ANNUAL REPORT

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POLISH ACADEMY of SCIENCES

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On the cover:
The vicinity of Halicz on the Josephine map of Galicia, 1779-1783, scale 1:28 800, fragment of sheet 300, original (Image courtesy of the Kriegsarchiv, Vienna)

Medical and Surgery Academy, Warsaw (now: the Polish Academy of Sciences, Staszic Palace) by F.H. Röber after L. Kapliński, woodcut engraving. Reproduction from the Archives of the Photographical Documentation Archives of the PAS Institute of Arts.

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Address by PAS President Professor Michał Kleiber

The year 2012 marked the 60th jubilee of the Academy's existence. To celebrate this occasion, the PAS held a special session of its General Assembly on 24 May 2012. Organized under the honorary patronage of Polish President Bronisław Komorowski, the jubilee celebrations prompted not only recollections of the Academy's origins and history but also deliberations on its current tasks, place, and role in the world of modern science as well as its duties to society. All those reflections were summarized in the book *Tradycja – współczesność – przyszłość. Refleksje jubileuszowe 1952-2012* ("Tradition, Modernity, Future: Jubilee Reflections 1952-2012").

Even so, the year 2012 was not exclusively or even predominantly a year of anniversary celebrations. It was the first year of multidisciplinary efforts after the completion of the crucial stage of the Academy's transformations, which began in October 2010.

The General Assembly adopted the Code of Ethics for Researchers, an important document much-awaited by the academic milieu, as well as a set of "Strategic Directions of Development for the Polish Academy of Sciences," a result and synoptic overview of a debate that had taken place in the Academy's various bodies for a long time. Just as in the previous years, the General Assembly discussed some of the most important problems in the state's science policy and the funding of science, with a special focus on the role of the PAS institutes.

PAS establishments performed superbly in domestic competitions and ranking lists. As part of consortiums formed with university faculties, the status of Leading National Research Centers was granted to the following institutes affiliated with the PAS: the Institute of Mathematics, the Henryk Niewodniczański Institute of Nuclear Physics in Kraków, the Jerzy Haber Institute of Catalysis and Surface Chemistry in Kraków, the Institute of Pharmacology in Kraków, and the Mossakowski Medical Research Center in Warsaw.

Created on the basis of the results of 15 competitions announced and decided in 2011-2012, the National Science Center's ranking of basic research leaders confirmed the considerable potential of PAS

K. Rainka

scientific units and their established position in the academic milieu. Seventy institutes and auxiliary units of the Academy won 881 out of a total of 4,360 grants. Among the PAS institutes, leaders of basic research include: the Nencki Institute of Experimental Biology, the Institute of Physical Chemistry, the Institute of Animal Reproduction and Food Research in Olsztyn, the Institute of Biochemistry and Biophysics, and the Institute of Physics.

A significant element of the Academy's scientific work is its international activity, chiefly in the form of bilateral cooperation, engagement in international organizations, and the activity of the PAS foreign scientific centers. Other examples of the Academy's active cooperation with foreign institutions are major scientific conferences organized by the PAS, including especially "Potential and New Challenges for Humanities and Social Sciences: Cross-Border Academic Dialogue" (the first joint conference of representatives of social sciences and humanities from the PAS institutes and the Leibniz Association) and the international conference "Electronic Health and Medicine: Advances and

Challenges" (devoted to the assessment of ongoing advancements in e-health technologies as well as their advantages and disadvantages). Members of the IAP Biosecurity Working Group, chaired by Poland, attended the plenary session of the meeting of the party-states to the Biological Weapons Conventions under the auspices of the United Nations. As an event complementary to the meeting, a conference was held to present the Group's activity and introduce its members in the field of promoting education and raising awareness of dual-use technology.

In 2012, members of the Academy won numerous scientific awards and prizes, including awards sponsored by the Polish Prime Minister, the Minister of Science and Higher Education, and the Foundation for Polish Science, as well as awards granted by the presidents of higher education establishments, cabinet ministers, domestic and foreign academic groups, and the highest state decorations. Ten individuals were awarded doctorates *honoris causa*. Prof. Michał Kleiber, president of the Polish Academy of Sciences, received France's *L'Ordre Nationale de Merite* and the Japanese Order of the Rising Sun, Gold and Silver Star. Together with Prof. Rita Süssmuth, former president of Germany's Bundestag, and Prof. Jack Lang, former French minister of culture, the PAS president received the Adam Mickiewicz Award, granted by the Committee of Polish-French-German Cooperation.

Also, the Academy granted its prestigious award, the Mikołaj Kopernik Medal, to Prof. Henryk Skarżyński. Medals of the Academy were given to: Prof. Leszek Pączek, Prof. Jerzy Szaflik, Prof. Lech Zimowski, Prof. Junichi Ueda (Japan), Prof. Alberto Oliverio (Italy), Prof. Hans Rothe (Germany), and the PAS Mammal Research Institute.

The PAS president set up the *Iuvenes Wratislavie* award, granted by the PAS branch in Wrocław to young employees of the Academy's center in Lower Silesia for outstanding scientific achievements that contribute to the development of science.

In 2013, the Academy will continue to pursue its research and organizational goals, both the ones it has been advancing for years and those taken on in 2012. Looking to the future with optimism, we would like to express our conviction that the Academy's mission as well as its scientific and social objectives will be advanced courageously, solemnly, and in compliance with the high ethical and intellectual standards applicable in the world of science.

Michał Kleiber
President of the Polish Academy of Sciences

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Humanities and Social Sciences

As of the end of 2012, PAS Division I: Humanities and Social Sciences had 45 national members (22 ordinary members and 23 corresponding members), plus 32 foreign members of the Academy. It is with deep sorrow that we note that the Academy's ordinary members Marian Biskup, Jerzy Kmita, and Zbigniew Radwański as well as foreign members Paul Andre Crepeau and Riccardo Picchio passed away in 2012.

The Division held two plenary sessions in 2012. During the first session, held on 19 April, the following individuals were elected to the Young Academy: Asst. Prof. Katarzyna Marciniak (classical philology, Italian studies) from Warsaw University, Asst. Prof. Dariusz Jemielniak (management) from Leon Koźmiński University, Dr. Konrad Osajda (law) from Warsaw University, Dr. Rafał Urbaniak (philosophy, logic) from Gdańsk University, Dr. Adrian Gleń (literature studies) from Opole University, and Dr. Michał Wierzchoń (psychology) from Jagiellonian University. After Prof. Zbigniew Kwieciński delivered a paper, the participants of the session decided to pass a resolution to set up a new task force committee dealing with education. The following members of the National Committee for Cooperation with the International Academic Union (IAU) were also selected: Elżbieta Witkowska-Zaremba, corresponding member of the Academy, Karol Myśliwiec, ordinary member of the Academy, Prof. Michał Olszewski from the PAS Institute of Philosophy and Sociology, and Asst. Prof. Michał Rzepiela from the PAS Institute of the Polish Language. Stanisław Gajda, corresponding member of the Academy and deputy chair of the Council of Provosts, gave a report on the activity of the Council of Provosts and evaluation of the PAS scientific committees.

During the second plenary session, held on November 8, Division's scientific awards were granted to the following individuals: the Erazm Majewski Award in archaeology went to Prof. Michał Kara from the PAS Institute of Archaeology and Ethnology for the work *Najstarsze państwo Piastów – rezultat przełomu czy kontynuacja?* [The Oldest Piast State – The Result of a Breakthrough or Continuation?]; in demography to Prof. Cezary Kuklo from the University of Bialystok for the work *Demografia Rzeczypospolitej Przedrozbiorowej* [Demography of Pre-partition Poland]; in cultural history to Asst. Prof. Grzegorz P. Bąbiak from the Tadeusz Manteuffel Institute of History for the work *Sobie,*

From left: Dr. Zdzisław Hensel, PAS Chancellor; Asst. Prof. Grzegorz P. Bąbiak winner of the Award in cultural history (Tadeusz Manteuffel Institute of History); Prof. Stanisław Filipowicz, Dean of Division I; Asst. Prof. Agnieszka Gromkowska-Melosik winner of the Władysław Spasowski Award in pedagogy (Adam Mickiewicz University in Poznań); Prof. Michał Kleiber, PAS President; Asst. Prof. Paulina Lewicka winner of the Award in oriental studies (University of Warsaw); Prof. Cezary Kuklo winner of the Award in demography (University of Bialystok); Prof. Michał Kara winner of the Erazm Majewski Award in archaeology (PAS Institute of Archaeology and Ethnology)

Dr. Zdzisław Hensel, PAS Chancellor; Prof. Stanisław Filipowicz, Dean of Division I; Prof. Michał Kleiber, PAS President

ojczyźnie czy potomności… Wybrane problemy mecenatu kulturalnego elit na ziemiach polskich w XIX wieku [For Oneself, for the Fatherland, or for Posterity … Selected Problems of the Elite's Cultural Patronage in Polish Lands in the 19th Century]; in oriental studies to Asst. Prof. Paulina Lewicka from Warsaw University for the work *Food and Foodways of Medieval Cairenes – Aspects of Life in an Islamic Metropolis of the Eastern Mediterranean*; the Władysław Spasowski Award in pedagogy to Asst. Prof. Agnieszka Gromkowska-Melosik from the Adam Mickiewicz University in Poznań for the work *Edukacja i (nie)równości społeczne kobiet. Studium dynamiki dostępu* [Education and Women's Social In(equalities) – A Study of Access Dynamics].

A panel consisting of Prof. Urszula Jakubowska, director of the PAS Institute of Psychology, Prof. Ryszard Nycz, corresponding member of the Academy, and Prof. Bogusław Śliwerski, chairman of the PAS Committee on Pedagogical Sciences was appointed to draw up a program of activities for Division I in accordance with the Academy's mission and strategic directions for PAS development. A draft statute for the PAS Institute of Literary Research was discussed and changes were approved in the statutes of the following units: the Tadeusz Manteuffel Institute of History, the Ludwik and Aleksander Birkenmajer Institute of the History of Science, the Institute of Political Studies and the auxiliary research unit known as the Polish Academy of Sciences Library in Gdańsk. A second part of the session was devoted to Prof. Jerzy Wilkin's lecture entitled *Komu potrzebne są nauki społeczne? Nauki społeczne w polskiej i europejskiej przestrzeni badawczej i w rozwiązywaniu problemów rozwoju* [Who Needs Social Sciences? Social Sciences in the Polish and European Research Areas and in Solving Problems of Development]. The participants of the same session also listened to a presentation by Prof. Andrzej Buko, director of the PAS Institute of Archaeology and Ethnology and a member of SH Panel 6 (the Study of the Human Past) of the European Research Council (ERC), on the ERC research funding application procedures. Prof. Jan Woleński, corresponding member of the Academy, delivered a lecture on problems of evaluating scientific journals in the field of humanities and social sciences, sparking a lively discussion.

The 22th Scientific Conference of the Standing Joint Commission of Economists of the Polish Academy of Sciences and Russian Academy of Sciences, this time entitled "Poland and Russia in the Process of Global Integration and Diversification," was held in Moscow on 26-27 June 2012, during which 17 papers were delivered (8 Polish and 9 Russian).

The Division I Council of Provosts held two sessions. During the first, held on 23 February 2012, the activity of the Council of Provosts in 2012 was summed up and there was discussion of a set of draft principles for evaluating the scientific institutes (presented by Jerzy Brzeziński, ordinary member of the Academy and chair of the Council of Provosts) and scientific and task force committees (presented by Stanisław Gajda, corresponding member of the Academy and deputy chair of the Council of Provosts).

At the next session, held on 29 November 2012, a document regulating *The Criteria for Evaluating the Scientific Institutes of PAS Division I* was approved, the chairs of the evaluation committees were appointed, and the schedule and procedures of institute evaluation were drawn up. Committees of independent experts will be carrying out evaluations of the following group of institutes: the Institute of Literary Research (evaluation committee chaired by Hubert Orłowski, ordinary member of the Academy), the Ludwik and Aleksander Birkenmajer Institute of the History of Science (chaired by Jerzy Strzelczyk, corresponding member of the Academy), the Institute of the Polish Language (chaired by Stanisław Gajda, corresponding member of the Academy), the Institute of Economic Sciences (chaired by Jerzy Wilkin, ordinary member of the Academy), the Institute of Legal Studies (chaired by Stanisław Waltoś, ordinary member of the Academy), the Institute of Rural and Agricultural Development (chaired by Zbigniew Kwieciński, ordinary member of the Academy), and the Institute of Political Studies (chaired by Karol Modzelewski, ordinary member of the Academy). A set of draft principles for evaluating scientific and task force committees sparked a lively discussion, during which meeting participants noted that such evaluations should be focused more on facts and activity, rather than on the parametric evaluation of a given committee. Given the large number of new remarks put forward concerning these committee evaluation principles, new members of the committee working on developing those principles were selected, namely: Prof. Joanna Kurczewska and corresponding members of the Academy Stanisław Gajda and Ryszard Nycz. The Council of Provosts selected the

following individuals to serve on the Competition Commission to fill the post of director of the PAS Institute of Economic Sciences: Jerzy Wilkin, ordinary member of the Academy (as chairman), Zdzisław Sadowski, corresponding member of the Academy, Aleksander Welfe, corresponding member of the Academy, Prof. Joanna Kotowicz-Jawor, and Prof. Andrzej Sopoćko. The Council also favorably reviewed the Tadeusz Manteuffel Institute of History's proposal to be granted property ownership rights, and passed a resolution to that effect. Moreover, a discussion was held on the difficulties that researchers who receive postdoctoral grants encounter as regards their employment at PAS institutes and the negative impact on PAS institutes caused by the current regulations on researchers' primary workplace.

The competitions to fill the posts of the directors at four Division I institutes ended with the appointment of the following individuals: Prof. Eugeniusz Cezary Król as director of the PAS Institute of Political Studies for a 4-year term starting 1 May 2012, Dr. Mirosław Drygas as director of the PAS Institute of Rural and Agricultural Development for a 4-year term starting 1 June 2012, Prof. Andrzej Rychard as director of the PAS Institute of Philosophy and Sociology for a 4-year term starting 1 July 2012, and Prof. Piotr Żmigrodzki as director of the PAS Institute of the Polish Language in Kraków for a 4-year term starting 1 September 2012.

Various Division I members received numerous awards and distinctions in the 2012 reporting year. Jerzy Axer was elected as an honorary member of the Adam Mickiewicz Literary Society and received the Award of the President of Warsaw University; Jacek Fisiak was elected as an honorary member of the Japan Society for Medieval English Studies and celebrated the republication of his doctorate at the University of Łódź; Stanisław Gajda received the Award of the Polish Minister of Science and Higher Education for his lifetime achievements, the Award of the President of Opole University, as well as the Award of the Minister of Science and Higher Education for his activity at the Central Commission for Academic Degrees and Titles; Franciszek Grucza was appointed an Honorary Chairman of the Association of Polish Germanists and a board member of the Warsaw branch of the Societas Humboldtiana Polonorum; Wiesław M. Grudzewski received the "100 Years of Technical Education in Lower Silesia" Medal and the Medal of the Wrocław University of Technology for his merits to the Faculty of Computer Science and Management; Andrzej Koźmiński was given the "40 Years of Warsaw University's Faculty of Management" Medal; Władysław Markiewicz was honored by the Ecumenical Foundation "Tolerance" with the Medal for the "Promotion of Tolerance" on 22 November 2012; Stanisław Mossakowski was decorated with the "Gloria Artis" Golden Medal; Karol Myśliwiec was decorated with the Commander's Cross of the Order of Polonia Restituta and received an honorary diploma from the Supreme Council of Antiquities for his long-standing contribution to restoring and preserving Egyptian monuments; Zdzisław L. Sadowski was given an honorary badge by the Polish Bank Association; Henryk Samsonowicz was given the Wojciech Kętrzyński Award by the Executive Board of the Warmia and Mazury region for his outstanding achievements in the humanities, with a lasting cultural impact on the Warmia and Mazury region. Piotr Skubiszewski was appointed an ordinary member of the Warsaw Scientific Society and was awarded the "Gloria Artis" Golden Medal; Jan Strelau received the 2012 Lifetime Achievement Award from the European Association of Personality Psychology; Jerzy Strzelczyk received a *doctor honoris causa* degree from Jan Długosz University in Czestochowa; Jan Szacki received the Józef Tischner Award from the "Znak" Publishing House and "Hestia" Insurance Company for his lifetime achievements; Piotr Sztompka received the Award of the President of Jagiellonian University for the highest amount of indexed publications at the Faculty of Philosophy; Stanisław Waltoś received the title of honorary professor, celebrated the republication of his doctorate at Jagiellonian University, and also given the Klemens Bąkowski Award by the Society of Friends and Lovers of Kraków; Bogdan Wojciszke was decorated with the Knight's Cross of the Order of Polonia Restituta and received the Polish Society of Social Psychology Award for his outstanding research achievements; Jerzy Wilkin received the individual Award of the President of Warsaw University.

In the first half of 2012, PAS Division I: Humanities and Social Sciences embraced 24 scientific committees. Ten committees set up for the 2011-2014 term held their first sessions. One of the major topics discussed by the committees was the parametric evaluation of research journals.

The Committee on the History of Science and Technology met at four plenary sessions, paying a visit to the Copernicus Science Center as part of one of them. The committee established cooperation with the Historical Commission of the Polish Academy of Arts and Sciences (PAU), the Warsaw Scientific Society, and the Society for the History of Education. A sub-body, the Commission on the History of Siberia, met five times in 2012 and listened E. Niebelski's paper entitled "Catholic Priests in Exile" and J. Tulisow's paper on the "120th Anniversary of Władysław Kotowicz's Expedition to Mongolia."

The Committee on Linguistics organized five plenary sessions at which 16 papers were delivered, for instance E. Mańczak-Wohlfeld's paper on "English Borrowings in the Polish Language vs. Dictionaries." The committee's subsections and panels held five sessions, with 10 papers. A jubilee session entitled "Linguistics in Poland: Research Directions and Prospects for Development," dedicated to the 60th anniversary of the committee, was held on 4 June 2012. The committee organized the 5th International Congress of Polish Studies together with Opole University and a conference on "Microtoponymy and Macrotoponymy" with the University of Łódź. The committee issued the periodical *Onomastica* and initiated a new series entitled *Pamięć o nieobecnych* [The Memory of Those Departed] devoted to the achievements of deceased language researchers. The committee launched a discussion about the evaluation of linguistic journals and defended the use of the Polish language for writing scientific publications.

The Committee on Demographic Studies met at three plenary sessions. In cooperation with the Polish Government Population Council, the committee organized the 2nd Congress on Demography and actively participated in the Congress on Polish Statistics. Members of the committee also took part in a debate organized by the Polish Parliament and the Office of the Polish President on the proposal to raise the retirement age and a draft bill regarding parental leave. The Historical Demography section met at five sessions during which five papers were delivered, including D. Chojnacki's paper on "Was the Kingdom of Poland Afflicted by the Black Death?" The journals *Studia Demograficzne* [Demographical Studies] and *Przeszłość Demograficzna Polski* [Demographic Past of Poland] were published.

The Committee on Economic Sciences organized five meetings during the year. Four papers were delivered, among them W. Jarmołowicz's paper entitled "Economic Transformation in Poland – Plans and Achievements." The 22th Scientific Conference of the Standing Joint Commission of Economists of the Polish Academy of Sciences and Russian Academy of Sciences was held in Moscow, entitled "Poland and Russia in the Process of Global Integration and Diversification," during which 8 Polish papers were delivered, including J. Kotowicz-Jawor's paper entitled "Poland's Development Path in Integrated Europe." Six issues of the bimonthly periodical *Ekonomista* [Economist] were published. In the latest evaluation of the Ministry of Science and Higher Education, this journal received 15 points.

The Committee on Ethnological Sciences met at three plenary sessions in 2012. Together with Adam Mickiewicz University the committee organized a conference on "Contemporary Migrations and Their Consequences from an Interdisciplinary Viewpoint: Between Isolation and Integration." A Commission on Anthropology of Cities and a Folklore Section were established. The committee and the Polish Ethnological Society jointly published the 96th volume of the journal *Lud* [People] and two collections of conference materials: *W zdrowiu i w chorobie… Z badań antropologii medycznej i dyscyplin pokrewnych* [In Sickness and in Health… Research on Medical Anthropology and Other Related Disciplines] edited by D. Penkala-Gawęcka, I. Main, and A. Witeska-Młynarczyk and *Imigranci: między izolacją a integracją* [Immigrants: Between Isolation and Integration] edited by M. Buchowski and J. Schmidt.

The Committee on Philosophical Sciences held five plenary session in 2012. Together with the Silesian University of Technology and the University of Silesia in Katowice, it organized the 9th Polish Congress of Philosophy. Papers presented there were further published in the journal *Przegląd Filozoficzny* [Philosophical Overview]. The committee lent its patronage to the conference "How to Teach Successfully: On Courageous Teaching of Philosophy and Ethics at All Stages of Education." The committee created a website on the Academicon portal, designed to integrate Polish philosophers, and initiated a new cycle entitled "Interviews with Distinguished Polish Philosophers," with A. Grzegorczyk as the first guest to be interviewed.

Three plenary sessions were held by the Committee on Historical Sciences in 2012, during which organizational matters were discussed. Members of

the Panel on Numismatic Studies participated in the Polish Parliament's debate on a bill concerning the protection and conservation of monuments. The Commission on Lithuanian Studies and the Tadeusz Manteuffel Institute of History jointly organized a conference on "War and Diplomacy – The Grand Duchy of Lithuania in 14th- to 19th-Century European Politics." The Panel on Czech History and Polish-Czech Relations together with Opole University's Institute of History organized a conference on "The Czech Republic and Poland between East and West – The Middle Ages and Early Modern Era." The journals *Studia Maritima* [Maritime Studies] and *Wiadomości Numizmatyczne* [Numismatic News] continued to be published.

Four plenary sessions were held by the Committee on Financial Sciences. The committee co-organized two scientific conferences, including "D-Finance 2012 – Finance Didactics at Higher Education Institutions" organized jointly with the Wrocław University of Economics. The committee lent its patronage to two other conferences, including "Financial Investments and Insurance." K. Borowski received the committee's award for his outstanding research achievements in the field of finance.

The Committee on Cultural Studies held four plenary sessions, including one session featuring M. Król's paper on "The Consequences of Neoliberalism for Culture." The program of the 2nd Congress on Cultural Studies was discussed, and a Commission for Cultural Studies Research Coverage was established. The committee put forward a proposal to the Ministry of Science and Higher Education to return to previous timeframe for preparing reviews of DSc (*habilitation*) theses. Two issues of the journal *Przegląd Kulturoznawczy* [Cultural Studies Review] were published.

The Committee on Ancient Culture met at eight plenary sessions featuring eight different papers, including G. Schade's presentation on "Sicily's Place in Greek Poetry" and K. Nawotka's on "Alexander the Great in Babylon." The committee took steps to develop an electronic database compiling data on research activity undertaken by different Polish research centers dealing with antiquity. The electronic database will be available for viewing on the committee's website. A concept for the model outcome of education in the fields of study of classical philology and Mediterranean studies (BA and MA levels) was drawn up in cooperation with the Polish Philology Association. The journal *Meander* was published.

The Committee on Literature Studies met at three plenary sessions in 2012. The committee co-organized the 5th International Congress on Polish Studies entitled "Polish Studies Facing the Challenges of Modern Times" together with the Institute of the Polish Studies of the University of Opole and the PAS Committee on Linguistics, a conference on "Literature and Technology" in conjunction with the PAS Institute on Literary Research, a conference on "New Regionalism? Research Reconnaissance and an Outline of Prospects" in cooperation with the Institute of Polish Studies of the University of Zielona Góra. The committee put forward a proposal to digitalize and spread scientific publications online, with the PAS Institute on Literary Research's approval.

