ **The Committee on Therapy and Drug Research**

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