The Committee on Labor and Social Policy Sciences held three plenary sessions. J. Orczyk delivered a paper on "Challenges for Labor and Social Policy in Poland." The panel on "The Development of Intellectual Capital" prepared a scientific session entitled "Contemporary Quality of Intellectual Capital in the Polish Economy" in September. The committee held a ceremonial session devoted to the 14th edition of the W. Szubert Medal. In conjunction with the Committee on Demographic Studies, the committee organized two conferences: the 2nd Congress on Demography and a conference on "Dilemmas of the Contemporary Labor Market." The committee actively participated in various advisory and consultation bodies to the Ministry of Labor and Social Policy and to the 16 voivodeship marshals, and drew up expert report for the Ministry dealing with "Solutions for Boosting Employment Among Young People in Poland". The next volume of the periodical *Problemy Polityki Społecznej. Studia i Dyskusje* [Social Policy Problems – Studies and Discussions] was published.

Three plenary sessions of the Committee on Oriental Studies were held in 2012. The following papers were delivered: "The State of Research on the Polish Tatras" by S. Chazbijewicz and "Prolegomena to the Study of Prehistoric Religions of the Ancient East" by P. Taracha. The committee together with the Polish Academy of Arts and Sciences (PAU), the PAS/PAU Joint Scientific Archives in Kraków, and the Faculty of Oriental Studies of Warsaw University organized an international conference on "Exploring the Languages and Cultures of Asia – Professor Władysław Kotowicz in Memoriam." The committee took first steps towards establishing a computer database of Polish Orientalists.

The periodical *Rocznik Orientalistyczny* [Oriental Studies Yearbook] was published.

The Committee on Organizational and Management Sciences held three plenary sessions in 2012. The committee co-organized a conference on "The Theory and Practice of Management: Development, Barriers, Challenges" in conjunction with the Warsaw School of Economics and a conference on "Modern Research Trends in Management Sciences" with Jagiellonian University. The committee lent its patronage to the international conference on Technology Innovation and Industrial Management 2012, entitled "Building Competences, Synergy and Competitiveness for the Future." The Tadeusz Kotarbiński Medal granted by the committee was awarded to Agnieszka Holland, Ryszard Tadeusiewicz, Herbert Wirth, and to the company KGHM SA in Lublin. The journal *Organizacja i Kierowanie* [Organization and Management] continued to be published.

The Committee on Art Studies held three plenary sessions during which three papers were delivered: "Alabasters – Bright but Covered" by A. Lipińska, "Images of Misfits – From Mythical Ones in H. Schledl's *Chronicles* to the Protagonists of T. Browning's Film *Freaks*" by A. Olszewska, and "The Residence in Żółkiew – Strategies for Restoration and Maintenance of the Sobieski Family's Royal Succession" by T. Biernatowicz. The committee sent a letter of support for the InterCity Plan project to the Polish Minister of Regional Development, as well as a letter to the Polish Minister of Justice expressing disapproval for a proposal to deregulate the profession of conservator. The periodical *Rocznik Historii Sztuki* [History of Art Yearbook] was published.

The Committee on Pedagogical Sciences held four plenary sessions during which M. Czerepaniak-Walczak delivered a paper on "Pedagogy Placement and Mass Education." The committee organized a two-day plenary session with the participation of deans of faculties of pedagogy. The committee lent its patronage to international conferences on "The Changing Role of Teachers within the EU – From Knowledge Transmitters to Knowledge Creators" and "Family Education – Historical and Contemporary Contexts." The 26th Summer School of Young Pedagogues was organized, this time dealing with the "Everyday World of the Participants of Educational Interactions – Explorations, Analyses, Interpretations." The next volume of the periodical *Rocznik Pedagogiczny* [Pedagogical Yearbook] was published.

The Committee on Political Sciences held five plenary sessions, including one with the participation of Barbara Kudrycka, Minister of Science and Higher Education, and academic circle representatives in political sciences. The committee co-hosted the 2nd National Congress on Political Science and a conference on "Experts and Expertise in Decision-Making." The committee expressed its opinion on teaching history in secondary schools and sent it to Bronisław Komorowski, President of Poland, and to Krystyna Szumilas, Minister of National Education.

Four plenary sessions were held by the Committee on Prehistoric and Protohistoric Sciences, during which A. Marciniak delivered a paper on the "Organization and Functioning of Archaeological Conservation Services in France and Great Britain." The June session organized by the committee's Panel for the Protection of the Archaeological Heritage was devoted to the present state of the protection of the archaeological sites in Poland. The committee was a co-organizer of the conference on "The Study of the Social Past from a Cross-Disciplinary Perspective – Research Status and Prospects." The committee began cooperation with the International Union on Prehistoric and Protohistoric Sciences (UISPP) affiliated with UNESCO and initiated preparatory work for a conference of the UISPP Executive Committee in Poland.

The Committee on Legal Sciences met at four plenary sessions. In conjunction with the PAS Committee on Political Sciences, it jointly organized the conference on "Experts and Expertise in Decision-making." The committee expressed its opinion on scientific journals and their parametric evaluation, the principles of issuing opinions on draft laws, and draft regulations on civil partnerships. The journal *Państwo i Prawo* [State and Law] continued to be published.

The Committee on Theological Sciences met at three plenary sessions in 2012. The committee together with the Theological Research Institute of the University of Erfurt and the Faculty of Theology of Opole University organized an international conference on "Generation Replacement in Theology."

The Committee on Psychology met at three plenary sessions. The committee sent a letter to the Polish Minister of Science and Higher Education expressing its opinion that it would be appropriate for psychologists to be trained in five-year programs. It also sent a letter of disapproval to the Polish Minister of Labor and Social Policy, concerning a pro-

posal to repeal the law currently regulating the profession of psychologist. The 21st Psychological Colloquia entitled "What's Next? Trends and Prospects for the Development of Psychology" were jointly organized by the committee and the Institute of Psychology at the University of Silesia in Katowice. The 8th edition of the Andrzej Malewski Award was won by Dr. M. Senderecka. The periodicals *Studia Psychologiczne* [Psychological Studies] and *Polish Psychological Bulletin* were published.

The Committee on Slavic Studies met at three plenary sessions. During the jubilee session dedicated to its 60th anniversary, papers summing up the achievements of Polish Slavic studies research in linguistics, literature, culture, and folklore were delivered. The committee discussed organizational matters concerning the 15th International Congress of Slavists, to be held in 2013. A two-volume book *Z Polskich Studiów Slawistycznych. Prace na XV Międzynarodowy Kongres Slawistów w Mińsku 2013* [On Polish Slavic Studies – Papers for the 15th International Congress of Slavists in Minsk, 2013] was published, as were the journals *Slavia Orientalis*, *Pamiętnik Słowiański* [Slavic Chronicle], and *Rocznik Slawistyczny – Reveue Slavistique* [Slavic Studies Yearbook].

Three plenary sessions were held by the Committee on Sociology in 2012. The committee organized a conference on "Poland in Times of Uncertainty – the Modernization of Institutions and the Problem of Generations" in conjunction with the Institute of Sociology at Warsaw University and an international conference entitled "Nationalism and Conflict: Interdisciplinary Methodological Approaches" with Ohio State University. It put forward an expert opinion on *Polska początku XXI wieku: przemiany kulturowe i cywilizacyjne* [Poland in the Early 21st Century – Cultural and Civilizational Transformations], and published the journals *Kultura i Społeczeństwo* [Culture and Society], and *Studia Socjologiczne* [Sociological Studies].

The Committee on Statistics and Econometrics held three plenary sessions in 2012. It initiated the development of a platform containing an interactive handbook for researchers from sub-disciplines represented by the committee. The committee co-hosted four conferences, including PhD Workshops on Econometrics and Statistics for young researchers. It published the journal *Przegląd Statystyczny* [Statistical Overview] plus a special issue including materials for the Congress on the Polish Statistics organized on the occasion of the "100 Years of the Polish Statistical Association."

There were four task force committees affiliated with Division One in the reporting year 2012. In addition, by a decision of the PAS Presidium in November 2012, a Committee on the Development of National Education was set up with Zbigniew Kwieciński, ordinary member of the Academy, appointed as its chairman.

The Committee on Human Migration Research held three plenary sessions. The committee organized a conference on "The Social and Cultural Consequences of the Polish Migration at the Turn of the Centuries" together with the Center of Migration Research at the University of Warsaw and the Institute of Sociology at Jagiellonian University, a conference on "Immigrants in Europe – The Culture of Acceptance" in conjunction with Cardinal Stefan Wyszyński University in Warsaw. Members of the committee participated in the 2nd Demographical Congress. The periodical *Studia Migracyjne – Przegląd Polonijny* [Study on Migration – The Polish Community Overview] and the committee's expert opinion *Repatrianci z Kazachstanu – charakterystyka i główne problemy adaptacyjne* [Repatriates from Kazakhstan – Characterization and Major Adaptation Problems] were published.

The Committee on Agricultural Economics and Rural Development met at four plenary sessions, with a jubilee session devoted to the 80th Anniversary of F. Tomczak's birth. The committee co-organized four conferences, including "Workshops for Agricultural Economists" and a "Panel of Editors of Leading International Journals" together with the Faculty of Economic Sciences at the Warsaw University of the Life Sciences (SGGW).

The Committee on Ethics in Science held two plenary sessions. In conjunction with the PAS Committee on Science Studies and Nicolaus Copernicus University it organized a conference on "Ethics in Research and Higher Education." The chairman of the committee was informed of several cases of research misconduct concerning relations between independent faculty and younger researchers. The chairman called on the authorities of those universities to take steps towards resolving conflicts through compromise.

The Committee on Science Studies held three plenary sessions and co-organized two conferences: "Funding of Research Projects in Poland – Theory

and Practice" with the National Science Center and "Ethics in Research and Higher Education" with Nicolaus Copernicus University and the PAS Committee on Ethics in Science. The committee moreover lent its patronage to a conference on "Information Management in Science." It cooperated with the Strategy Department of the Polish Ministry of Science and Higher Education and published the quarterly *Zagadnienia Naukoznawstwa* [Problems of Science Studies].

Sensational archaeological findings at Domasław in Silesia

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The site at Domasław, in the Kobierzyce commune, is situated approx. 20 km southwest of Wrocław in the Wrocław Plain, part of the Silesian Lowland. Rescue excavation work was performed at sites in Domasław by the Rescue Research Team of the PAS Institute of Archaeology and Ethnology in Wrocław. During the field work, 13,794 nonmovable objects were discovered, documented, and explored. Most of them were relics of camps, settlements, and graveyards dating back to the Late Stone Age (4200-3800 BC), the early period of the Bronze Age (2300-1500 BC), the middle to late Bronze Age (1300-750 BC) and Early Iron Age Hallstatt period (750-400 BC). The findings at the site in Domasław have proven to be a sensational source of new knowledge about certain fragments of prehistory and archaeological cultures.

This was the first successful attempt in Silesia to make such an extensive reconnaissance of a graveyard of a regional cultural group defined as a Jordanów culture group from the Neolithic Age (4200-3800 BC). The significance of this achievement lies largely in the fact that we found tombs richly equipped with large amounts of "imported" copper products (Fig. 1). This discovery shows us a new picture of the inflow of products made of this material into Polish lands and their inhabitants' contacts with cultural centers existing at that time.

Fig. 1. Domasław, Wrocław region, Neolithic inhumation burial (L. Nowaczyk)

However, the most revolutionary results were yielded by work on a cremation graveyard of a population of the Lusatian archaeological culture. The graveyard was used from ca. 1300 BC to ca. 450 BC, presumably by the same community, which maintained the tradition of the burial place for their dead. However, the picture of this community changed fundamentally at the beginning of the Iron Age, ca. 750 BC. It is in tombs dating back to the Early Iron Age that social differentiation of this population, and consequently differentiation in terms of wealth, manifests itself so clearly for the first time in the prehistory of Polish lands. The burials, especially the nearly 300 discovered chamber tombs (Fig. 2), had a complicated structure and were exceptionally richly equipped, in terms of quantity as well as quality, and are concentrated in one zone of the graveyard.

These graves from Domasław are particularly distinguished by their grave goods. They were equipped sometimes with a single urn, sometimes with few urns, plus 10 to over 50 additional vessels. Among them, pieces of luxury pottery are frequent, including numerous pieces of Silesian painted pottery. Among the painted pottery, a four-wheeled cart from grave no. 4270 (Fig. 2) is undoubtedly the most valuable artefact, being a sensational piece in Early Iron Age archeology on a Europe-wide scale (Fig. 3). The cultic symbolism connected with the solar cultus of the cart motif was widespread in the Bronze Age and Early Iron Age. The fact that the cart was placed in the grave of a person who belonged to the prominent social group means that it had acquired specific significance in funeral rites. In this case, it is most probably a trace of influences from the sphere of Mediterranean civilization,

Fig. 2. Domasław, Wrocław region, Early Iron Age cremation burial no. 4270 (A. Woźniak)

Fig. 3. Domasław, Wrocław region, four-wheeled cart from grave no. 4270 (I. Dolata-Daszkiewicz)

including ancient Greece, where a deceased chief-leader was most frequently conveyed to his last resting place on a cart (*ekphora*). A large number of metal objects, mainly bronze, have been found in the graves and iron artefacts were also very numerous. In three of the graves bronze vessels have been found, which, like a considerable share of the metal objects, were imports from the Alpine area of the Hallstatt culture and from Northern Italy. A large number of amber, bronze, and glass beads as well as golden items were also among the jewelry found in the rich graves. The graves contain many sorts of jewelry, such as fibulas, borsches, bracelets, necklaces, and pins. Six long swords and some other elements of weaponry are also worthy of note. All these items seem to indicate that this was a place of interment for an "elite" who maintained wide trade contacts with cultural centers of the time.

The above brief description of findings from new research at Lower Silesian sites presents significant features of a new picture of the model of culture in the Early Iron Age. In many respects, it resembles the picture formed in the Alpine area, of the circle of the Hallstatt culture. Silesia can thus be considered a province of this culture.

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Mikołajska. Teatr i PRL
[Mikołajska: Theatre and Communist Poland]

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Mikołajska: Theatre and Communist Poland by Joanna Krakowska is a biography of the prominent Polish actress and social activist Halina Mikołajska (1925-1989), presented in the broad historical context of the Polish postwar theatre and history of Communist Poland from its beginning to its very end. As it happened, Halina Mikołajska's professional activity comprised the period from 1946 to 1989, making her an iconic representative of the generation that consciously lived their lives in the People's Republic

of Poland. The whole history of postwar theatre, its mainstream and major achievements, are brought into focus in Mikołajska's stage performances. Theatre-external history is also significantly reflected in her own life, engagements, and choices she had to face. The theatre of her time constantly invoked the external reality in order to reflect and overcome its shortcomings and traumas, responding to the common consciousness of artists and spectators.

As a democratic opposition activist and a member of Workers' Defense Committee, Mikołajska bore witness to forbidden and censored truths, giving open testimony to facts that were hidden to the public opinion by the regime. Her personal connections placed her at the center of artistic and intellectual life in Poland. In the theatre she collaborated with the most outstanding directors of her time, she met with VIPs, celebrities, and people of influence and power, and her relationships in literary circles were deep and personal. Starting in the mid-1970s she was fully engaged in opposition activity, putting her own safety at risk, lending her famous name, and devoting her time and effort to a cause she believed in.

Joanna Krakowska's monograph therefore became not the personal story of an actress, but rather the story of a system and its disintegration, where Mikołajska plays the role of a perfect guide. In many reviews of the book, it was emphasized that *Mikołajska: Theatre and Communist Poland* is an argumentative and factual testimonial on politics, ethics, theatre, and public life. Critics and scholars have called it a perfect synthesis of artistic phenomena, cultural policy, social processes, attitudes of the people and their relations towards the regime. The book is characterized by outstanding knowledge of different historical sources and archives. It features deep methodological reflection on their nature as well as on the concepts of historical narration.

Halina Mikołajska in the melodrama "Letters of Mlle. De Lespinasse"

Mikołajska: Theatre and Communist Poland has gained wide recognition among theatre researchers, historians of contemporary history, and literary critics. It was nominated for several major awards, such as the Nike Literary Award, Gryfia Literary Award and Kazimierz Moczarski Historical Award.

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New discoveries – a new picture of the life and work of Marcin Mielczewski (d. 1651)

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During the seventeenth century, Marcin Mielczewski was the Polish composer most widely known in Europe. Extant copies of his works show that beyond the Polish-Lithuanian Commonwealth they were copied and performed in Moravia, Upper Hungary (present-day Slovakia), Silesia, Thuringia, Baden-Baden, Schleswig-Holstein, and Muscovy. As a result of research conducted over a period of

Cover of the sixth album in the Marcin Mielczewski CD series *Opera omnia* (PMC 026; Musicae Antiquae Collegium Varsoviense, dir. Lilianna Stawarz)

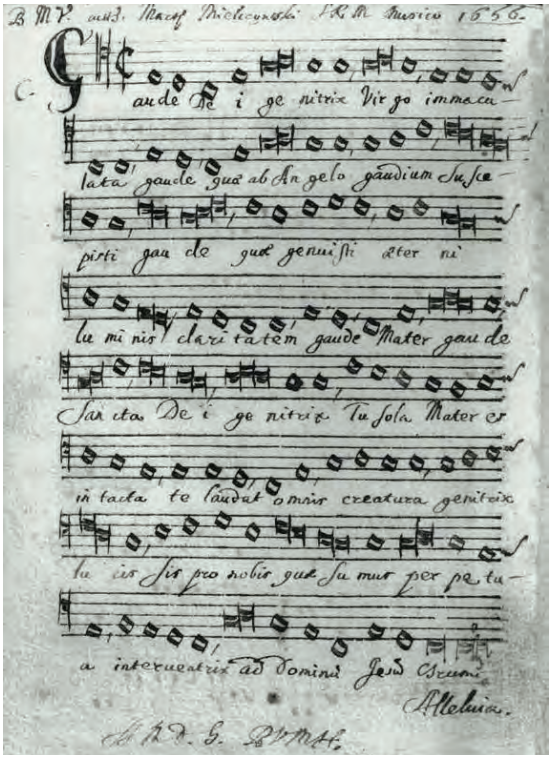
around one hundred years, beginning in the late nineteenth century, music historians succeeded in unearthing sources of almost thirty compositions by Mielczewski. Thanks to Barbara Przybyszewska-Jarmińska's discovery, in 1994, in the Staatsbibliothek in old East Berlin of almost forty works signed in period sources with just the monogram 'M. M.' and her attribution of those works, the list is now more than twice as long. The newly-discovered works have entered the repertoire of Polish and foreign early music ensembles and have been recorded for disc and radio in Poland, France, Germany and Italy.

Barbara Przybyszewska-Jarmińska's book *Muzyka pod patronatem polskich Wazów. Marcin Mielczewski* [Music under the patronage of the Polish Vasas: Marcin Mielczewski] (2011) is the first monograph on the life and work of Marcin Mielczewski. The author presents the composer's biography within the context of musical life at the courts of kings Sigismund III and Ladislaus IV, as well as that of Prince Charles Ferdinand Vasa, Bishop of Wrocław and Płock, and discusses Mielczewski's oeuvre against the background of the reconstructed repertoire of the Polish Vasas' chapels.

In preparing this work, the author drew on the very rich subject literature (dating from the 1890s onwards), significantly augmented in recent decades in connection with the growing interest in Mielczewski's music triggered by the discovery of the sources kept in Berlin, and on her own research. It opens with a discussion of the history of research into Marcin Mielczewski's life and work, which is followed by a section devoted to the composer's biography. Next, we have a study of his output, focussing – successively – on sources, genre, and style, and aspects of performance. The work is rounded off with a catalogue of Mielczewski's works, a list of the manuscript sources used, and an extensive bibliography.

In connection with the ascription to Marcin Mielczewski of works signed with only the monogram 'M. M.', and also due to the fact that the musician's creative output, besides two printed compositions, has been preserved in poorly researched manuscripts scattered around Europe, of varying provenance, date, form and conformity to original sources no longer known to us, proportionately the most space is taken up in this work by the documentation and evaluation of the sources of his works.

The chapters devoted to analyzing Mielczewski's compositions in various genres include a characterization of his compositional language, in which the author indicates techniques that should be deemed conventional for the epoch, constituting evidence of the reception of the output of particular musicians or of specific stylis-



Marcin Mielczewski's *Gaude Dei Genitrix*, Tenor II part of the manuscript copy I.16 of the Archives of the Kraków Cathedral Chapter

tic trends, as well as techniques that are specific to this composer.

The chapter devoted to issues relating to the performance of Marcin Mielczewski's works may be of practical value. Based on knowledge about the performance practice of the period in question, the author formulates concrete recommendations for musicians. In this chapter, the author also draws attention to the existence of Mielczewski compositions transmitted in sources of Silesian provenance that are currently known solely with texts of German-language *contrafacta*. She argues that musicians should incorporate these works into their repertoire as well, as testimony to the popularity of a Polish composer who wrote for the Roman Catholic Church in German-language Protestant environments.

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Zarys prawa prywatnego – Część ogólna
[Outline of Private Law – General Part]

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The *Outline of Private Law* is the first textbook highlighting issues included in the General Part of the Polish Civil Code against a broad background of European law. At the heart of the considerations contained in this publication lies the private individual right, as a universal legal structure that expresses and protects private interests, combining formal and material elements.

The manual is not limited to addressing the legal status of existing law, but also attempts to indicate the approximate direction of the transformation of national private law under the influence of European (EU) law, which combines the tradition of Anglo-Saxon (common) law with the continental law tradition of Roman roots (*ius civile*). The manual thus presents and supports, in the modern era, the process of developing a common European private law with a mixed character (mixed jurisdiction), as symbolized in common European principles (rules) expressing the axiology of law.

The transformation of national private law under the influence of European law has far-reaching implications for the re-evaluation of continental (positivist) legal thought and legal structures for the protection of individual interests. In this era of globalization taking place under the strong influence of Anglo-Saxon institutions, continental private law is witnessing the introduction of a certain necessary pragmatism, expressions of which are taking on the importance of a general rationale, as well as the economic analysis of law, stressing the economic effectiveness of regulation.

This book's presentation of national private law's evolution (from formalism towards pragmatism) is combined with consistent references to the achievements of doctrine and jurisprudence – because a full picture of modern private law, shaped not only by the legislator, cannot be obtained without such familiarity. Following the Anglo-Saxon tradition, judge-made-law (case law) is becoming increas-

ingly important in continental Europe, as a sign of prudent law-making, more sensitive to social values.

The considerations within the manual are consistently accompanied by the spirit of a meeting between expansive modernity and the European legal tradition. The structure of the manual, dictated by its main objective, consists of six parts: general characteristics of private law, private law bodies, legal interests as a matter of private rights of individuals, legal action as a continental structure to serve the implementation of autonomous will in the legal system, the passage of time as an event stabilizing juridical relations, and the basics of institutional protection scheme of private rights.

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The web of the senses – Online methods of presenting academic research results

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The PAS Institute of Literary Research has developed a multimedia website containing several hundred concise articles on the representations of the senses in Polish culture. This interdisciplinary project is the first of its size within the Polish humanities to employ online presentation of academic research results ("digital" humanities). It must be pointed out, however, that the method does not merely consist in *uploading* the text, but in *applying Internet logic* to the arrangement and organization of research data, which facilitates users' access to the desired content.

The website is the outcome of a research and developmental project entitled *Sensuality in Polish Culture: Representations of the Human Senses in Language, Literature, and Art from the Middle Ages to the Present* (NCBiR No. 17 0005 06/2009), conducted between 2010 and 2012 by the Department of Historical Poetics (PAS Institute of Literary Research). The team consists of Prof. Włodzimierz Bolecki (project manager), Dr. Tamara Brzostowska-Tereszkiewicz, Maciej Maryl, Dr. Magdalena Rembowska-Płuciennik, and Dr. Beata Śniecikowska.

Representations of the human senses (sight, hearing, taste, touch, smell, and physicality) underlie both the conceptualization of the human being as a sentient, cognitively oriented subject, and the description of social events, insofar as the human sensorium is always inscribed into all cultural production. The team's research has focused on the presence of historical forms of sensuality in Polish literature and art (from the Middle Ages to the present), language (in etymology, semantics, grammar; also in their historical forms), folk culture,

Sensuality in Polish culture

theater, the discourse of the humanities (literary theory, translation, art criticism) as well as the new media (radio and internet literature).

The project's fundamental goal has been to establish an innovative online digital platform, serving as a thematic, specialized, multimedia compendium, available only in the form of a website. Collaboration between humanities scholars and computer scientists has resulted in a non-standard research tool, applicable to the humanities and social sciences, enabling new ways of doing research and disseminating results. This tool allows authors to systematically update prior research results, broaden the spectrum of subjects as well as develop cooperation in Poland and beyond, relying on digital technology as a supranational medium of communication.

The publication of each article (entry) online enables them to be hyperlinked to other texts and multimedia material already available on the website, as well as to extraneous web resources directly or less directly related to the topic (e.g. in the field of history, politics, philosophy, or religious studies). Only such fluid and multidirectional navigation of multifariously presented entries addressing diverse subjects can aptly demonstrate that the history of sensuality encompasses all fields of a culture. Such presentation of research results heightens the activity of the recipients, who acquire knowledge through simultaneous access to freely selected websites, text directories, or files, containing graphics, music, or film.

The project has brought together 175 scholars from 30 universities and institutes of the Polish Academy of Sciences. Within 13 previously established thematic areas, 957 entries have been produced, half of which are already available on the website, whereas the remainder are in the process of being uploaded. Over 2,500 multimedia files have been collected, relating directly to the content of particular entries and to the project's overarching theme. The overall volume of the entries / articles, excluding the multimedia files, roughly equals 15 books of average length. The project's research potential has already inspired great interest among humanities scholars; consequently, the project is bound to be continued, i.e. supplemented, expanded as well as modernized in terms of digital structure.

The website is available at the following address: www.sensualnosc.ibl.waw.pl

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The Secrets of Ancient Egyptian Pottery

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Preliminary research suggests that the ancient Egyptians had discovered the secrets of luxury ware manufacture long before the Attic potters became famous for their still-admired high quality Black- and Red-figure vessels.

Pottery is the type of object archaeologists find in the largest numbers during most excavations, especially those taking place in Egypt. To make their vessels, the ancient Egyptian potters used two distinct kinds of clays: river mud (Nile silt), common throughout all of Egypt along the Nile banks, and marl clay, deposits of which were limited to just a few places, such as the area of Thebes, i.e. modern-day Luxor. The latter is also referred to as "Qena clay" in the specialists' jargon, after the town located in the vicinity of Thebes where this type of fabric is still in use. The author's project, *"Studies on production, distribution and chronology of the Upper Egyptian marl ceramics in the Middle Kingdom (2100 – 1800 BC),"* is devoted to Qena clay pottery. Its astounding technological quality (unusually high for the times) and rich plastic and incised decoration suggest the production was controlled by the state administration (Fig. 1).

This suggestion is further confirmed by the fact that Qena clay ceramics appeared in high numbers for the first time in Thebes – the first capital of the Middle Kingdom – and, moreover, quickly became exported from Egypt to foreign lands. They are present throughout the entire eastern stretch of the Mediterranean: in the present-day Syria, Palestine, Israel, and Nubia – Egypt's southern neighbor, located between the First and Fifth Cataract on the Nile. However, they are the most numerous in Upper Egypt. Unfortunately, Qena clay ceramics are not always recognized, even by specialists, primarily due to the absence of a monograph – a universal "key" of a sort, which would enable archaeologists to identify the pottery type from a small fragment. The current project, aimed at producing such a textbook, consists of several stages. Apart from creating a standard typology of the vessels and describing the function and date of the particular forms, the research also deals with the question of distribution of Qena clay ceramics in Egypt and neighboring lands. Importantly, the pottery of this group is a valuable source of information on domestic trade, on exports at the turn of the 3rd and 2nd millennia BC, as well as on food distribution. It offers insight both into the types and quantities of merchandise transported from the royal stores to the distribution centers for redistribution and the transformation of trade during the Middle Kingdom. It also should be noted that many of the vessels made from Qena clay bear small potter's marks applied either prior or post firing and acting as a sort of a label – the meaning of which has yet to be understood (Fig. 2). It is possible they provided information on the type of product, the quantity, and its destination.

One of the problems researched as a part of the project deals with the production of the vessels and aims to answer the following questions: what kind of procedures did the potters apply to create such high-quality product, and why do some of

Fig. 1. A medium-sized vessel made from Qena clay, found within the settlement on Elephantine (a Nilotic island in the present-day Aswan, Egypt). Its incised decorations were applied with fin bones from a Nile fish of *Synodontis* family. Courtesy of the German Archaeological Institute in Cairo. Photo, T. Rzeuska

Fig. 2. A potter's mark depicting a human figure, incised on a large vessel made from Qena clay and used for grain storage; found within the settlement on Elephantine (a Nilotic island in the present-day Aswan, Egypt). Courtesy of the German Archaeological Institute in Cairo (T. Rzeuska)

Fig. 3. A cosmetic vessel with a characteristically glittering surface; found at the necropolis in Edfu (Upper Egypt) by the joint Polish and French project. Courtesy of the National Museum in Warsaw, index no. MN140849

the forms (primarily small cosmetic containers for precious oils) have an unusual glittering surface (Fig. 3)? The preliminary analyses suggest that prior to firing, the potters coated the unfired vessels with

Fig. 4. Areas surrounding Elephantine, an island on the Nile situated in the vicinity of the First Cataract, where the majority of the analyzed material was found. View of the West Bank (T. Rzeuska)

a special, slip-like mixture, which formed the glittering layer when exposed to high temperature. It appears, against the general belief, that it had been the Egyptian craftsmen who invented this method, rather than the Attic potters who applied an identical technology a thousand and a half years later (Fig. 4).

The project is being carried out as a part of the Homing Plus Foundation program of the Foundation for Polish Science.

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Explaining the Computational Mind

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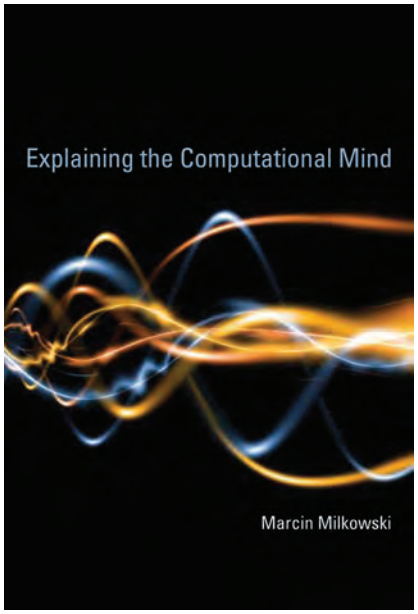
In this book, published by the most renowned publisher in the area of cognitive science, MIT Press (Cambridge, Mass., USA), Marcin Miłkowski argues that the mind can be explained computationally because it is itself computational – whether it is engaging in mental arithmetic, parsing natural language, or processing the auditory signals that allow us to experience music. All these capacities arise from complex information-processing operations of the mind. By analyzing the state of the art in cognitive science, Miłkowski develops an account of computational explanation used to explain the capacities in question.

Defending the computational explanation against objections to it – from John Searle and Hilary Putnam in particular – Miłkowski writes that computationalism is here to stay but is not what many have taken it to be. In particular, it does not rely on a Cartesian gulf between either software and hardware, or mind and brain. The computational method of describing the ways information is processed is usually abstract – but cognition is possible only when computation is realized physically, and the physical realization is not the same thing as its description. The mechanistic construal of computation allows the author to show that no *purely* computational explanation of a physical process will ever be complete. This is because we also need to account for how the computation is physically implemented, and in explaining this, we cannot simply appeal to computation itself. In addition, we need to know how the computational mechanism is embedded in the environment, which, again, is not a purely computational matter. For this reason, computationalism is plausible only if you also accept explanatory pluralism: the proposition that there are acceptable causal explanations that are not spelled out in terms of any computational idiom. This is perfectly in line with the mechanistic philosophy of science.



Miłkowski sketches a mechanistic theory of implementation of computation against a background of extant conceptions, describing four dissimilar computational models of cognition. The first model is Allen Newell and Herbert Simon's model of problem solving involved in so-called cryptarithmetics, which is a kind of mathematical puzzle. Then, a connectionist model of past tense acquisition of English verbs, developed by David Rumelhart and James McClelland in 1980s, is scrutinized, to be followed by a biologically plausible model of path integration in rats. The latter one was built in 2005

by John Conklin and Chris Eliasmith and is one of the cutting-edge developments in computational neuroscience. The last case study is a robotic model of phonotaxis in crickets, developed by Barbara Webb, which shows the application of robotic explanations in neuroethology.

The author reviews other philosophical accounts of implementation and computational explanation and defends a notion of representation that is compatible with his mechanistic account and adequate vis à vis the four models discussed earlier. Instead of arguing that there is no computation without representation, he inverts the slogan and shows that there is no representation without computation – but explains that representation goes beyond purely computational considerations. Miłkowski's arguments succeed in vindicating computational explanation in a novel way by relying on mechanistic theory of science and interventionist theory of causation. The overall ambition of the project is to furnish cognitive scientists with an up-to-date conceptual and methodological framework of computational explanation.

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Europa Zimnej Wojny
[Cold War Europe]

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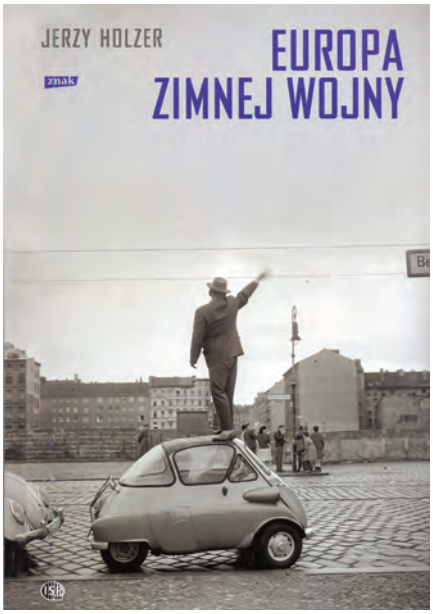
Cold War Europe is a recapitulation of an important stage of the author's individual research project which focuses on diverse aspects of Europe in the twentieth century. The book is a much-needed addition to the range of Jerzy Holzer's previous publications, which include Communism in Europe (published in 2000 and translated into German, Spanish, and Croatian), European Tragedy of the Twentieth Century: the Second World War (2005) and an essay entitled "Poland and Europe: In Poland – That is to Say, Nowhere" (published in Polish in 2008, subsequently translated into German). The findings of the author's current research project were first presented in Europe at War, 1914-1945 (2008), to which the current publication, Cold War Europe, is a follow-up.

Like Jerzy Holzer's earlier publications, Cold War Europe adheres to a number of methodological assumptions. Firstly, the author maintains emotional distance from the events described, even though they happened during his lifetime and influenced his biography – and also presumably those of his readers. Secondly, he devotes just as much space to the presentation of social, economic, and cultural phenomena as he does to that of political events.



Thirdly, the author strives to divide his attention equally between all regions of Europe. Thanks to this strategy, he provides more in-depth coverage of Central and Eastern, South-Eastern and Eastern Europe than is customary among Western European authors. All previous attempts at a synthetic presentation of European history in the twentieth century, which were made by Western European scholars, were inevitably based almost solely on bibliographical sources in English, French and German.

By contrast, Jerzy Holzer's extensive use of sources in Polish, Russian, and Czech makes it possible for him to compare the problems faced by West European democracies and regimes to those of East European Communist regimes in the given period. A vital part of the author's research was devoted to analyzing the transitions from dictatorship to democracy in the West, in Portugal, Spain and Greece and comparing these countries' "exit strategies" with the routes taken by ex-Communist countries of the Eastern Bloc, with special attention to the complex case of the former Yugoslavia.

In spite of significant differences in political and economic structure, there were also a range of similarities. On both sides, attempts were made at multi-state integration that would combine military, economic, and political spheres. In the West, these integration attempts were by nature democratic, whereas in the East, they involved subjection to the leading role of Moscow.

Another phenomenon that occurred in many Western European countries and in some countries in Eastern Europe was a measure of rebellion against the post-war reality. The conditions against which the protesters rebelled could not have been more different: capitalism in the West and Communism in the East. Predictably, therefore, the rebels' specific demands were very different: they were rooted in leftist ideology in the West and in democratic aspirations in the East. However, the composition of the rebelling groups was very similar: they consisted of university students in the West, Poland, and Yugoslavia, and of intellectuals in the aforementioned countries and Czechoslovakia.

In both the East and the West during the Cold War there occurred economic and social transformations, most importantly industrialization and urbanization, concomitant with the decrease of rural populations and dwindling importance of agriculture. These processes were, however, much more advanced in the West than in the East.

Likewise, on both sides the years of the Cold War were also a period of great educational impetus. On both sides, the focus on education led to the eradication (or virtual eradication) of illiteracy, lengthened mandatory school attendance, and the popularization of secondary education, vocational education, and (especially in the West) tertiary education.

Processes of secularization were also ubiquitous. In the West, the pace of secularization was slow at first and gained momentum gradually. In the East, secularization was imposed by the official propaganda and (in some countries at least) it was very successfully implemented. Interestingly, it can be pointed out that Catholicism proved much more resilient when compared to Protestantism or Russian Orthodoxy.

The Cold War ended with a routing of the Communist Bloc. The reasons behind the defeat were both ideological (the blatant discrepancy between ideology and the realities of the system's functioning) and economic. After the initial stage of disorderly though energetic growth, Communist systems proved unable to sustain modernization, and this failure resulted in economic stagnation, which was stupendous when compared to the pace of growth in the West.

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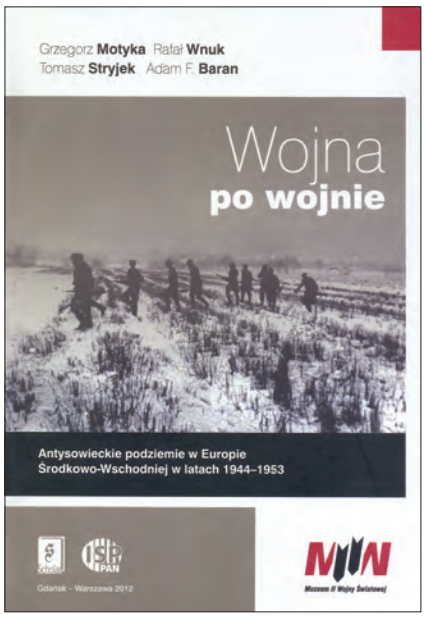
Wojna po wojnie. Antysowieckie podziemie w Europie Środkowo-Wschodniej w latach 1944-1953
[War after War – Anti-Soviet Underground in Central and Eastern Europe in 1944-1953]

G. Motyka | R. Wnuk | T. Stryjek | A.F. Baran | Institute of Political Studies | Polish Academy of Sciences

The end of World War II brought the communist experiment to the inhabitants of East-Central Europe, which meant brutal repressions and ideological coercion. Some took up arms to oppose it while hoping for the imminent outbreak of a third world war between the Western Allies and the Soviet Union. Dramatic partisan conflicts flared up in all territories that were incorporated into the USSR – from the Baltic Sea to the Carpathian Mountains. Military resistance had been suppressed by force, but some groups continued their struggles into the 1950s. In the Soviet Union, as well as in other "people's democracies," resistance against communism was presented in official propaganda as banditry, as a defense of unwarranted privileges, and often as an expression of fear of the "just" punishments meted out for collaborating with Nazi Germans. It was not until the fall of communism in 1989 that scholars began to study these "doomed soldiers." The renewed attention in the last twenty years has yielded a rich body of literature, consisting of hundreds of titles. What has been missing, however, is a comparative analysis of anti-communist underground movements across East-Central Europe. The present volume is intended as a first step in filling that gap. The comparative research covers the territories annexed by the Soviet Union (to a lesser extent, and only for the purposes of comparison, it also includes the territories of post-war Poland). Chronologically, it covers the years 1944-1953.



The volume consists of four extensive essays. The first of them examines the underground in Lithuania, Latvia, Estonia, and western Belarus. It also discusses the history of Polish partisans in the western territories of the Second Polish Republic. A common feature of all the anti-communist conspiracy groups was their peasant nature. Particular groups differed, however, in nearly every other aspect: in their genesis, ideological profile, ideas regarding the nature of the future socio-political order, internal organization, the level of centralization, and the radicalization of their actions.

Until mid-1944 most of the Polish conspirators' efforts focused on the struggle against Nazi occupation rather than against the Soviet one. Conversely, the Lithuanian Army of Freedom and the Highest Lithuanian Committee never actively opposed the Nazi aggressor. The situation in Estonia, Latvia, and western Belarus was slightly different – there the anti-Soviet underground was created with the support of the Abwehr. At the same time, until 1941, Ukrainian nationalists were oriented towards Germany.

The tactics used by the security forces were similar in all the republics because the process was carefully controlled by the headquarters in Moscow. This control was achieved through an impressive reporting system. The party leadership differed in their opinion of how many people the repressions should encompass. Some were persecuted even in absence of military resistance, e.g. local

elites. Moreover, the completion of collectivization made the peasantry doubt the sense of further armed resistance.

Another chapter discusses anti-Soviet youth conspiracy groups, comparing in particular the anti-communist underground organizations and youth groups in Poland and the USSR in 1944-1953. In the Baltic countries and in western Ukraine, youth and school conspiracy groups were not eradicated until the end of the 1950s. In Poland and in the Soviet Union, youth activism was concentrated in high schools in medium-sized and large cities.

The volume ends with a thorough examination of the role of the underground resistance in the memory of the region, in public debates, and in domestic and foreign policy. This part incorporates both research on the politics of memory and an analysis of "second-degree history." The section presents the different ways that the inhabitants of Central, Eastern, and Western Europe remember the 1930s and 1950s. It emphasizes the difficulties in maintaining a dialogue between the representatives of the heroic narratives of the eastern part of the continent and the representatives of the "post-national" narratives favored by the societies of the "old" Europe. Considerable space is devoted to contemporary estimations of Nazi and Soviet crimes – above all, the Holocaust; how the participants of public debates view their own respective nations, identify victims, and struggle with (or avoid) the identification of perpetrators.

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Process of domestication as a model of environmental effects on behavior and brains – Comparisons of wild and laboratory animals

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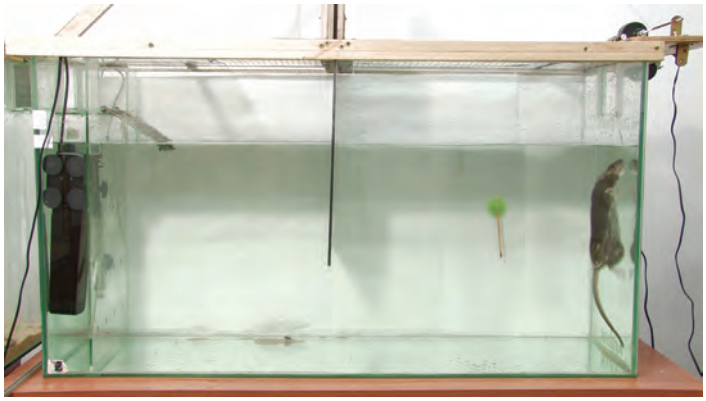
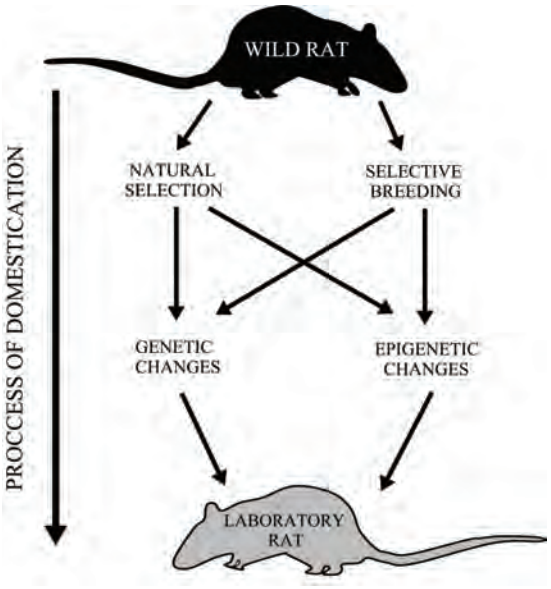
The domestication process seems to be a powerful factor shaping brains and behavior resulting in many significant differences between domesticated animals and their ancestral counterparts. However, little is known about the nature of that process, especially at its early stages. In a series of studies we present a promising animal model of the wild rat – Warsaw-Wild-Captive-Pisula-Stryjek (WWCPS) – to be used to investigate these issues, as well as initial research data.

In one of our first studies we analyzed species-specific forms of behavior (digging and swimming) and response to novelty (neophobia) in laboratory rats and their wild-type counterparts at a very early stage of laboratorization. Wild-type (WWCPS) and laboratory (Wistar, Sprague-Dawley, and Brown Norway) rats were compared in a spontaneous swimming test, while WWCPS and Wistar rats were studied in burrowing and neophobia experiments. Wild rats were found to be faster at building tunnels and to construct more complex burrow systems than Wistar rats. The experiment on response to novelty showed that Wistar rats exhibited a lower level of neophobia, while WWCPS rats showed highly neophobic behavior. The swimming experiment showed that wild rats performed more complex water tank related activity (swimming and exploring under the surface environment) than their labora-



A wild rat female swimming in a water tank



Factors determining the process of domestication and their means of transmission to subsequent generations

A rare sight – a female albino rat in a self-dug burrow

tory counterparts. The research showed profound behavioral differences in quasi-natural forms of behavior between wild-type rats and laboratory strains.

One of the main questions underlying our studies addresses the issue of the pace and the profoundness of the domestication process. To gain insight into this problem we conducted our next comparative study. The behavior of laboratory gray short-tailed opossums, WWCPS and laboratory rats (Wistar) has been registered in the period of familiarization with a new environment and consecutive confrontation with a novel, innocuous object placed in that familiarized environment. In the new environment the sequence of anxiety, investigation, and habituation was shortest in the opossum, longer in the laboratory rat and longest in the WWCPS rat. When placed in it, gray short-tailed opossums investigated the new environment with the shortest delay and most intensity. In reaction to novel objects, opossums and laboratory rats prolonged the time spent in the proximity of the new object, while the WWCPS rat did not show such a reaction. Both opossums and laboratory rats increased the number of contacts with the new object, whereas WWCPS rats reduced those contacts. Other analysis showed a higher level of anxiety in both lines of rats than in the opossum. Behavioral differences between species and lines of animals used in this study may be attributed to different ecological adaptations of rats and opossums and to the effect of domestication in the laboratory rats.

Since the hypothesis based on ecological factors involves such behavioral faculties as recognizing object properties and its spatial organization, we conducted another experiment to investigate the effects of domestication on exploratory behavior in rats. The comparison was made between wild WWCPS rats and Wistar laboratory rats. The study used a purpose-built maze divided into zones connected with a corridor. The location and shape of objects were subject to experimental manipulation. The study revealed that wild rats had much higher exploration latency than their laboratory counterparts. Wistar rats spent much more time

on object interaction in the experimental arena. In post-manipulation sessions, however, it was wild rats that explored object zones relatively longer than laboratory rats. Results suggest that wild rats tend to explore much more cautiously than laboratory rats and are more sensitive to changes in their environment. The underlying cause of these differences is likely to be the higher level of stress in wild rats, resulting from adaptation to threats in their natural habitat.

Further studies will investigate the brain mechanisms underlying the behavioral changes observed in the animals undergoing initial stages of domestication.

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Kołchoźnicy. Antropologiczne studium tożsamości wsi białoruskiej przełomu XX i XXI wieku
[Kolkhozniks – An Anthropological Study of the Identity of Belarusian Villagers at the Turn of the 21st Century]

A. Engelking | Institute of Slavic Studies | Polish Academy of Sciences

Anna Engelking's monograph does not describe the Belarusian village from a purely academic perspective. It is the outcome of almost 20 years of intense qualitative field research conducted in kolkhozes of western and eastern Belarus. The result is a complex and varied group self-portrait of their inhabitants, reconstructed by the author from inside the researched culture. In dialogue with the interviewees she tries to draw upon their own conceptual categories ("emic") and the vision of the world constructed by those categories, in order to then analyze and interpret them in the researcher's language categories ("etic"). The aim of the author's anthropological inquiry is to understand who Belarusian kolkhozniks are in their own eyes.

The subject of the book is neither the Sovietization of the Belarusian village, nor the specificity of the post-communist mentality, though it can also be considered a Sovietological work. *Kolkhozniks* is an anthropological analysis that deconstructs the commonly held stereotype of the kolkhoz as an institution inseparable from the phenomenon of *Homo Sovieticus*. It is focused on questions about the longevity, or *longue durée,* of the traditional cognitive and axiological categories constitutive for the identity of contemporary kolkhozniks, which have survived the 21st century paroxysms of destruction that have been a mortal threat to the traditional peasant world: collectivization, expulsion of the lords, en-

A roadsign to the "Zavety Ilicha" ["Ilyich's Teachings"] sovkhoz in Petrikov district in eastern Polesie, 2011 (A. Engelking)

forced atheism, village pacification by the Nazis, and the Shoah.

The book discusses the *longue durée* of cognitive structures which categorize the content of social reality at the beginning of the 21st century according to pre-modern, often deeply archaic patterns that hark back to feudalism. This taxonomical order, thanks to which the contemporary Belarusian kolkhozniks classify and name their social universe according to the rules followed by generations of their ancestors, is intertwined with a mythical order, which gives it an axiological dimension and provides tools for a meaningful interpretation of the world. In the post-Soviet reality of contemporary Belarus it is not only the peasant values that live on, but also oppositional cognitive categories grounded in myth, such as peasant – lord, peasant – Jew, Christian – Jew. They structure perception of the changing social world, enabling the construction of a long-lasting image and ethos of the group. The contemporary kolkhoznik continues the identity model of his or her ancestors, which is a resultant of stereotypes of "the lord" and "the Jew" functioning in collective memory: two historical and symbolic social partners of the traditional peasant.

The core of kolkhozniks' self-image is the sacral model of the good *haspadar*. This old ideal of a hard-working pious man was embodied in the collectivized country by the main ideological enemy of the Soviet kolkhoz system: the *kulak*. Today we can observe the continuation of this model in the hundreds of thousands of country dwellers who work on mini-plots adjacent to their cabins – the scraps of their old farms – and thus implement the fundamental values of the peasant community, namely land cultivation and belief in God.

The collective identity of the Belarusian village in its contemporary kolkhoz version turns out to be a peasant post-serfdom identity, carrying evident traces of the old class system. It remains indifferent to the modern ideological and political projects and at the same time draws strength from the archaic mythical worldview. As a result, it retains the universalistic dimension, concentrated

The author and an inhabitant of Olmany village in western Polesie during an interview, 2011 (A. Smalanchuk)

The May Mass at the cross in Papyernya village in the Grodno region, 2010 (A. Engelking)

around the relations between the human-being and the sacrum.

Kolkhozniks shows the ways in which the heritage of peasant culture shapes the mentality of contemporary societies of post-Soviet Europe. It is an innovative work with significant influences on anthropology, sociology, political science, and post-communist studies, important for the understanding of social and political processes taking place now, not only in Belarus. Its value was recognized when it won the "Przegląd Wschodni" Award 2012 in the "Domestic Polish Work" category.

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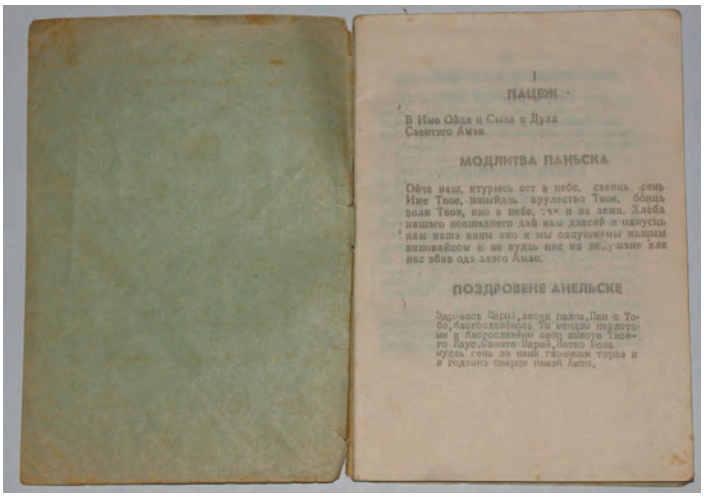
Jak mówić do Pana Boga? Wielojęzyczność katolików na Białorusi na przełomie XX i XXI wieku

[How to Speak to the Lord? The Multilinguality of Catholics in Belarus at the Turn of the 21st Century]

E. Golachowska | Institute of Slavic Studies | Polish Academy of Sciences

The book *How to Speak to the Lord? The Multilinguality of Catholics in Belarus at the Turn of the 21st Century* came into being as a result of fieldwork conducted in western and eastern Belarus between 2009 and 2012. The main aim of the research was to answer the question of whether the increasingly widespread use of the Belarusian language in the liturgies of the Catholic Church has changed the status and the range of functioning of the Polish language within Catholic communities in Belarus, and if so, how such a situation influences the national identity of Catholics living in the country.

Recorded interviews conducted as part of the research have proven the legitimacy of the subject matter as formulated above, as they show that the national identification of Catholics in Belarus, even alongside the western borders, has undergone changes, with only the eldest generation of Catholics still having a Polish self-identification. For the young and middle-aged generations, meanwhile, the connection between nationality and faith is no longer as obvious, since being a Catholic does not exclude possessing a Belarusian national identity. Ecclesiastical affiliation to the Catholic Church is determined by baptism in accordance with Catholic ritual, whereas national identification can be defined in many ways and be redefined as a result of varying life experiences. Catholicism evinces itself as a less questionable and more lasting category than any given nationality. This publication uses the term 'Catholics' instead of 'Poles,' as it is much more inclusive and encompasses Catholics with a Polish national identity, as well as those inclined only to speak of their Polish roots, those with a dual Polish and Belarusian identity.



Polish prayers written in Cyrillic

Monument to Polish soldiers who perished in the Polish-Soviet war, in Radashkovichy (Minsk region)

Observations made during the research corroborate other researchers' descriptions of the so-called 'depolonization' process of the Catholic Church in Belarus. However, it seems that this process is much more complex than has been suggested in many papers focusing on these issues, and that it cannot be solely analyzed through such categories as 'the loss of Polishness' by Catholics. Rather, it is connected to changes in the religious model, as well as in the understanding (and self-designation) of one's own religious and national identity by members of the younger generation. Religion has become a conscious choice and not the consequence of being born into a Catholic family. This holds true not only in regards to members of the Catholic community, but also for mixed families or those that are religiously nondescript.

Walled-off entranceway to the (active) Neogothic church in Babruisk

Linguistic issues, which enhance or impede changes in the national identification of Catholics in Belarus, do not seem to be of as much importance as might have been expected. Firstly, it is possible for the sphere of the *sacrum* to utilize the Belarusian language, whilst the Polish identification and the national identity of individuals are simultaneously maintained. Secondly, the fact that the Belarusian language has become part of the Catholic Church is not an isolated incident but a part of transformations initiated in the 1990s. Following three years of intense research, certain reservations remain regarding the notion that the introduction of the Belarusian language into the liturgy has increased the prestige of the language. It is equally justified to state that Belarusian has entered the church because the resurgence of the language during the 1990s has given it such prestige that it became possible to abolish the preconception of it being a 'lesser language'.

The book *How to Speak to the Lord? The Multilinguality of Catholics in Belarus at the Turn of the 21st Century* consists of two parts. The first is entitled "The multilinguality of Catholics in Belarus at the turn of the 21st century: 2009-2012 fieldwork research report." It consists of descriptions and in-

terpretations of observations made during the research work. The second part of the publication, "The multilinguality of Catholics in Belarus at the turn of the 21st century: Accounts of witnesses of history," contains extensive excerpts of the most interesting interviews recorded during research.

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Słownik polszczyzny Jana Kochanowskiego
[Dictionary of Jan Kochanowski's Polish]

B. Sieradzka-Baziur | Institute of the Polish Language | Polish Academy of Sciences

Słownik polszczyzny Jana Kochanowskiego [Dictionary of Jan Kochanowski's Polish], following *Słownik języka Adama Mickiewicza* [Dictionary of Adam Mickiewicz's Language] and *Słownik języka Jana Chryzostoma Paska* [Dictionary of Jan Chryzostom Pasek's Language] is the third dictionary to be completed, reflecting the Polish language as used by a major historical author. This dictionary presents the vocabulary of Jan Kochanowski, one of the greatest writers of Polish literature, whose works demonstrate the richness of 16th-century Polish. It contains 8,807 entries organized by content and by alphabetic order, and encompasses the vocabulary applied by Kochanowski within all of his works in Polish (appellative vocabulary as well as proper names). Each entry has a structure consisting of headword, type of expression, description, and text documentation. The volume of descriptions varies greatly from headword to headword (from a single line to a few pages), depending on a given headword's particular characteristics and its number of confirmations in the poet's texts. Each headword expression is followed by the meanings of this phrase or its function, followed by numbers which refer the user to source documentation. The remainder of the description lists word combinations, contextual meanings, proverbs, phrases, rare flexion forms,

etc. All citations provided within the example section are listed in fixed order of sources and are moreover numbered, thus the number of the last citation simultaneously reflects the overall number of times the given phrase or expression appears within Kochanowski's works. The main advantage of the dictionary lies in the fact that it shows what type of vocabulary was used by the first great Polish poet, and what ways. The collection of such data may be broadly applied by researchers interested in the history of the Polish poetic language.

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Galicja na józefińskiej mapie topograficznej 1779-1783. Tom 1-15
Die Josephinische Landesaufnahme von Galizien 1779-1783. Band 1-15
[Galicia on the Josephine Topographic Map 1779-1783, vol. 1-15]
Edited by Zdzisław Budzyński, Waldemar Bukowski, Bogusław Dybaś, Andrzej Janeczek, Zdzisław Noga

W. Bukowski | Tadeusz Manteuffel Institute of History | Polish Academy of Sciences

The topographic maps of the multinational Habsburg monarchy and other countries ruled by this dynasty, made between 1763 and 1787 as part of the so-called Josephine land survey and topographic mapping exercise (*Josephinische Landesaufnahme*), enjoy interest in today's literature and are highly esteemed as a pioneering endeavor and cartographic milestone prior to 1918. Comparisons are made between the series of Josephine maps and the map of France by César-François Cassini de Thury, which marked a breakthrough in the development of cartography. The Josephine project outpaced the latter map with a threefold larger mapping scale and more extensive area, spanning over all of Central Europe plus remarkable expanses of the east, south, and west of Europe, with the area covered totaling 570,000 sq. km. The scale applied is 1:28,800, with a total of 3,500 sheets produced.

Given Austria's occupation of southern lands of the Polish-Lithuanian Commonwealth in the First Partition in 1772, part of the Josephine survey is a map of the Kingdom of Galicia and Lodomeria, compiled in 1779-83, known in the Polish reference literature as 'the Mieg map,' after Lt. Col. Friedrich von Mieg, a General Staff officer who took charge of the management of most of the exercise. Kept at the Vienna Kriegsarchiv, the map is composed of 413 sheets, whose aggregated area is approx. 115 sq. m. The map itself is accompanied with six large folio volumes, comprising detailed descriptions of the mapped area.

The general high appraisal of the quality of the Josephine work certainly applies to its Galician section. The cartographic and descriptive material is impressive in the abundance of detail displayed. It came as an unmatched achievement, against the

background of its contemporary cartographical depictions of the Commonwealth lands – in terms of the initial triangulation and field survey methods applied and in terms of the enormous resource of content provided, plus the high precision. The map records the state of those lands at the advent of the Partition period, still before the deep economic and social transformations that altered the early Polish landscape and blurred its original characteristics for good. No comparable maps have been inherited from the Old-Polish period. For these reasons, the map of Galicia is particularly useful in historical research and other types of studies, e.g. research on transformations of the early natural landscape.

The Josephine map of Galicia long remained secret, known only to a narrow circle of individuals authorized by the Emperor. The very existence of the descriptions was only revealed in 1864; the work was first presented in public in 1873, at the World Exhibition in Vienna. Between the two World Wars, the National Library of Warsaw imported reproductions of the map, made on glass negative plates, using which black-and-white photographs were subsequently made, and used by Polish scholars for long years. However, the quality of those photos and microfilms, verging on illegibility, prevented the users from exploring a number of informative qualities of the map. What was known to them was as if a faint shadow of the original, while the descriptions remained completely outside of scholarly circulation. The historical community became increasingly aware of the need to have the complete work published.

Finally, 230 years after this cartographic snapshot was taken, the map is being prepared for print as a joint effort of historians from the PAS Institute of History, the PAS Institute of Archaeology and Ethnology, the PAS Scientific Centre in Vienna, the Pedagogical University of Kraków, and the University of Rzeszów. Funding has been provided by the Polish Ministry of Science and Higher Education, in a series of research grants; the printing of Volumes 1–7 has been enabled by the National Program for the Development of the Humanities. The digitalization effort has party been carried out using grant funding from the Foundation for Polish Science.

The descriptive material and the facsimiles of the maps will be contained in a total of fifteen volumes, each consisting of two parts (sub-volumes), the first comprising the descriptive section and the critical apparatus, the second the maps. The project in its entirety is expected to be running for fourteen years. Volumes 1 and 4, edited by W. Bukowski, B. Dybaś and Z. Noga, were issued in Krakow in 2012.

The vicinity of Halicz on the Josephine map of Galicia, 1779-1783, scale 1:28 800, fragment of sheet 300, original

The vicinity of Halicz on the Josephine map of Galicia, 1779-1783, scale 1:28 800, fragment of sheet 300, copy

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Biological and Agricultural Sciences

In 2012, PAS Division II: Biological and Agricultural Sciences had 72 national members (37 full and 35 corresponding) and 46 foreign members. In the past year the Division bid a final farewell to three of its deceased foreign members: Prof. János Holló, Prof. Marcel de Boodt, and Prof. Jan Bureš. Due to Prof. Ryszard J. Górecki taking over as the new Rector of the University of Warmia and Mazury in Olszytyn, Prof. Adam J. Zięcik became a new vice president overseeing the work of the Division.

The Division held three plenary sessions in 2012: a spring session on 18 May and two autumn sessions, on 25 September and 21 November.

At the spring plenary session the members discussed key issues concerning the mission and strategic goals of the Division and the Academy as a whole. Also discussed was a proposal for the establishment of sections of the Division. The session favorably reviewed a document on "The operation and development of the Polish Academy of Sciences," presented by Prof. Górecki. The discussion also concerned the initiative of creating a National Museum of Natural History. The participants of the meeting supported the initiative, but felt that the concept needed to be worked out in greater depth and talks should be held mainly with representatives of the Kraków science museum community. Such a meeting was held in Krakow on 26 September 2012 at the headquarters of the Natural History Museum of the PAS Institute of Systematics and Evolution of Animals.

The 25 September session was devoted to the transformation of the Center for Ecological Research. Based on the position taken by the Division's Council of Provosts, the Division approved the final report of the commission for partitioning the entity operating under the name of the PAS Centre for Ecological Research in Dziekanów Leśny.

The 21 November session was held in two parts. The first concerned the rules for electing national and foreign members of the Division in 2013. The second part concerned the periodic evaluation of research units in 2012 and the evaluation of the scientific committees. The Division approved the positive conclusions of the Council of Provosts concerning the periodic evaluation of the Institute of Plant Physiology, Institute of Systematics and Evolution of Animals, Museum and Institute of Zoology, Institute of Animal Reproduction and Food Research, Institute of Plant Genetics, Institute of Dendrology, and Institute of Parasitology.

As is traditional, the Division granted its own awards, medals, and distinctions in 2012. The Michał Oczapowski Medal was awarded to Professors Andrzej Anioł, Zdzisław Wójcicki, and Adam J. Zięcik. The Division Two Awards were conveyed as follows: to the team of Prof. Tomasz S. Osiejuk, Dr. Paweł Ręk, and Michał Budka, at the recommendation of the Department of Biology, Adam

Spring session in Wierzba on 18 May 2012

The Michał Oczapowski Medal being awarded to Prof. Adam J. Zięcik

Prof. Jan Sadowski's award-winning team

Mickiewicz University in Poznań, for a series of research publications on "Experimental explanation of the mechanisms ensuring credibility of aggressive sound signals in the intra-sexual selection of the corncrake (*Crex crex*)"; to the team of Prof. Magdalena Rakowska-Boguta, at the recommendation of the Scientific Council of the PAS Institute of Biochemistry and Biophysics, for a series of research publications on "Molecular mechanisms regulating the activity of RNA polymerase III by Maf1 protein"; and to Dr. Igor Jerzy Chybicki and Prof. Jarosław Burczyk, at the recommendation of the Scientific Council of the Institute of Dendrology in Kórnik, for a series of research publications on "The course of genetic processes in populations of forest trees." Distinctions were awarded to the following individuals: to Prof. Alexander G. Radchenko, at the recommendation of the Scientific Council of the PAS Museum and Institute of Zoology, for his monograph on *Myrmica ants (Hymenoptera, Formicidae) of the Old World*, and to the team of Prof. Jan Sadowski, Dr. Agnieszka Ludwików, Dr. Lucyna Misztal, Dr. Piotr Ziółkowski, Dr. Danuta Babula and Dr. Małgorzata Kaczmarek, at the recommendation of the Department of Biology, Adam Mickiewicz University in Poznań, for the monograph *Genetics, Genomics and Breeding of Vegetable Brassicas*. Moreover, several members of the Division were honored with prestigious state orders and scientific medals and awards in 2012.

PAS Division II ceased publishing its two journals in 2012: *Postępy Nauk Rolniczych* [Advances in Agricultural Sciences] and *Zeszyty Problemowe Postępów Nauk Rolniczych* [Advances in Agricultural Sciences – Problem Issues]. The latter publication was transferred from the Polish Academy of Sciences to the Warsaw University of Life Sciences, on the basis of a donation contract.

In 2012, the Division oversaw 26 scientific committees. They held their first plenary meetings for the term 2011-2014, at which the committees convened and elected chairmen for the new term. All the committees worked out their rules of operation for the term 2011-2014, which were approved by the Vice President of the Academy. Via the "DUN" fund for popular-science activity, the Academy supported the committees in organizing or co-organizing 20 conferences, three scientific workshops, and one exhibition and in publishing five periodicals and one book.

The Division's Council of Provosts focused in 2012 on assessing the activity of selected research institutions, restructuring the auxiliary units and the real-estate properties administered by some of them, conducting competitions to select new directors for the institutes, issuing opinions on various proposed legal regulations, on current issues of particular import, on applications for statutory funding and research grants, etc. The Council of Provosts held three plenary session in 2012, concomitant with Divisions meetings, on 18 May, 25 September, and 21 November. During the year 2012 the Division II Council of Provosts helped oversee five auxiliary units of the Division, three of which are in an advanced stage of restructuring (Anthropology Unit, Center for Ecological Research, and Ichthyobiology and Aquaculture Unit).

Comparative proteomic analysis of acute myeloid leukemia

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Acute myeloid leukemia (AML) is a malignant disease of blood-forming tissue characterized by the rapid growth of abnormal cells that accumulate in the bone marrow and interfere with the production of normal blood cells. AML is the most common leukemia that affects adults, and its incidence increases with age. For many years, AML diagnostics was based on classic laboratory blood tests. On this basis, the French-American-British AML classification was created, which makes it possible to distinguish eight subtypes of the disease (AML M0-M7). The newer, World Health Organization (WHO) system, proposed in 2008, groups AML into 5 subtypes, taking into account cell morphology and immunophenotype as well as the results of cytogenetic and genetic analyses. The new AML classification is of significant prognostic importance; however, it practically does not affect the therapeutic patterns. Uniform treatment is recommended in the majority of cases of AML subtypes. In addition, the clinical and laboratory test-based AML prognostic models are characterized by a low predictive value. Thus, there is an immense need for new biomarkers to enable better AML diagnostics, classification, and treatment. To this end, we performed a comparative proteomic analysis of two FAB AML subtypes: M1 and M2, which differ in the degree of maturity of the abnormal cells and prognosis, but are identical in terms of treatment. The protein profiles of blood and bone marrow samples collected from AML-M1/M2 patients were analyzed in order to find proteins characteristic for different subtype of AML and proteins related with response to treatment.

We attempted to determine whether there were any differences between the proteomes of patients who responded to treatment and achieved remission and the proteomes of patients who proved resistant to therapy. We found that these two groups of patients considerably differed in accumulation of three proteins: annexin I and two proteins related with glutathione metabolism, namely, glutathione transferase omega and formylglutathione hydrolase (Fig. 1).

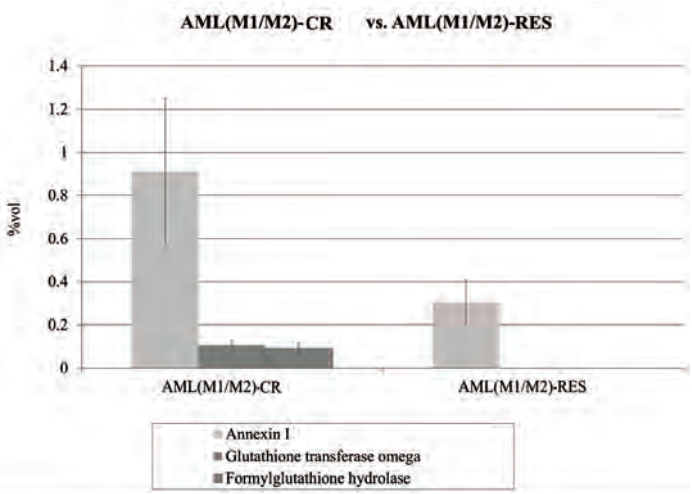

Fig. 1. Histogram of proteins that differentially accumulated in AML patients who responded to treatment and achieved remission (CR) and AML patients who were resistant to therapy (RES)

Additionally, we sought to determine any early protein markers characteristic for patients exhibiting a longer or shorter remission period. We have demonstrated that patients showing less than one year remission had a significantly higher level of gamma 1 actin in comparison to patients with longer than one year remission (Fig. 2).

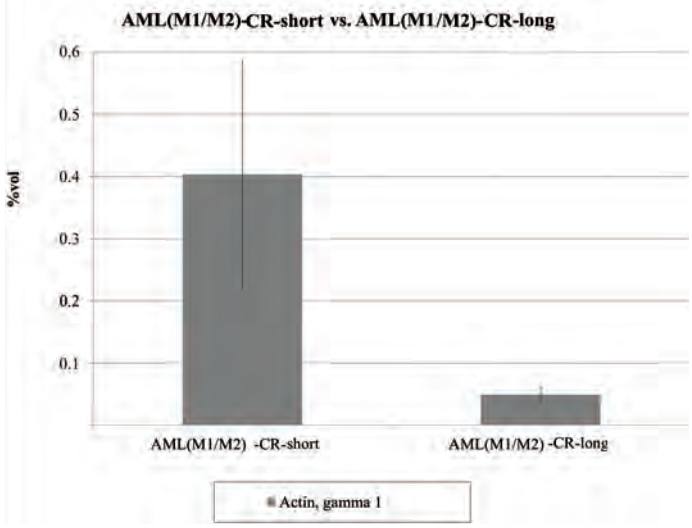

Fig. 2. Histogram of protein that differentially accumulated in AML patients who exhibited short-term remission (CR-short) and long-term remission (CR-long)

Interestingly, this protein showed similarly high accumulation in the group of patients resistant to therapy. Therefore, it appears that all four identified proteins can be used as markers to differentiate patients who are responding to treatment from those showing a short-term response or resistance to the medication used. Deregulation of annexin gene expression has been observed in a large number of cancers. However, the role of annexin 1 in carcinogenesis remains unclear. There are several lines of evidence that this protein is involved in cellular signaling during proliferation and apoptosis. Actin gamma 1, a structural protein, seems to play a significant role in cancer cell motility and in the migration of endothelial cells, which leads to the development of tumor vascularization.

As we have already mentioned, the available diagnostic methods do not permit unequivocal differentiation between AML-M1 and M2. Therefore, in the subsequent stage of our research, we attempted to determine whether AML-M1 and M2 significantly differ at the proteome level. As a result, we identified five proteins that accumulated differently in the AML-M1 and AML-M2 subgroups (Fig. 3).

The higher level of accumulation of catalase and peroxiredoxin6 (PRDX6) in the M2 compared to the M1 subtype may indicate better adaptation of M2 cells to reactive oxygen species (ROS) which are considered as dangerous mutagenic and carcinogenic factors. Interestingly, 6-phosphogluconate dehydrogenase (6PGD) is also increased in M2 subtype. This protein catalyzes the reaction that is the main source of NADPH in the cell and, consequently, increases the synthesis of ROS, which as a result, should lead to increased production of antioxidant enzymes, including catalase and PRDX6. It is also worth mentioning that the activity of cytotoxic drugs used in chemotherapy generates high ROS concentrations, thus the increased levels of catalase, PRDX6, and 6PGD may be associated with a certain resistance to these drugs. Higher accumulation of these proteins was observed in AML M2 patients who were resistant to treatment compared to those with complete remission. This implies that the effectiveness of the chemotherapy may depend closely on the redox conditions inside the cell and the concentration of antioxidant enzymes.

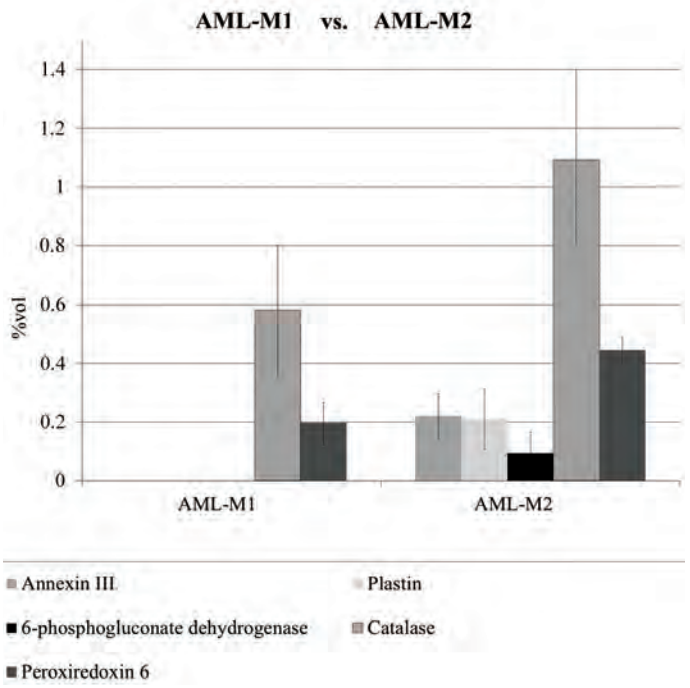

Fig. 3. Histogram of proteins that differentially accumulated in M1 and M2 AML patients

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Gene-rich regions in narrow leafed lupin (*Lupinus angustifolius* L.)

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Genome sequencing of model plant species and of some crops has intensified research in the field of plant genomics. When a complete sequence of a crop genome is not available, data on the DNA sequence of related species are exploited. This is the case for lupins (*Lupinus* sp.). *Lupinus* is a relatively large genus, one of the most geographically widespread, with a great diversity of species, including several crops with long domestication history. Narrow-leafed lupin (*L. angustifolius*), the most economically valuable lupin crop, is considered as a model plant for genomic studies of the whole genus. Scientific attention has focused on this species because of its relatively compact genome size, facilitating molecular research, and due to its basal position in the Papilionoid clade of legumes, promoting comparative mapping and evolutionary analyses. Crucial progress has recently been achieved in *L. angustifolius* genomic studies, expressed by the development of genetic maps (showing relationships between groups of genes encoding expression of agricultural traits), bacterial artificial chromosome (BAC) libraries, and specific cytogenetic landmarks (Naganowska et al. 2011). Our team utilized these resources jointly to identify and sequence several genome regions, including genes conferring important processes and traits (symbiotic nitrogen fixation, flowering time, disease resistance).

The bacterial artificial chromosome (BAC) library of the *L. angustifolius* nuclear genome has been the basic tool in our research. Such a library is a set of DNA fragments cloned in specific vectors, known as bacterial artificial chromosomes (BACs). The library was screened with DNA probes (gene or marker fragments) to select BAC clones carrying probe sequences. BAC clones selected by hybridization were subjected to restriction fingerprinting, i.e. cut with restriction enzymes followed by separation of products in the agarose gel to produce specific band patterns. This made possible the assembly of contigs, or larger virtual genome fragments reconstructed by joining several BAC clones possessing partially overlapping sequences.

BAC clones selected from the library were also used as probes for FISH (fluorescence *in situ* hybridization), a procedure used in molecular cytogenetics to localize DNA fragments in chromosomes and to visualize their signals under a fluorescence microscope. Our study based on preparations of chromosomes in metaphase, when they are the most condensed and well visible, has enabled the identification of BACs positions with reference to individual chromosomes. BACs showing single signals constituted cytogenetic chromosome markers. The ends of such clones were sequenced; molecular markers anchored in these sequences were developed and introduced into linkage groups of the genetic map. Integrating these approaches made it possible to assign the first linkage groups to particular chromosomes (Leśniewska et al. 2011). Most of linkage groups are already assigned (Fig. 1) and our research

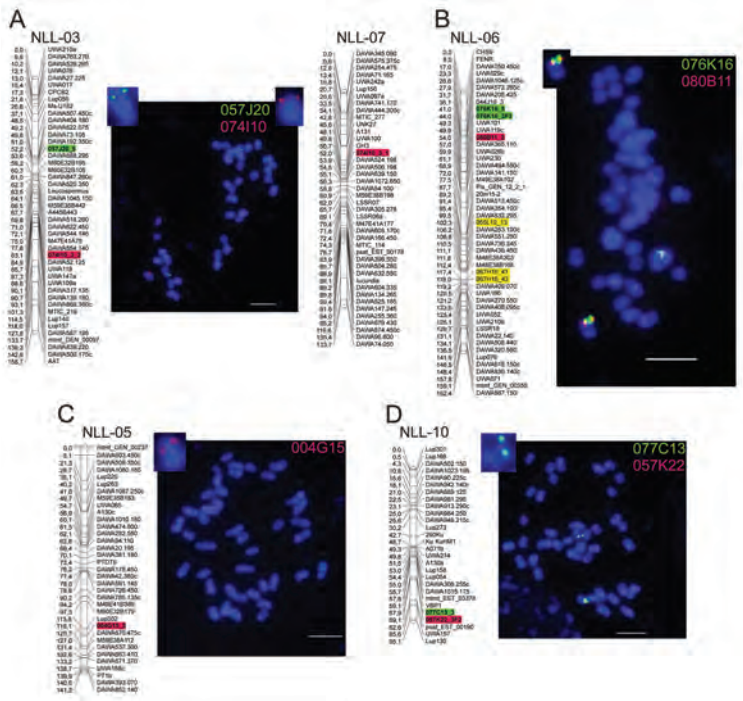

Fig. 1. Integration of *L. angustifolius* genetic and cytogenetic maps: examples of assignment of linkage groups (NLLs) to corresponding chromosomes by BAC-FISH. A: NLL-03 and NLL-07. B: NLL-06. C: NLL-05 D: NLL-10 (published in Książkiewicz et al. 2013)

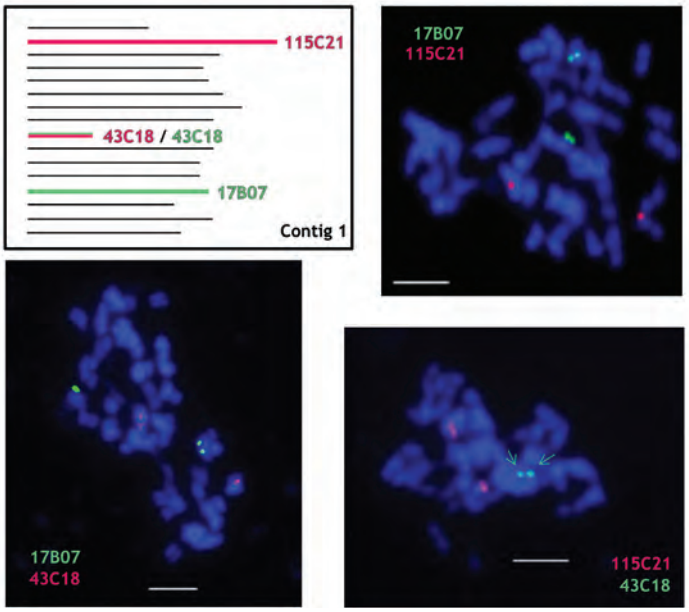

Fig. 2. BAC-FISH signals of clones from one contig in three chromosomes showing the false-positive overlapping of BACs in this contig. Scale bar: 5 µm. (published in Naganowska et al. 2011)

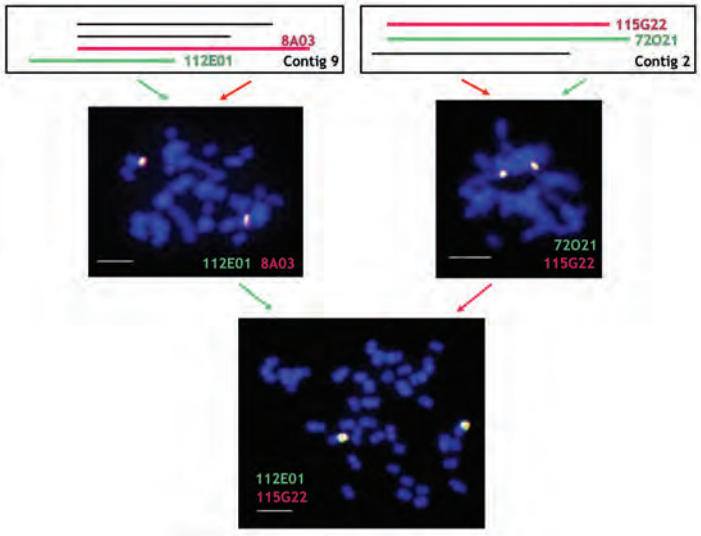

Fig. 3. BAC-FISH location of four BACs from two contigs in the same chromosome site, indicating the physical proximity of clones analyzed. Scale bar: 5 µm. (published in Naganowska et al. 2011)

work aiming to construct an integrated genome map for narrow-leafed lupin is nearing completion.

The exploitation of BAC-FISH was extended to validate the structure of contigs and their location in linkage groups. Cytogenetics enabled us to verify contig composition directly, by physical localization of BACs in individual chromosomes. Firstly, BAC-FISH was used for the internal contig control: FISH signals of several clones from the same contig, localized in one physical site or in different sites, confirmed or negated the contig integrity (Fig. 2). Then, one common FISH signal observed for clones coming from separate contigs indicated the physical proximity of such contigs in a chromosome, at a distance smaller than the resolution of the method (Fig. 3).

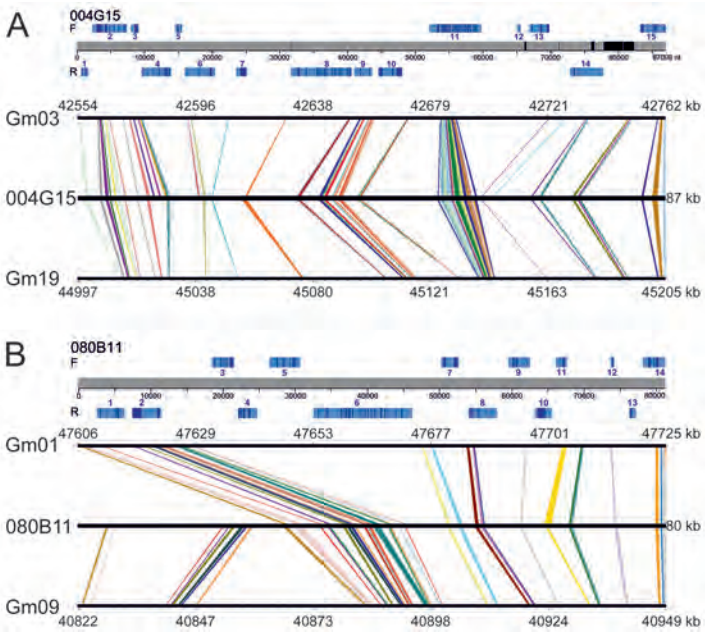

Fig. 4. Synteny between gene-rich regions of *L. angustifolius* (narrow-leafed lupin) and *Glycine max* (soybean). (A) and (B): visualization of narrow-leafed lupin BAC clones; 004G15 and 080B11: lupin sequences; Gm01, Gm03, Gm09, Gm19: soybean sequences. The order and orientation of syntenic blocks is illustrated by colored homology links (published in Książkiewicz et al. 2013)

Based on physical and genetic mapping results, cytogenetic localization and BAC-end sequencing, a set of BACs was selected for whole clone sequencing. Within the sequences of clones that hybridized in FISH to single sites, large gene-rich regions (GRRs) were identified (Książkiewicz et al. 2013). Functional annotation of these sequences was performed, which means that the hypothetical function of encoded genes in narrow-leafed lupin was deduced, based on information on other plant species in databases. Comparative analysis of lupin GRRs with other legumes showed conserved synteny to soybean (*Glycine max*) duplicated genome regions, defined as an identical gene order and orientation (Fig. 4). In contrast, the sequences of clones generating FISH signals dispersed in numerous chromosomes were kind of a mosaic, in which isolated genes were interspersed by repeat blocks, which was the cause of the messy signals in FISH.

Our results contribute to lupin genomics by enriching the pool of chromosome markers, anchoring individual sequences or sequence contigs to defined chromosome regions. Moreover, we made an important step towards the construction of a comprehensive *L. angustifolius* genome map, an essential resource for the investigation of selected gene-rich regions and for sequence assembly after completion of lupin genome sequencing.

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A History of Polish Birds

Z.M. Bocheński | T. Tomek | Institute of Systematics and Evolution of Animals | Polish Academy of Sciences

A History of Polish Birds is the first book to summarize our knowledge of bird remains from all fossil and subfossil sites in Poland. It reviews information derived from all books and papers that were published up to 2011. It also includes the authors' own data on hitherto unpublished bird remains from 33 sites, listed in a separate appendix. All bird remains excavated in Polish territory are listed in the present work. They represent 257 taxa (including 28 extinct species) found on 236 sites in Poland in the Paleogene, Neogene, and Quaternary deposits (Fig. 1). Bird species which breed in present-day Poland and which have not to date been found as fossils/subfossils are only discussed briefly on the basis of data from the literature.

The information on each taxon included in the work consists of three parts: (1) a complete list of sites whence the taxon was recorded; (2) a brief chronological summary of the fossil and archaeological materials; and (3) a summary of information from the literature on the status of the species from the 16th century to the present.

Fig. 1. Distribution of sites that have yielded bird fossils in Poland. When two or more sites are known from the same locality they are listed under a single acronym

The book includes stratigraphic charts, a graphical presentation of the temporal distribution of all avian taxa in Poland, and a complete list of fossil and subfossil sites with bird remains. Numerous illustrations supplement the scientific content and make it easy to follow even for non-specialists. A brief summary draws attention to some regularities of the occurrence of selected birds in present-day Poland.

The book presents updated and corrected information on the stratigraphy of all the sites for which ^{14}C dates were performed after the original publications. Moreover, all ^{14}C dates in the present work were calibrated and the stratigraphic nomenclature was standardized.

Several examples: The oldest bird remains found in Poland are about 30 million years old, are dated to the early Oligocene and come from the Carpathian Flysh. Although such old specimens are very scarce, they include two nearly complete birds – a hummingbird *Eurotrochilus noniewiczi* and a passerine bird *Jamna szybiaki* (Fig. 2) (another passerine bird *Resoviaornis jamrozi* was described after the book was published). The new species described from Poland are among the oldest representatives in their respective groups and therefore broaden our knowledge on the early evolution and diversification of their groups.

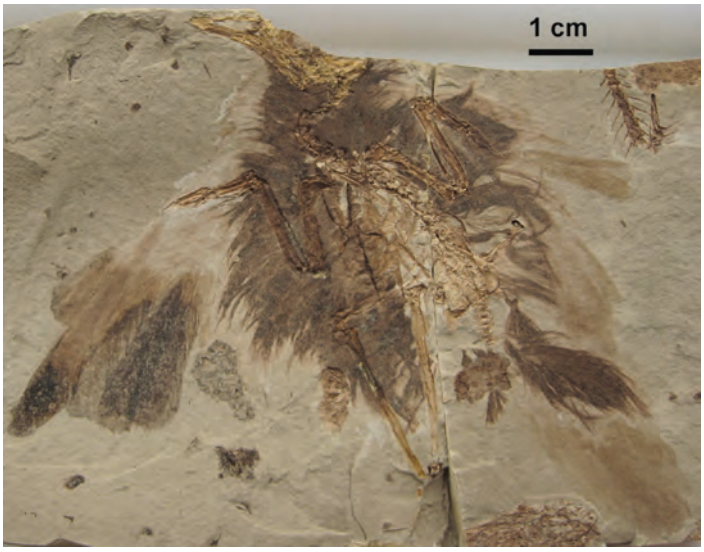

Fig. 2. A holotype of *Jamna szybiaki*, a passerine bird from the early Oligocene of Poland (P. Wojtal)

Remains of the Willow Grouse *Lagopus lagopus* are the most numerous of all wild bird species in Poland (Fig. 3). They were found in sediments of

Fig. 3. The Willow Grouse – the most frequently found bird at fossil sites in Poland (drawing by M. Bujoczek)

27 sites, sometimes amounting to several hundred bones. The Willow Grouse has an uninterrupted fossil record from the Małopolanian Interglacial (MIS 19; ca. 600,000 BP) up to the middle Holocene (ca. 6,000 BP). Data from the 16th-century literature indicate that the species could still occur close to the northeastern border of Poland, where it retreated after the last glaciation.

Today a common bird in towns and cities, the Domestic or Feral Pigeon *Columba livia* forma *urbana* has a rather short fossil record in Poland. It is known from only 14 archaeological sites; the oldest comes from the middle Holocene (ca 4,000 BP), whereas the remaining sites are dated to the early Middle Ages or later times. The Domestic Pigeon is derived from the Rock Pigeon that lives in the Mediterranean. It was not until the Middle Ages that the species populated towns north of its natural area of distribution. It is uncertain whether this was a natural expansion or occurred with the intentional help of man. The remains from the middle Holocene of Poland suggest a natural expansion.

The book should prove to be an invaluable resource for avian paleontologists, zooarchaeologists, and ornithologists, as well as serious birdwatchers who wish to broaden their knowledge. It is a good starting point for ornithological analyses of particular geological periods, environmental and climatic changes, as well as trends in the abundance and ranges of particular species in historical times.

The book is the result of many years of work of Prof. Zygmunt Bocheński, who died in 2009 before finishing it. The project was then completed by the other coauthors. It is currently the only such study in Central Europe.

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Disturbances in reproductive function at the central nervous system level during immune stress

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The survival of a living organism depends on many external and internal factors, including environmental conditions and the availability of nutrients, the ability to prevent invasion by other organisms and the presence of a perfectly operating reproductive system for the successful completion of reproduction and species perpetuation. This can be achieved by the interaction between the immune system and the hypothalamic-pituitary-gonadal (HPG) axis. There is evidence that impaired reproductive function may accompany infections. Immune stress, such as bacterial and viral infections or autoimmune disease, has profound effects on female reproductive health, ranging from disruption of cyclicity to loss of pregnancy. The network of interactions between the reproductive and immune systems is complicated and specific for each level of the HPG axis. Nevertheless, the hypothalamus appears to be a critical site in reproductive axis suppression during an immune challenge.

The studies presented in this article were undertaken to identify the central pathways, both direct and indirect, through which immune stress influences gonadoliberin (GnRH) secretion. GnRH is a hypothalamic neuropeptide that plays a key role in controlling reproduction at the level of the central nervous system (CNS). The secretory activity of GnRH neurons is regulated by multiple neuronal systems that involve neurotransmitters, neurohormones, and peptides. The most important are: catecholamines, prostaglandins, g-aminobutyric acid (GABA), and neuropeptide Y (NPY). The aim of the experiments was to explain how immune stress caused by intravenous (iv) injection of bacterial endotoxin – lipoplysaccharide (LPS) – affects ovine reproductive processes at the level of the hypothalamus, a structure in which the most GnRH neuronal cell bodies are located.

The experiments were conducted on 2- to 3-year-old Blackhead ewes in the anestrous season. The animals received an intravenous (iv) injection of LPS or an intracerebroventricular (icv) injection of interleukin (IL)-1b. The perfusates for assaying GnRH and catecholamine levels were collected from the medial basal hypothalamus/medial eminence (MBH/ME) using the push-pull method. The concentration of luteinizing hormone (LH), prolactin (PRL), and cortisol in blood were determined by radioimmunoassay (RIA), GnRH concentration in perfusates by ELISA and catecholamine levels by HPLC with electrochemical detection. In the hypothalamus and anterior pituitary gland (AP), the

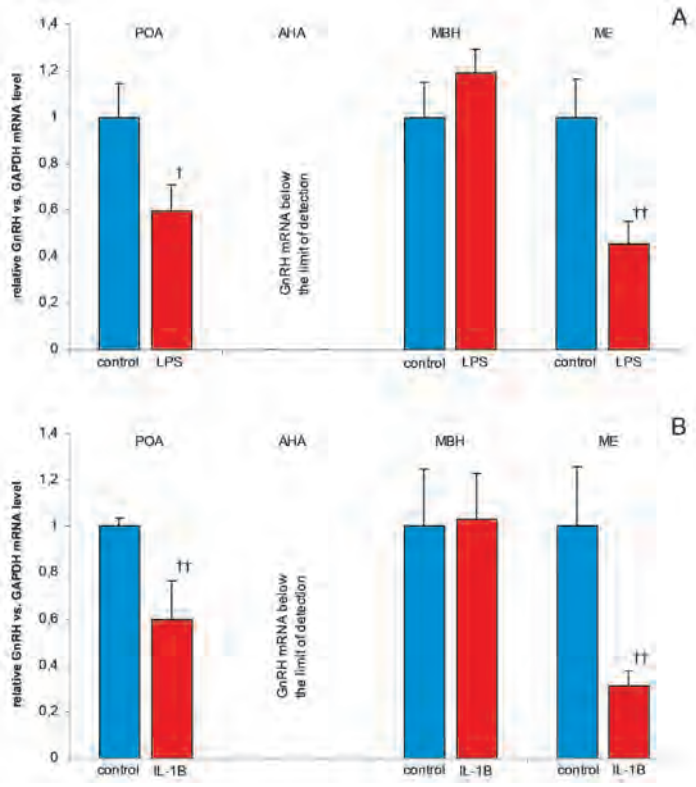

Fig. 1. The effect of iv LPS (A) and icv IL-1b (B) on GnRH gene expression (±SEM) in the hypothalamic structures of anestrous ewes. † P≤0.05; †† P≤0.01

expression of genes encoding GnRH, GnRH-receptor (GnRHR), LHb, neuropeptide Y (NPY), IL-1R, Toll-like receptor 4 (TLR4), Tollip, cyclooxygenase (COX)-1 and COX-2, was assayed using real-time PCR.

Our studies show that immune stress induced by iv injection of LPS inhibits GnRH/LH secretion. Endotoxin caused profound downregulation of GnRH gene expression (Fig. 1A) in the hypothalamus and GnRH-R gene expression in the AP with concomitant inhibition of LH release. The peripheral immune challenge also affects TLR4 gene expression in the hypothalamic area suggesting that this receptor (which mediates in signal transduction events induced by LPS) is involved in the inflammatory response in the CNS.

In experiments with icv injection of IL-1b we demonstrated that this cytokine caused a decrease of GnRH gene expression in the POA, and GnRH and GnRH-R in the ME (Fig. 1B). The reduction in GnRH gene expression in these structures was accompanied by suppression of GnRH release into the perfusates from the MBH/ME (Fig. 2). Treatment with the icv IL-1b also caused an increase in IL-1R gene expression in the hypothalamic structures POA, AHA, and MBH.

Looking for other central processes which IL-1b can promote, we determined catecholamine levels in perfusates from the MBH/ME and changes in NPY, COX-1, and COX-2 gene expressions in hypothalamic structures. We found no effect of this cytokine on catecholamine levels or COX-1 and COX-2 gene expression. The icv injection of Il-1b significantly decreased NPY mRNA levels in hypothalamic structures (AHA and MBH).

The overall results suggest that immune stress reduces reproductive process at the CNS level. Suppression of GnRH/LH secretion could be the effect of changes in the activity of the GnRH-ergic system in the hypothalamus. The Il-1b is an important

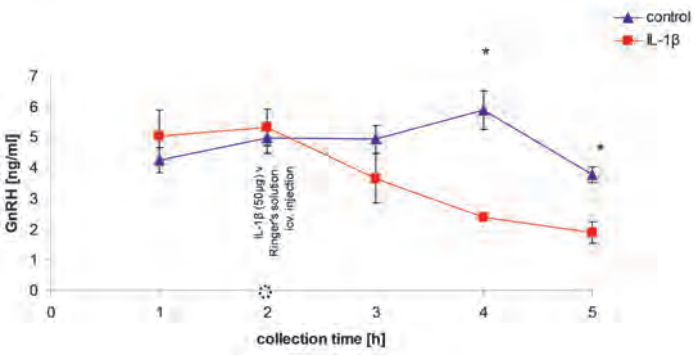

Fig. 2. The effect of icv IL-1b on the GnRH concentration (±SEM) in perfusates collected from the MBH/ME in anestrous ewes. *P≤0.05

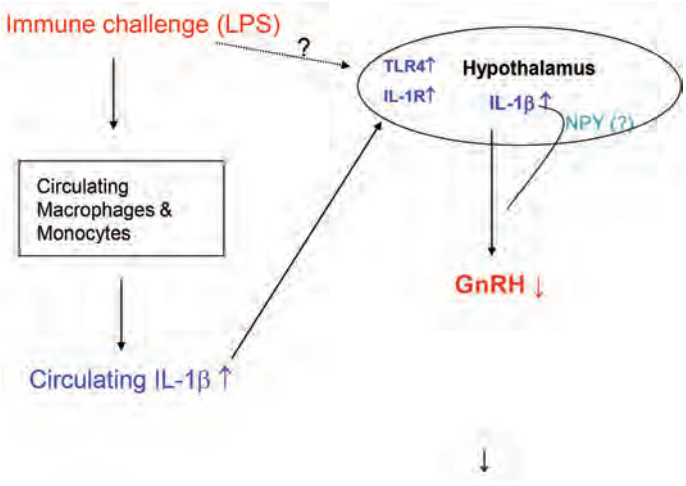

Fig. 3. Scheme illustrating possible central pathways through which LPS may influence GnRH secretion at the hypothalamic level

factor modulating the GnRH biosynthesis and release. It suppresses GnRH secretion mainly by acting directly through its own hypothalamic receptor, IL-1R. Nonetheless, the indirect action of this cytokine on GnRH secretion through other central pathways involving neurotransmitters and neuropeptide cannot be excluded. The obtained results suggest that an important role in this indirect action of IL-1b may be played by the NPY system. The direct and indirect action of Il-1b on GnRH mRNA seem to target post-transcriptional processes such as stability of GnRH mRNA and reduction of its translation. The direct influence of LPS through the TLR4 receptor at the level of hypothalamus cannot be excluded.

Identification of the central pathways responsible for the transmission of stress signals to GnRH neurons is essential in understanding immune stress-induced reproductive disorders in humans and animals. Our results provide new data concerning the interaction between the neuroendocrine and the immune systems.

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470 Ma old fossils from China with preserved soft tissues

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The vast majority of paleontological evidence is based on studies of organisms having a fossilized mineral skeleton. As a result, our knowledge of biodiversity in the geological past is fairly incomplete, as most organisms possess no skeleton, and consequently stand little chance of being preserved in the fossil record. Moreover, even organisms with hard skeletons may often not be preserved due to unfavorable sedimentary and taphonomic conditions. Fortunately, there are also certain unusual findings (known as "taphonomic windows") characterized by exceptionally good preservation, including the soft tissues. These windows give us a unique opportunity to gain greater insight into biodiversity through the Earth's geological past.

An example of such a taphonomic window has recently been discovered by a Polish-Chinese paleontological team in the 470 Ma old Early Ordovician Fenxiang Formation in Hubei Province, southern China. This unique invertebrate fauna includes brachiopods (lingulids) with the pedicle preserved in the finest detail, the oldest known traces of nematode life activities, the oldest record of hydrozoans, and the first fossil black corals, previously unknown from the fossil record, as well as other findings.

At the locality investigated, the Fenxiang Formation reaches about 10 m in thickness. Of the fossils having a mineral skeleton, bryozoans, trilobites, benthic graptolites, and black corals are the most characteristic. Extant black corals (Antipatharia) live mainly in deep waters and differ from other corals by having an organic skeleton covered with spines (Fig. $1D_3$). Although they play an important role in today's marine ecosystems, they were completely unknown in the geological record until this study. The present discovery of a number of well-preserved phosphatized fragments of originally chitinous skeletons of black corals (Fig. $1D_{1-2}$) from 470 Ma old rocks indicates that the essential phylogenetic

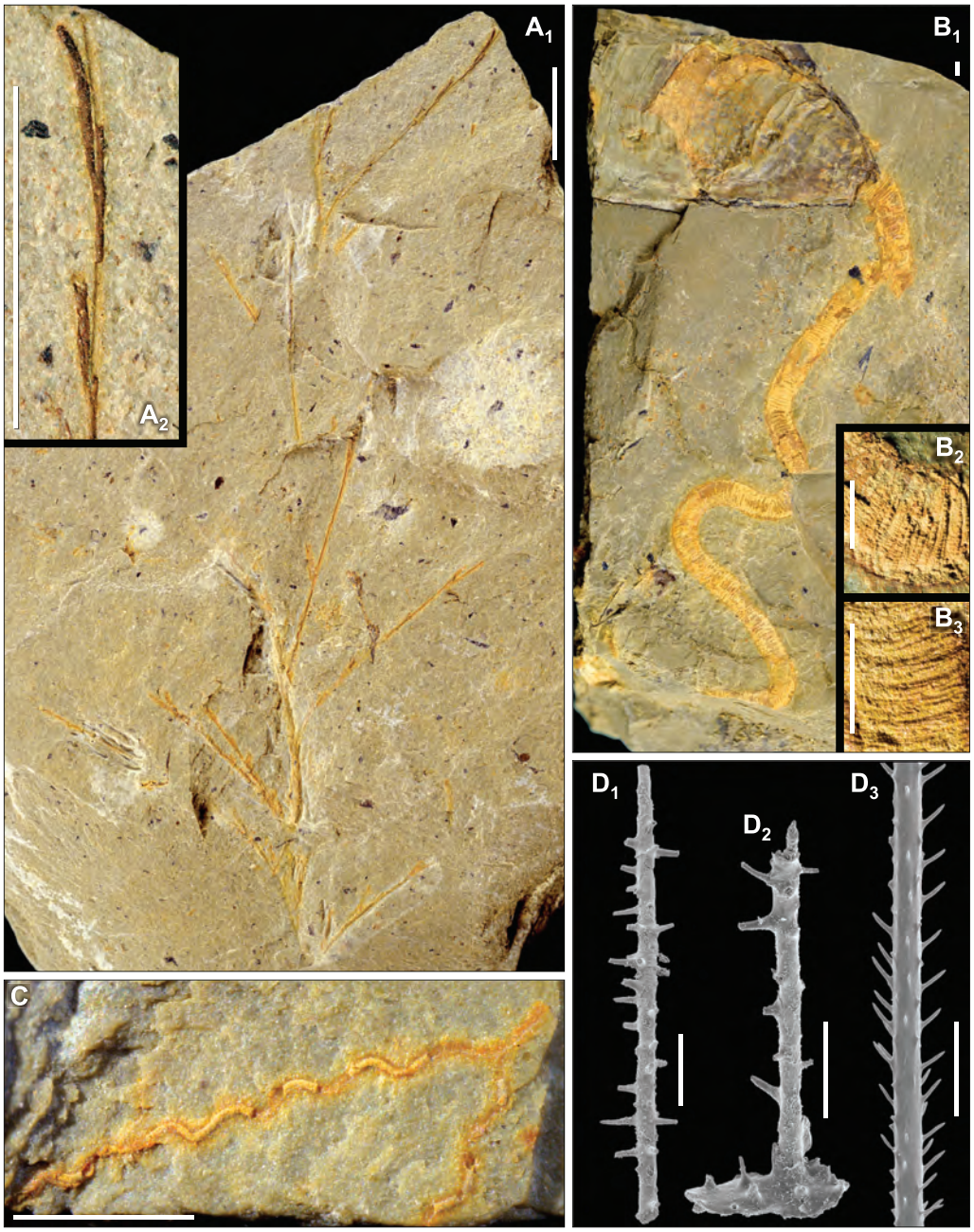

Fig. 1. The most important findings from the early Ordovician Fenxiang Formation (Hubei Province, China). **A** – Hydroid colony, in a general view (A_1) and enlargement of the lateral branch with zooids (A_2); scale bar 5 mm. **B** – Brachiopod *Leontiella* with preserved pedicle, in a general view (B_1) and enlargement illustrating the fidelity of the preservation (B_2–B_3); scale bar 1 mm. **C** – Sinusoidal nematode burrows in sediment; scale bar 100 µm. **D** – Fragments of skeleton of the black coral *Sinopathes reptans* (D_1–D_2), and a comparison with an extant representative of the group (D_3); scale bar 500 µm

differentiation of the Hexacorallia, which include black corals, took place before the Early Ordovician (Baliński et al., 2012).

Another important finding in the fossil material from the Fenxiang Formation is specimens with pyritized soft tissue. Due to the weathering of pyrite, which precipitated on decaying organic material, these specimens stand out in color from the rock background.

One example of an exceptional state of preservation was found in specimens of the lingulid (Brachiopoda) *Leontiella* with perfectly preserved, long, vermiform pedicle (Fig.1$B_{1–3}$). The long muscular pedicle and streamlined shell of this brachiopod

indicate that it was probably the oldest representative of the group which developed an infaunal lifestyle. It was living in mucus-lined burrows in soft sediment as extant linguloids. Because the Cambrian lingulids were epifaunal or at most semi-infaunal, the present finding supports the assumption that a fully infaunal lifestyle in lingulids developed after the Early Cambrian, but before the Early Ordovician.

The material from the Fenxiang Formation also includes microscopic, cylindrical, sinusoidal burrows in sediment of about 20-60 μm in diameter (Fig. 1C). These are tightly filled with weathered pyrite that precipitated as a result of bacterial decomposition of organic matter within the burrows. The geometry and dimensions of these burrows reveal a striking resemblance to the burrows of extant free-living nematodes. The specimens from China are 230 Ma older than the oldest known (Triassic) nematode trace fossils. They are also about 70 Ma older than the oldest (Devonian) findings of the nematode body fossils themselves.

Also among the findings from the Fenxiang Formation is a pyritized colony of an advanced hydroid (Hydrozoa; Fig. $1A_{1-2}$). This colony is composed of an upright monopodial axis and about 13 helically arranged straight lateral branches with strongly elongated, cylindrical zooids on their upper surface (Fig. $1A_2$). Because the oldest reliable hydroids come from the late Carboniferous and early Permian, the currently discovered specimens from China represent the oldest known representative of this group of cnidarians. Finding an advanced evolutionarily hydroid in 470 Ma old sediments indicates that the main differentiation of the group preceded the early Ordovician.

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Mathematics, Physics, Chemistry and Earth Sciences

PAS Division III: Mathematics, Physics, Chemistry, and Earth Sciences covers scientific activity in astronomy, physics, mathematics, chemistry and Earth sciences. The Division consists of 90 national members of the Academy (55 ordinary members and 35 corresponding members), 55 foreign members, and 9 members of the Young Academy.

Division III coordinates the activity of 19 research institutes, with a total of 1,239 researchers (compared to 1,244 in 2011) pursuing fundamental research in domains represented in the Division as well as in various applied research fields. In 2012 the institutes carried out 1,057 (1,167 in 2011) research projects, 208 (234) of which were foreign. Over the past year, researchers from the Division's institutes published 2,054 (1,969) papers in refereed journals of international circulation, and the institutes were engaged in editing 15 (15) scientific journals.

Fifteen of the institutes affiliated with the Division are authorized to confer doctorate (PhD) degrees, while 14 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 a total of 454 members, are as follows: the Committee on Analytical Chemistry, Committee on Astronomy, Committee on Chemistry, Committee on Crystalography, 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,* and *Molecular Physics Report* in the domain of astronomy and physics, *Biotechnologia* [Biotechnology] and *Polish Journal of Applied Chemistry* in the domain of chemistry, *Fundamenta Mathematicae*, *Studia Mathematica*, *Acta Arithmetica*, *Colloquium Mathematicum*, *Annales Polonici Mathematici*, *Bulletin of the Polish Academy of Sciences – Mathematics*, and *Dissertationes Mathematicae* in the domain of mathematics, as well as *Acta Geophysica, GeoPlanet: Earth and Planetary Sciences Series*, *Oceanology*, *Review of Geophysical Studies*, *Studia Quaternaria*, and *Acta Geologica Polonica* in the domain of Earth sciences.

PAS Division III was engaged, directly or via its Committees, in the promotion of gifted high school and university students. The International PhD Studies program established at Division Three in 2000 continued to operate in 2012. The Division's institutes participated actively in various projects under the European Union Framework Programme. The Division continued to coordinate the Polish part of the EU – Republic of Korea scientific cooperation Program (KORANET). Close collaboration with various scientific societies active in the domains represented in the Division has been continued.

Two plenary sessions of the Division III were held in 2012. At its spring session, the Division elected the following three candidates to become members of the Young Academy: Asst. Prof. Adam Nowak, Asst. Prof. Marcin Stępień, and Dr. Ireneusz Weymann.

As is traditional, the Division granted its annual prizes in 2012. The prestigious Maria Skłodowska-Curie Award in chemistry was bestowed upon Prof. Jacek Waluk from the PAS Institute of Physical Chemistry for his contribution to the theory of proton tunneling and excited state proton transfer. The prestigious Stanisław Staszic Award in Earth

The ceremony of granting Division III Awards. From left: Dr. Piotr Pietrzyk, Dr. Mikołaj Zapalski, Prof. Janusz Pempkowiak, Prof. Jacek Waluk, Dr. Piotr Kuświk, Asst. Prof. Tadeusz Kulczycki, Prof. Michał Kleiber, PAS President, Prof. Marek Chmielewski, PAS Vice-President, and Prof. Marek Grad, Dean of Division III

From left: Prof. Jacek Waluk with his wife, Dr. Piotr Pietrzyk, winner of the Stefana Pieńkowski Scientific Award, Prof. Michał Kleiber, PAS President, and Prof. Marek Grad, Dean of Division III

In the center Prof. Michał Kleiber and Asst. Prof. Tadeusz Kulczycki, laureate of the Wacław Sierpiński Award. In the background, Prof. Marek Grad, Dean of Division III, Prof. Marek Chmielewski, PAS Vice-President, Prof. Andrzej Schinzel, Ordinary Member of the Academy, and Prof. Stanisław Kwapień, Ordinary Member of the Academy

sciences was bestowed upon Asst. Prof. Karol Kuliński and Prof. Janusz Pempkowiak from the PAS Institute of Oceanology for a set of papers related to carbon circulation in the Baltic Sea. The Division Three research awards, in turn, were conveyed as follows: the Wacław Sierpiński Award in mathematics to Asst. Prof. Tadeusz Kulczycki from the Institute of Mathematics and Computer Science at Wrocław University of Technology for a set of papers related to spectral theory; the Stefan Pieńkowski Award in physics and astronomy to Dr. Piotr Kuświk from the PAS Institute of Molecular Physics for a set of papers related to the magnetic structure of (NiFe/Au/Co/Au) multilayers; the Włodzimierz Kołos Award in chemistry to Dr. Piotr Pietrzyk from the Faculty of Chemistry at Jagiellonian University for a set of papers related to the molecular background of the mechanism of NO reduction and reactant activation; the Ignacy Domeyko Award in geology and mineralogy to Dr. Mikołaj Zapalski from the Faculty of Geology at the University of Warsaw for a set of papers related to the palaeobiology of Palaeozoic corals.

In 2012 various members of the Division were frequently commended and honored for outstanding achievements in science. The year's price of the Foundation for Polish Science (FNP) in chemical and material sciences was won by Prof. Mieczysław Mąkosza. An honorary doctorate was granted to Prof. Wojciech J. Stec by the Technical University in Łódź. The Sierpiński Medal in mathematics was received by Prof. Jerzy Kaczorowski, and the Smoluchowski-Warburg Award in physics by Prof. Krzysztof Redlich.

A new modification of the Friedel-Crafts type reaction in the synthesis of planar, functional molecules for optoelectronic applications

P. Bałczewski | Center of Molecular and Macromolecular Studies | Polish Academy of Sciences

Among the various functional materials, those containing spatially developed systems of pi-conjugated bonds play a particularly important role due to their semiconducting, DNA-intercalating, medical, catalytic, and many other unique properties. Our synthetic group develops new strategies for the preparation of such useful molecules, recently focusing on optoelectronic materials. Since the groundbreaking discoveries of the 1990s, such organic molecules have found wide applications in optoelectronic elements and devices, especially in organic light emitting diodes (OLEDs) and also in organic field effect transistors (OFETs) and organic photovoltaic cells (OPVs), marking a technological breakthrough and enabling the development of new, low-cost electronic device markets. In the intensive search that remains underway for better-perfected optoelectronic molecules and methods for their synthesis, our group has recently discovered and developed a new reaction, mechanistically based on electrophilic cyclizations of the Friedel-Crafts (1877) and Bradsher (1940) types. This new tool enables the synthesis of polycyclic aromatic and heteroaromatic hydrocarbons, such as hexahydroxylated anthracenes **1**, benzo[*b*]carbazoles **2**, benzo[*g*]quinolines **3**, pyrido[3,2-*b*]carbazoles **4**, benzo[*b*]thieno[3,2-*b*]carbazoles **5**, and benzo[*b*]naphtho[2,3-*b*]thiophenes **6**. using a simple, high-yield, one-pot procedure under acidic conditions and aqueous, eco-friendly reaction media (Fig. 1).

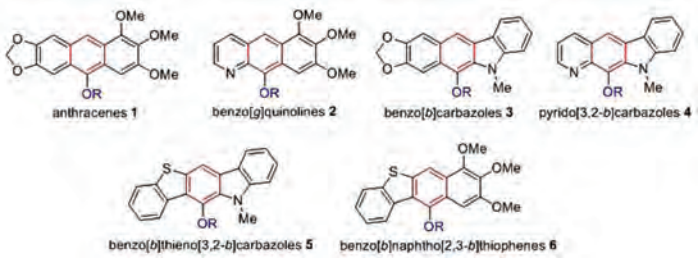
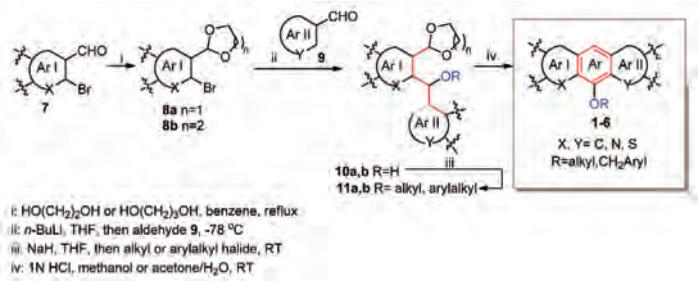


Fig. 1. Examples of polycyclic, fused (hetero)aromatic hydrocarbons obtained in the new variant of the electrophilic cyclization reaction



Scheme 1. A general strategy for the synthesis of polycyclic, fused (hetero) aromatic hydrocarbons of type **1-6** via a new intramolecular, electrophilic cyclization reaction

The characteristic feature of these hydrocarbons is the presence of a six-membered aromatic ring Ar, built on two other Ar(I) and Ar(II) rings of two independent aromatic aldehydes **7** and **9**, used as substrates, and the presence of an OR substituent able to influence properties and solubility (Fig. 1, Scheme 1).

The general strategy for the new approach involves: i) protection of the aldehyde group in the *ortho*-bromo aldehyde **7** with diols to give acetals **8a,b**; ii) the Br/Li exchange reaction in **8a**,**b** followed by condensation with the second aromatic aldehyde **9** to afford diarylmethanols **10a,b**; iii) protection of the hydroxyl group in **10a,b** with alkyl or arylalkyl halide to obtain protected diarylmethanols **11a,b**; and iv) acid-catalyzed electrophilic cyclization of **11a,b** to the corresponding polycyclic (hetero)aromatic hydrocarbons **1-6** (Scheme 1). The synthetic protocol involves the protection of both aldehyde and hydroxyl groups to prevent formation of isobenzofurams instead of the expected fused hydrocarbons, but it does not impose the need to carry out a deprotection step since the reactive carbocation may be formed directly from the acetal moiety. The acid-sensitive acetal and dibenzyl alkoxy functions, as potential sources of two competing carbocations, were for the first time used together in one molecule during the electrophilic cyclization reaction and therefore required application of very special, mild cyclization reaction conditions. Our protocol showed much milder reaction conditions than ever used in intramolecular, electrophilic cyclizations (1N HCl, aqueous MeOH or acetone at room temperature versus 48% HBr in refluxing

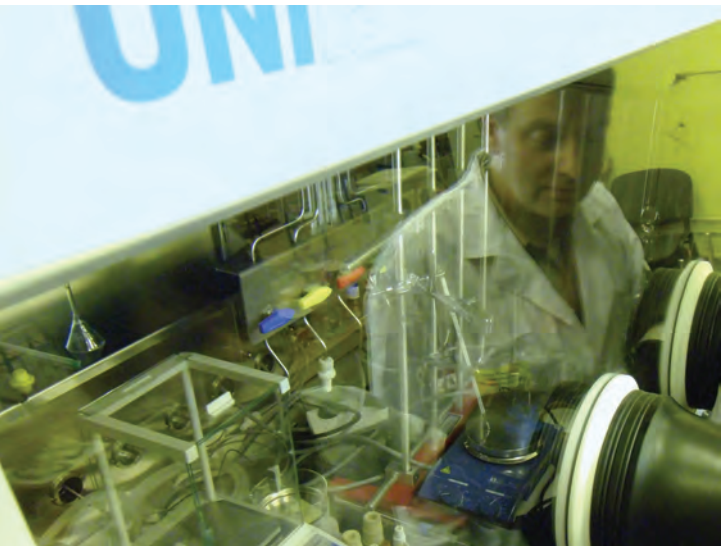


Fig. 2. M. Koprowski (PhD) and J. Skalik (MSc) from the Centre of Molecular and Macromolecular Studies, operating with fluorescent samples in a glovebox chamber (P. Bałczewski)

AcOH, as for the Bradsher reaction). Due to these advantages, the new reaction won an award from the editors of *SynFacts –Highlights in Current Synthetic Organic Chemistry* in 2012 (see ref. below).

The physicochemical and optoelectronic properties of the obtained compounds, such as Stokes shifts, fluorescence quantum yields, theoretical and experimental HOMO-LUMO levels and optical band gaps, X-ray analysis, morphology of thin film surfaces, current-voltage characteristics, charge carriers lifetimes and mobilities, resistivity, electron and hole conductivity were investigated in collaboration with physicists and electrochemists, in solution, crystal, as well as solid films. OLED prototypes have also been constructed and investigated.

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Pseudo-Hadean ages due to ancient radiogenic Pb mobilization – A SIMS imaging study

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The iotopic disturbance of zircons ($ZrSiO_4$) from > ca. 3.4 Ga Archean high-grade metamorphic rocks of the Napier Complex, Antarctica has been known for many years. Using a novel high spatial resolution ion imaging technique it has been possible to generate Pb-isotopic "age" maps for these zircons. These

record patchy variations in the isotopic ratios that result in spurious ages, including some that are Hadean (>4.0 Ga). These data provide the first unambiguous demonstration of the distribution of unsupported ancient radiogenic lead in zircon. This feature is related to the ultrahigh temperature metamorphism (UHT) in this region, which occurred at ca. 2.5 Ga. Our results raise the possibility that other old ages derived from zircon subject to similar metamorphism may be erroneous. Given that zircon is the only direct sample we have of the Hadean (e.g. the well-known Jack Hills detrital zircons), many models for Earth's earliest evolution critically depend on the veracity of ages obtained using an ion microprobe.

Zircons from strongly layered early Archean ortho- and paragneisses in ultrahigh temperature (UHT) metamorphic rocks of the Napier Complex in East Antarctica are characterized by complex U-Th-Pb systematics. Published ages from Mount Sones, Dallwitz Nunatak, and Gage Ridge are scattered, with the oldest ages being reversely discordant (U/Pb ages older than $^{207}Pb/^{206}Pb$ ages). This problem has attracted scientific attention, because $^{207}Pb/^{206}Pb$ ages are considered to be more robust than U-Pb ages in ancient rocks. Several different mechanisms were proposed to explain the U and Pb behaviour in the zircon structure that resulted in such spurious ages. As uranium is unlikely to be mobilized due to the fact it is strongly lattice-bound, the most favoured explanation was "Pb gain," a mechanism opposite to Pb loss in normally discordant data. However, this problem has remained unresolved for more than 25 years.

We utilized the novel high spatial resolution ion microprobe imaging technique to investigate the problem. Selected areas of 70µm x 70µm were imaged using a small (~2 µm) rastered primary beam on the Cameca IMS 1280 at the National History Museum in Stockholm. The distribution of ^{48}Ti, ^{89}Y, ^{180}Hf, ^{206}Pb, ^{232}Th and ^{238}U was imaged in the monocollection mode and ^{204}Pb, ^{206}Pb, ^{207}Pb and ^{180}Hf in multicollection mode (Fig. 1). Hafnium is evenly distributed in zircons and served as a proxy matrix peak in both routines.

As an example, a zircon grain from paragneiss from Dallwitz Nunatak (945 Point) with a spot age of 3379±9 Ma ($^{207}Pb/^{206}Pb$ age) and U content of 678 ppm was selected for investigation. The ion maps reveal the distribution of various elements. Yttrium, together with Th and U, exhibits zonation

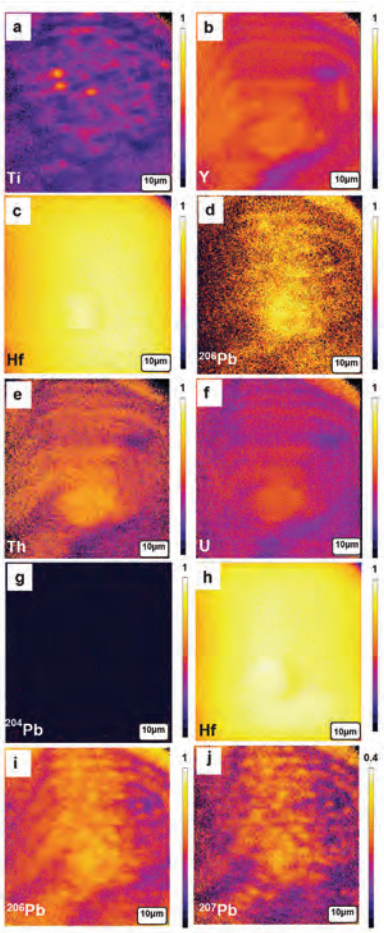

Fig. 1. Scanning ion images of grain n3847-44 from Dallwitz Nunatak sample 11178-1 using a monocollection routine: (a) ^{48}Ti, (b) ^{89}Y, (c) ^{180}Hf, (d) ^{206}Pb, (e) ^{232}Th and (f) ^{238}U; and a multicollection routine: (g) ^{204}Pb, (h) ^{180}Hf, (i) ^{206}Pb and (j) ^{207}Pb. All images (except ^{204}Pb and HfO) are normalized to the HfO image to minimize the effect of enhanced ion emission from the original spot analysis crater. The color-scale bars are relative intensity (i.e. do not correspond to ppm)

visible on the cathodoluminescence (CL) images (Fig. 2a). Unusual patchiness is visible in the map showing Pb distribution (Fig. 1d,i,j). However, although it broadly follows the U and Y zonation, there are bright patches with enhanced signal which do not correspond to any zones or to crystal imperfections (e.g. cracks). Similar to Pb, Ti shows patchy distribution too, but there is no direct correlation between patches of these two elements.

In the multicollector mode, ^{206}Pb and ^{207}Pb isotopes exhibit similar patchiness (Fig. 1i,j). The ^{204}Pb image (Fig. 1g), which appears black, shows a lack of common Pb in the analysed area. Using the WinImage program, we produced $^{207}Pb/^{206}Pb$ ratio maps

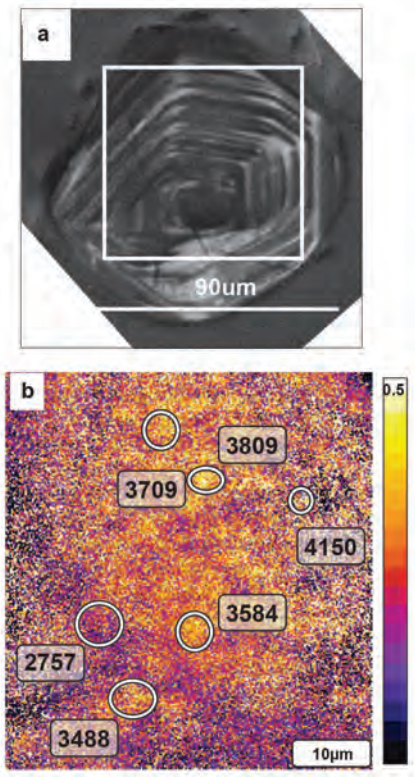

Fig. 2. (a) Cathodoluminescence (CL) image of zircon grain n3847-44 from Dallwitz Nunatak sample 11178-1, (b) $^{207}Pb/^{206}Pb$ ratio image; ellipses show the areas defined for $^{207}Pb/^{206}Pb$ age calculation. Width of white rectangle is 10 µm

(Fig. 2b) that allow calculation of $^{207}Pb/^{206}Pb$ ages for spots of any size within the frame of the picture (70µm x 70µm) and at any time after data collection. Indeed, this provides a new and unique method for obtaining age information from zircon. These maps show areas of enhanced brightness where the $^{207}Pb/^{206}Pb$ ratio is higher and demonstrate that within the small areas (µm scale) the apparent $^{207}Pb/^{206}Pb$ age is older.

Using these images, we can calculate the $^{207}Pb/^{206}Pb$ age of areas of any size from ~2 μm^2 upward. Within the area, the calculated $^{207}Pb/^{206}Pb$ data yield ages from 2.76 Ga up to 4.15 Ga (Fig. 2b), exceeding the age of rock, however this technique allows both younger and older ages to be obtained.

Spuriously old $^{207}Pb/^{206}Pb$ ages in areas enriched in radiogenic Pb are the result of a combination of supported and unsupported radiogenic Pb. Some of the ages we measured were Hadean (>4 Ga) and hence Pb redistribution of this type might lead to incorrect ages being assigned to zircons showing this phenomenon. In this case, the Antarctic zircons experienced ancient Pb mobilization and redistribution, most likely at ~2.5 Ga, the time of UHT metamorphism in the Napier Complex. This well-documented event reached temperatures as high as >1100°C, the highest recorded on Earth from the continental crust.

In addition, Ti also exhibits random distribution; although its patchiness is independent of Pb. The presence of patchy titanium is likely to affect Ti-in-zircon thermometry, with implications for the accurate determination of zircon crystallization temperatures.

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Archaean Earth's mantle – New data on the everlasting "wet or dry" controversy

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The Earth remains a habitable planet through continual chemical exchange between the deep inerior (mantle) and exterior reservoirs (e.g. crust). Investigating the nature, dynamics, and diversity of the Archean geosystem is of crucial importance for our understanding of habitats available for life.

Fig. 1. Kabbaldurga quarry showing "wetter" Closepet granite (grey) and "drier" charnockite rock (brown) (H. Martin)

Among the many components of the geosystem, the fossil hydrothermal environment, fluids- and volatiles-rich, is intensively studied. Such research allows us to understand how 'nutrients' are mobilized and provided through fluid-volatile circulation. Even so, the circulation during early Earth evolution has not been fully clarified. The composition and origin of Archaean fluids is a matter of discussion and controversy. Views on this issue focus around two concepts, described as "dry" vs. "wet" (Arndt et al., 1998). The concept of the "dry" mantle or crust involves fluids assumed to be CO_2 dominated, whereas the opposite theory is formulated for the "wet," hydrous system. While as a rule the crust is believed to be dry, there is no similar consensus regarding the mantle. The hydrous nature of the mantle is indeed frequently called into question.

The present research (Słaby et al., 2012), carried out by a Polish-French-German-Japanese-Indian team, pertains to the hydrothermal system as recognized in Archaean granites from Closepet (Dharwar Craton, India) (Fig. 1). It has been performed on minerals that show unusual growth and regrowth textures. To determine the origin of both of them, a multi-method approach was taken (major element, trace element and isotope geochemistry, infra-red spectroscopy, cathodoluminescence, 3D depiction of geochemical data, and fractal statistics). This approach has made it possible to distinguish and separate textures resulting from various processes throughout the formation – the transformation history of the investigated minerals.

The 3D depiction of trace element distribution indicated that the crystallization process was followed by interaction with fluids (Fig. 2). The magmatic system involved in the minerals' formation showed non-linear dynamics. The interaction with fluids was also deterministic, but in contrast to the magmatic crystallization, it showed an increasing persistency in element behaviour; causing selective enrichment in large ion lithophile elements, Pb, Y. The zones of mineral-fluid interaction have been well visible under cathodoluminescence, as the affected areas are characterized by different trace element distribution as well as defect density (Fig. 3).

The minerals investigated are among the NAM class (nominally anhydrous minerals). However, ultra-sensitive IR measurement led to an estimation of the substantial water content in the areas changed

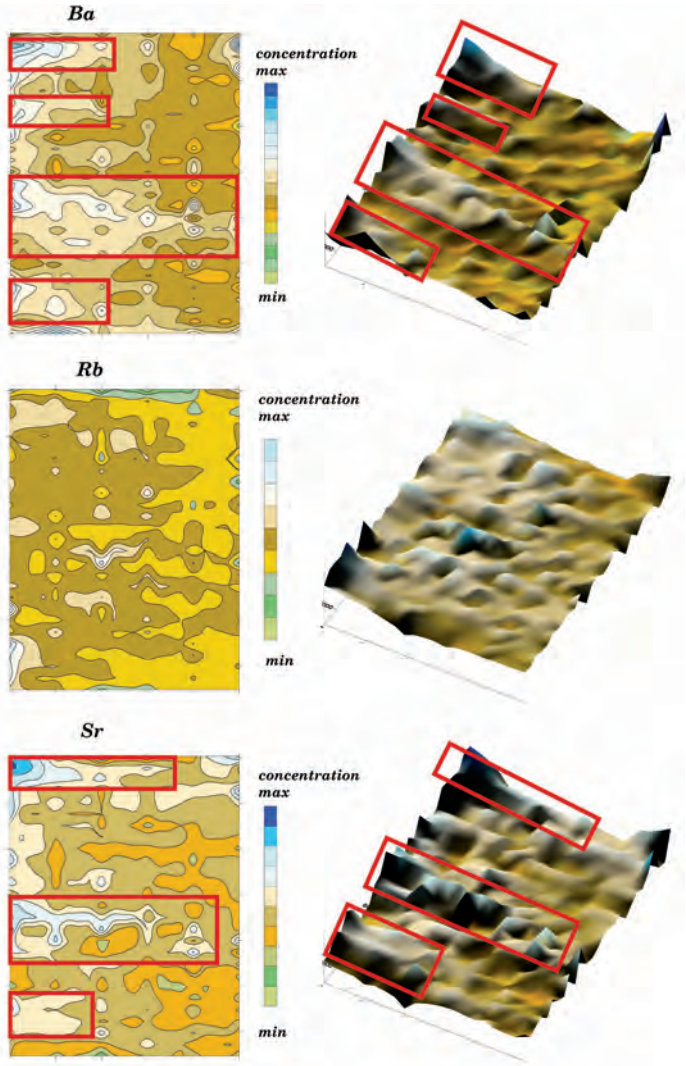

Fig. 2. Spatial distribution of trace element (Ba, Rb and Sr) in alkali feldspar shows that primary homogeneous growth pattern (right side) is obscured by another one (left side): the elements (preferentially Ba and Sr) are exchanged within some domains (red squares); (drawing by M. Śmigielski).

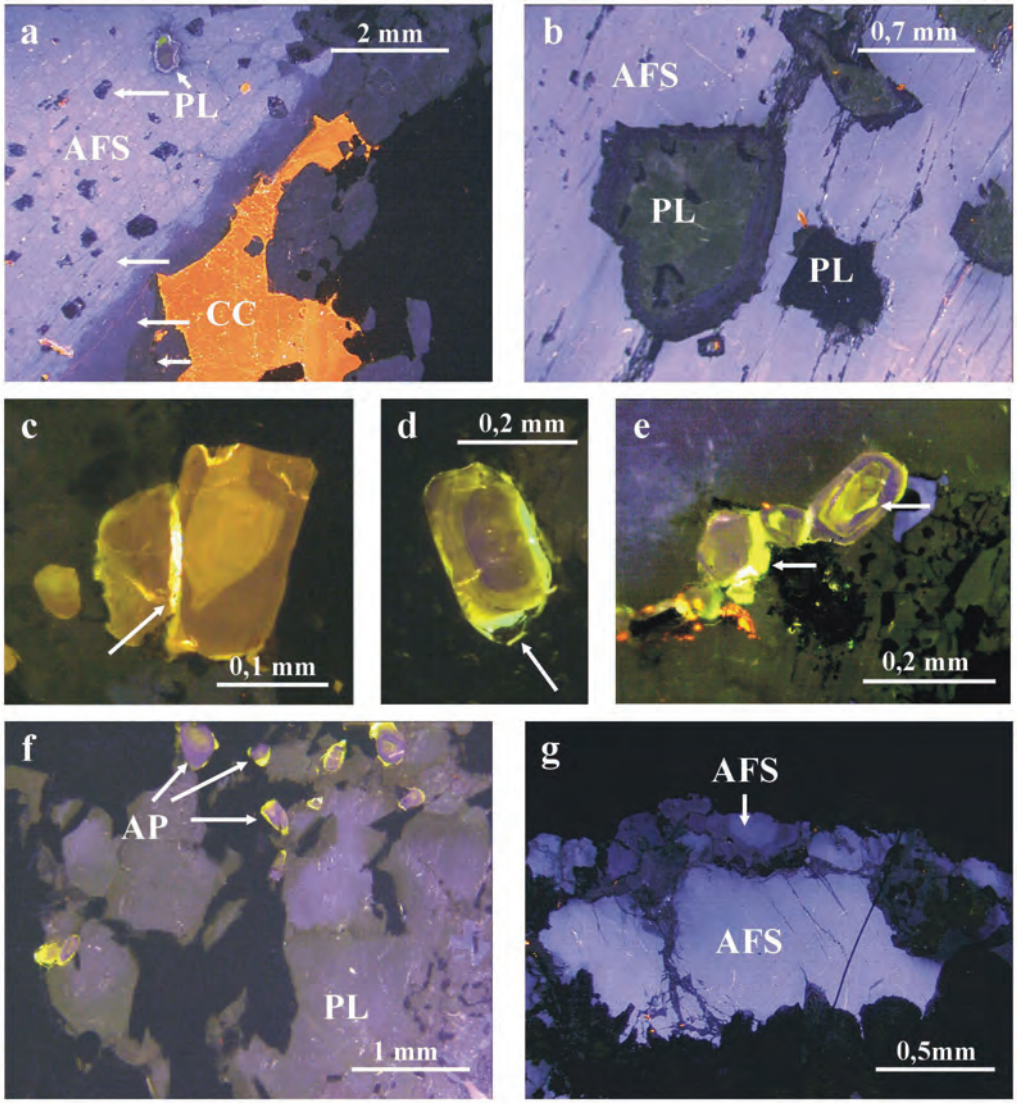

Fig. 3. Cathodoluminescence micrographs showing growth and re-growth textures of minerals: AFS – alkali feldspar, PL – plagioclase, CC – carbonate, AP – apatite (photo by Jens Götze). (a) alkali feldspar affected by interaction with fluid; notice progressive change in the intensity of the blue CL color from dark blue (reaction with fluid) to medium blue and light blue (not affected by fluid) (arrows); the reaction causing appearance of dark blue luminescence implies simultaneous carbonate crystallization; reaction rims are also visible on plagioclase inclusions; (b) plagioclase inclusions with reaction rims, margins of plagioclase show at least two reaction zones, between two plagioclase inclusions a path of probable fluid migration is well visible; (c-e) zoned apatite crystals with primary growth zoning (violet-orange) accordingly pointing to a multiple change in growth conditions during the crystallization of apatite in the magma; in addition, cracks, other zones, sometimes inward zone of yellow color (related to fluid reaction) are visible; (f) zoned apatite and matrix plagioclase with patchy marginal zones; the apatite crystals show light yellow luminescent rims, which result from hydrothermal overprint (arrows); (d) alkali feldspar – dark blue luminescence is related to fluid interaction

by fluid interaction (Fig. 4). Trace element as well as water species characteristics defined the interacting fluids as hydrous and fertile. The oxygen isotopes of the fluids-affected domains and the isotope signature of co-precipitated carbonates indicate that the observed recrystallization was derived by mantle-derived fluids under high temperature conditions. At the same time the recognized water-rich fluids testify in favor of a hydrous mantle array during Archaean time.

Studying the mobilization of major and trace elements by hydrothermal mantle-crust circulation driven by magmatic heat has many important aspects. It significantly contributes to our understand-

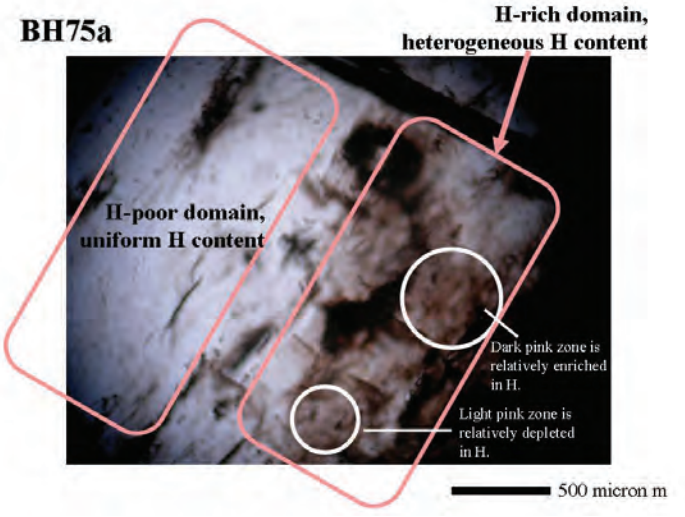

Fig. 4. Section of megacrysts which shows water-rich and water-poor domains selected for IR studies (M. Hamada)

ing of the evolution of the geosystem as a whole. It makes it possible to trace the origin of early Earth deposits. It helps to define the first potentially habitable Earth places suitable for sustaining primitive chemosynthetic life. Finally, such knowledge may be useful upon discovering new exo-planets, for predicting if the planet may be habitable or not.

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Ultra High Optical Power in New Constructions of Nitride-Semiconductor Based Syperluminescent Diodes (SLD)

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G. Targowski | TopGaN Ltd.

The superluminescent diodes fabricated in our laboratories emit light in the blue-violet emission range. They demonstrate record output power (above 200mW), confirming the potential of the employed design and the advantages stemming from the use of bulk GaN substrate in optimizing the light-emission efficiency. This has decisively contributed to the optimization of the optical power value achieved.

The two best-known semiconductor emitters – light emitting diodes (LEDs) and laser diodes (LDs) – differ greatly in terms of their optical characteristics, making them useful in very different fields of application. However, some optoelectronic systems, like fiber-optic gyroscopes (FOG) and optical coherence tomography (OCT), require light exhibiting low time coherence and simultaneously a high spatial coherence. These features are achievable by cer-

Fig. 1. Photo of a working SLD

tain lesser-known semiconductor emitters, known as superluminescent diodes (SLDs).

With the advent of AlInGaN semiconductors it became possible to fabricate ultraviolet (UV)-blue-green LEDs and LDs. From the point of view of superluminescent diodes this opens up new fields of application in speckles-free display technology (blue and green SLDs) and in biochemical and material imaging (UV).

The process of light emission in these devices is based on the coexistence of spontaneous and stimulated emission. The spontaneous emission provides a wide and smooth light spectrum, which is then amplified by stimulated emission processes – a mechanism called amplified spontaneous emission. To achieve significant contribution of stimulated emission we have to reach population inversion, like in conventional laser diodes. Consequently, the general shape of stripe-like geometry typical for laser diodes is also adopted for SLDs.

However, laser oscillations must be prevented from occurring. This can be done by many means, with the three strategies most often used (separately or combined) being high quality antireflection (AR) coatings (Fig. 2a), passive absorber sections (Fig. 2b), and designing a tilted waveguide (Fig. 2c), i.e. at certain angle from the physical facets of the chips. Such a tilt prevents light from returning to the waveguide and feeding back into the waveguide oscillations.

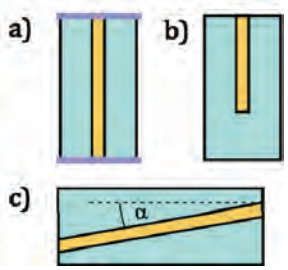

Fig. 2. Popular superluminescent diode geometries

In our case, superluminescent diodes were fabricated in a j-shape waveguide geometry. This particular geometry consists in the creation of two waveguide sections. The first, at the rear facet side, is straight and perpendicular to the facet like in a standard laser diode, whereas the output facet part is curvy and the stripe exit is oriented at a certain angle to the output facet. The advantage of such geometry is that the light emitted backwards, towards the rear facet, is bounced back to the waveguide and thus travels more than twice the distance as compared to the front-facet propagating wave. The light amplification and output power are subsequently greater, and therefore a double-pass device should allow higher optical powers to be achieved.

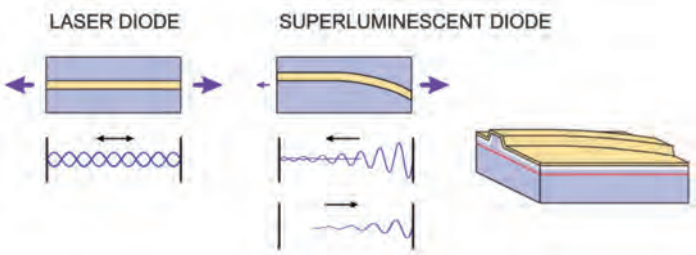

Fig. 3. This comparison of the working principles of a laser diode and SLD diode produced at the PAS Institute of High Pressure Physics illustrates the different nature of light wave propagation in the waveguide

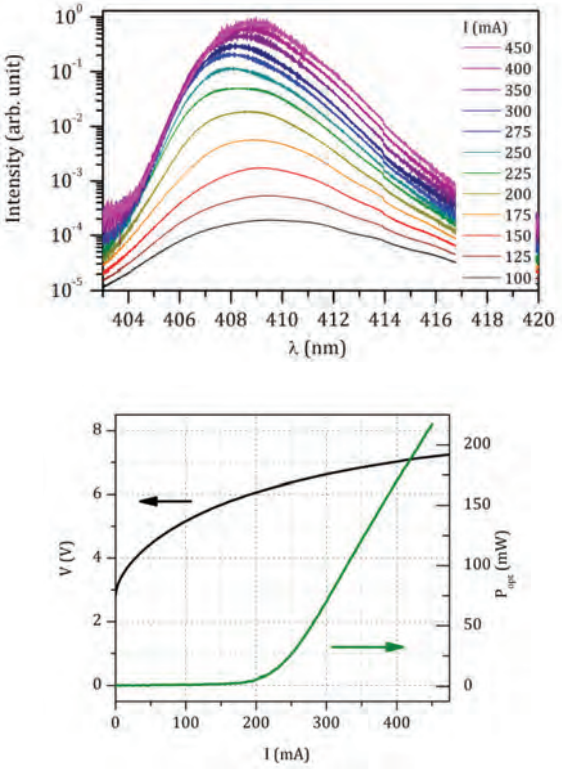

Fig. 4. Measured shape of emission spectra acquired for different currents for SLD with record high output power. Right-hand side figure shows I-V and P_{opt} – I characteristics

The device structures were fabricated by metalorganic vapor phase epitaxy (MOVPE) on bulk GaN crystals obtained via ammonothermal synthesis. The performed measurements consisted in the acquisition of current vs. voltage (I-V) and optical power vs. current (P_{opt}-I) characteristics. (Fig. 4).

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Tensor decompositions in algebraic geometry and applications

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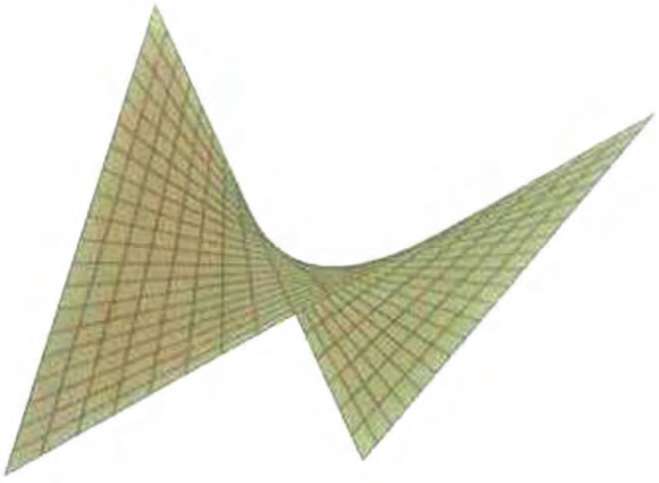
Algebraic geometry is a branch of mathematics that deals with geometric objects that have some further algebraic structure. As a trivial example, a circle can be described by a polynomial equation $x^2+y^2-1 = 0$. As we learn at school, to study the properties of the circle we can exploit both its geometry and the properties of its equation (algebra). More generally, algebraic geometry is the science of algebraic varieties, which are zero sets of a collection of polynomial equations.

Tensors (also referred to as multi-way arrays) are present both in pure mathematics and in more applied sciences: computer science, engineering, physics, chemistry, etc. The central problem we will consider here is about tensor decomposition. That is, we have a set of tensors that are called simple and given any tensor, we would like to express it as a sum of simple tensors.



The quadratic surface, a two dimensional analogue of the circle. Figure provided by Zach Teitler (Boise State University)

As an example, imagine a single antenna that receives a signal from many mobile phones at the same time. The receiver must decompose this superposed electromagnetic wave into original simple signals, each one encoding a single conversation.

As another example, fluorescence spectroscopy is a method for analyzing samples of solutions and determining the concentration of chemicals. Each sample is excited by light at various wavelengths and the light emitted is measured. The data is collected as a tensor, and we need to determine the decomposition of this tensor in order to extract information about the chemicals and their concentrations.

In other words, for many sciences it is critical to extract simple and meaningful ingredients from some complicated data. In mathematical terms, this corresponds to the problem of decomposing tensors. It is a relatively new idea to use algebro-geometric methods for improving explicit calculations, the

More and more people are using mobile phones, and a great deal of advanced mathematics is involved in wireless communication. An important part of it involves the theory of tensor decomposition

efficiency of algorithms decomposing tensors, as well as purely theoretic results about these decompositions. The key notions here are *ranks of tensors* and *secant varieties*.

The *rank of a tensor* is the minimal number of simple tensors that are needed in the decomposition. Thus in the examples above, it *should* correspond to the number of mobile phones talking, or the number of different chemicals in the solutions. But it might not necessarily correspond, because there are situations when the decompositions are not unique. For example, if there are too many mobile phones for the capabilities of the antennae, or too few samples with solutions containing too many different chemicals. The *r-th secant variety* is essentially the set of tensors of rank at most *r*. [1]

There are many variants of the problem, for instance, we can consider general tensors, symmetric tensors, skew-symmetric or partially symmetric tensors, etc. Some of the present author's research deals with general tensors and partially symmetric tensors, but my main interests lie in symmetric tensors, equivalent to problems regarding multivariable homogeneous polynomials. For the rest of the article we will concentrate on this case.

In this setting, the simple tensors are just polynomials in $x_1, x_2, \dots, x_n$ which are powers of linear forms:

$$\ell^d = (a_1x_1 + a_2x_2 + \cdots a_nx_n)^d.$$

Here x_i are the *variables*, n is the number of variables, d is the degree, and a_i are some numbers. A homogeneous polynomial of degree d is a sum of terms of the form $bx_1^{e_1}x_2^{e_2}\dots x_n^{e_n}$, where b is a number, $e_i \geq 0$ are integer numbers, and $e_1 + e_2 + \cdots + e_n = d$.

The decomposition problem is now to express a general homogeneous polynomial $f(x_1, x_2, \dots, x_n)$ of degree d as a linear combination of simple tensors:

$$f(x_1, x_2, \dots, x_n) = c_1\ell_1^d + c_2\ell_2^d + \cdots + c_r\ell_r^d.$$

Here c_j are constants, whereas $\ell_j = \ell_j(x_1, x_2, \dots, x_n)$ are some linear forms. We also request that r is as minimal as possible. For example if $n = 2$, $d = 3$, then:

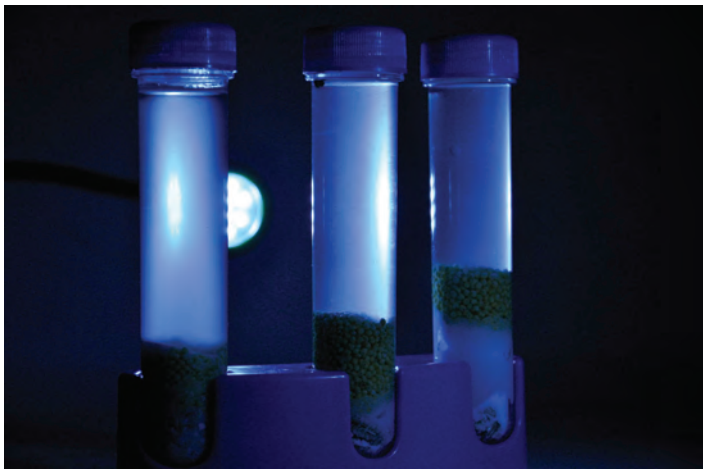
$$f(x_1, x_2) := x_1(x_1^2 + 3x_2^2) = \frac{1}{2}(x_1 - x_2)^3 + \frac{1}{2}(x_1 + x_2)^3$$

has a unique decomposition. The linear forms $\ell_1 = (x_1 - x_2)$ and $\ell_2 = (x_1 - x_2)$ can be recovered from f by noticing that

$$\left(\frac{\partial}{\partial x_1} + \frac{\partial}{\partial x_2}\right)\left(\frac{\partial}{\partial x_1} - \frac{\partial}{\partial x_2}\right) f = 0.$$

The linear polynomial ℓ_1 is dual to $\left(\frac{\partial}{\partial x_1} + \frac{\partial}{\partial x_2}\right)$ and ℓ_2 is dual to $\left(\frac{\partial}{\partial x_1} - \frac{\partial}{\partial x_2}\right)$. This is an easy application of a general method called *apolarity*, and with more variables $(n > 2)$ it is much more complicated, but still successful in some interesting cases.

To find the decomposition it is essential to know the rank of a tensor, or at least to know a sensible bound for the rank. Thus one needs an easy-to-verify criterion to determine ranks. This is provided by *defining equations* of secant varieties.[2]



While we do not actually use spectroscopy in our research at the PAS Institute of Mathematics, we do work on the theory of tensor decomposition that underlies the method. Here are some toys of the author's daughter. *Oats*, *potato starch* and *millet* represent chemicals with various fluorescent properties, and they are dissolved in water in different concentrations

In my research joint with two Americans – Joseph Landsberg, a mathematician from Texas, and Adam Ginensky, a businessman from Chicago who also does research in pure mathematics – we have introduced several new ideas into this subject. Building on that pioneering work, my wife Weronika Buczyńska and I have calculated explicitly very nice forms of defining equations of many secant varieties of importance, thus providing efficient methods for calculating ranks in some of the interesting cases.

Buczyńska and I, together with Zach Teitler, an American mathematician from Idaho, have further found explicit decompositions for a few types of

[1] More precisely, the secant variety also contains limits of such tensors.
[2] This is not precise, as these equations only provide tests for *border rank*. For many applications this is sufficient.

polynomials, including all monomials. In our ongoing research we are calculating the criteria for another type of decompositions, which we call *direct sum decomposability*. Further research in this area is being conducted in collaboration with the Italian group of mathematicians: Enrico Carlini, Maria Virginia Catalisano, and Gianfranco Casnati.

Research on tensor and polynomial decompositions is motivated by applications. But the elegance and beauty of this field of science also derives from pure mathematics. There are many interactions of tensor studies with differential geometry, algebra, representation theory, combinatorics, and problems considered by geometers in the 19th century.

This research is a part of the project entitled "Secant varieties, computational complexity, and toric degenerations," 2012-2014, being carried out under the Homing Plus programme of Foundation for Polish Science, co-financed by the EU Regional Development Fund. It is also a part of "Canaletto," an international cooperation scheme between Italy and Poland, under the project "Computational complexity, generalized Waring type problems and tensor decompositions," 2013-2015.

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The cell behind the wall

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In his essay *On Proof and Progress in Mathematics*, William P. Thurston includes two basic objects in his definition of mathematics: natural numbers and plane and solid geometry. Most people, asked about mathematics, immediately think about school arithmetic and computing machines, and occasionally, prime numbers. We somehow forget geometry, the second leg of mathematics, more ancient than Euclid's *Elements.* The five regular solids were related by Plato to the elements from which the universe was assumed to be built of. Those solids, the honeycombs that they admit, their groups of symmetries and generalizations to higher dimensions is what forms the essence of G*eometric Group Theory*.

When asked about the usefulness of studying 4-dimensional polytopes, one could answer by citing H.S.M. Coxeter's words from his wonderful book: *We can never fully comprehend them by direct observation. In attempting to do so, however, we seem to peep through a chink in the wall of our physical limitations, into a new world of dazzling beauty. Such an escape from the turbulence of ordinary life will perhaps help to keep us sane.* The beauty of the polyhedra, their subdivisions and tilings, is the force that drives the present author's research.

Consider the following question that your next-door neighbor will enjoy trying to solve on a rainy evening: Is there a triangulation of a square into acute-angled triangles? In other words, can we cut up a square into triangles all of whose angles are acute? Let us also require that a vertex of one of these triangles must not land inside the edge of another.

A first try would be to cut the square along a diagonal into two right-angled triangles. This does not suffice since we required the angles to be acute

and not just non-obtuse. Trying to subdivide any of these triangles with a cut starting at the right angle also does not do the trick: one of the two angles at which the cut reaches the opposite side is not acute. After several attempts we discover the following necessary conditions for an acute triangulation:

1. We have to add edges issuing from all the vertices of the square.
2. If we add a vertex of the triangulation at the boundary of the square, we have to add at least 2 edges issuing from that vertex.
3. If we add a vertex of the triangulation in the interior of the square, we have to add at least 5 edges issuing from that vertex.

The requirement that there must be 5 edges around each vertex seems to be a very unusual, strong condition, until we realize that we know an object with this property. It is the icosahedron – the Platonic solid whose boundary consists of 20 equilateral triangles, with 5 triangles meeting at each vertex. Inscribing part of the boundary pattern of the icosahedron into the square leads to a handful of solutions. One is drawn in Figure 1 on the left. We challenge the reader to find an acute triangulation of the square with only 8 triangles. In fact, it has been proved that all 2-dimensional polygons admit acute triangulations. For a survey on the subject, see the article by Tudor Zamfirescu.

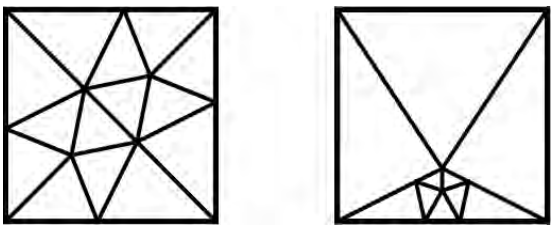

Fig. 1. An acute triangulation on the left. The dissection on the right is not a triangulation (E. Kopczyński, Institute of Informatics, University of Warsaw)

To my great surprise, I recently learned that the problem of finding an acute triangulation of the 3-dimensional cube, and in general cubes in higher dimensions, remained open. The condition of being *acute* means, say for the 3-dimensional cube, that the tetrahedra into which we cut the cube have all their dihedral angles acute. Hence we have a similar condition as in dimension 2. Around every edge

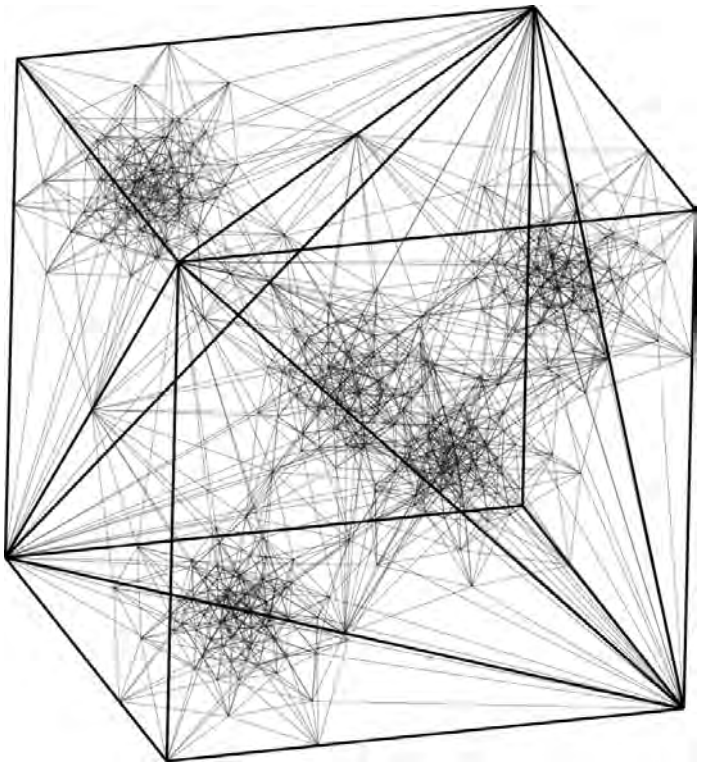

Fig. 2. Acute triangulation of the cube (E. Kopczyński, Institute of Informatics, University of Warsaw)

that we add inside the cube there have to be at least 5 tetrahedra.

One might again be discouraged by that condition and abandon attempts of finding an acute triangulation, if one is not aware of Coxeter's table of 4-dimensional regular polytopes. There is a 4-dimensional solid, called the *600-cell*, whose boundary consists of 600 regular tetrahedra arranged so that around each edge in the boundary exactly 5 of these tetrahedra meet. Taking particular 543 tetrahedra from this arrangement gives a non-trivial acute triangulation of a large tetrahedron and assembling 5 such triangulations together gives an acute triangulation of the 3-dimensional cube with 2715 tetrahedra. The solution that E. Kopczyński, I. Pak, and I have found, inspired by previous work with J. Świątkowski, is illustrated in Figure 2.

We close the article by mentioning that we also prove that there are no acute triangulatons of cubes in higher dimensions. This is reflected by the fact that in dimension 5 there is no replacement for the icosahedron in dimension 3 and the 600-cell in dimension 4. Once again it turns out that solving a recreational mathematics problem required just a peep onto the other side of Coxeter's wall.

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Carbon cycling in the Baltic Sea

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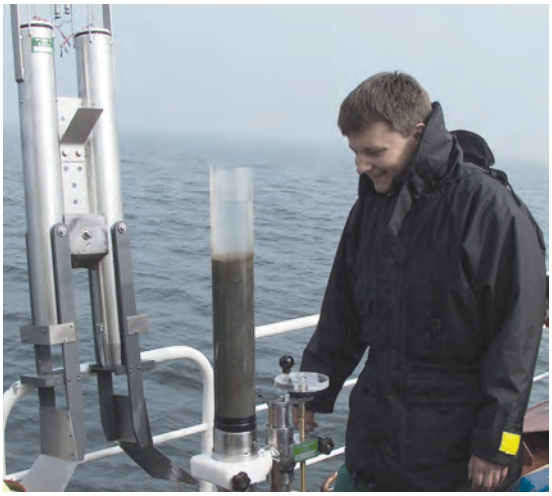
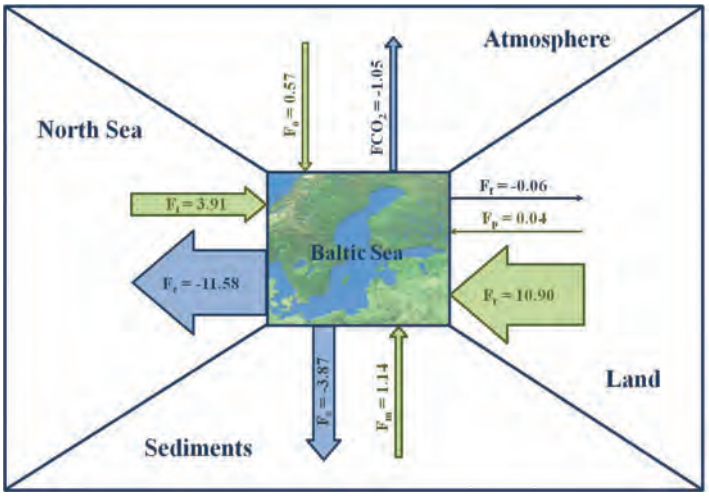
The Baltic Sea carbon cycling studies performed at the PAS Institute of Oceanology in Sopot constitute part of the global scientific effort focused on evaluating interactions between the functioning of natural ecosystems and anthropogenically driven climate change. Long-term studies carried out at the institute have covered both modelling and experimental research performed from aboard the research vessel Oceania and at the PAS Institute of Oceanology laboratories. The results obtained have enabled a carbon budget to be worked out for the Baltic Sea, including all of the important carbon sinks and sources: input from land via rivers, exchange with the North Sea via the Danish straits, sediment burial, atmospheric deposition, fish catches, CO_2 exchange with the atmosphere through the seawater surface, etc. The results indicate that the Baltic Sea emits approx. 3.8 million tons of CO_2 into the atmosphere annually.



Sediment core



Carbon budget

The carbon cycle links all three of the Earth's surface compartments: land, ocean, and atmosphere. The major carrier of matter in this cycle is CO_2. Due to its physico-chemical properties, CO_2 absorbs infrared radiation and is thus considered one of the greenhouse gases. Large amounts of CO_2 have been emitted into the atmosphere as a result of the socio-economic development within the last several decades. These anthropogenic CO_2 emissions originate mostly from fossil fuels combustion and cement production and contribute significantly to global climate change. At the same time, numerous scientific efforts aim to quantify carbon dioxide sinks

and sources. It has been estimated that the oceans are responsible for the uptake of approx. 30% of the global CO_2 emissions, reducing the negative impact of the anthropogenic activities. The role of the coastal seas in the global CO_2 cycle, although indicated as exceeding the aerial contribution of the seas to the World Ocean, is still unclear.

Although the Baltic Sea is one of the best explored marine areas in the world, there has as yet been no straightforward understanding of the role played by the entire Baltic Sea in the CO_2 air-sea exchange. The Baltic Sea is characterized by high dynamics and significant, temporal and spatial variability of the environmental conditions occurring here. Previous CO_2 air-sea exchange studies were usually performed locally and/or covered a short period of time. Thus the results of different studies were often divergent and sometimes even contradictory.

The research performed at the PAS Institute of Oceanology was aimed at assessing the carbon budget for the Baltic Sea as a whole. The most important sinks and sources of carbon were defined and each of them was investigated to the extent that quantification was achieved. Since the annual mean carbon concentrations have recently been relatively constant, it was assumed that carbon sources to the Baltic Sea should be comparable to the carbon sinks. Based on this assumption and the previously quantified carbon fluxes, the direction of the net CO_2 exchange with the atmosphere and its magnitude were determined for the entire Baltic Sea. The results indicate that the Baltic Sea is a net source of CO_2 to the atmosphere and emits approx. 1.05 million tons of carbon into the atmosphere as CO_2 (3.8 million tons of CO_2). This proves that the emission of CO_2 from the Baltic Sea to the atmosphere is higher than its uptake, a feature never before indicated.

The sea is, therefore, a marine area heterotrophic in nature, where respiration predominates over photosynthesis. However, one may ask: How is it possible for a sea known for eutrophication and intensive phytoplankton blooms driven by a high nutrient input from land to be considered a eutrophicated basin? An answer to this question was also provided by the carbon budget. The results indicate that high carbon loads, both inorganic and organic, enter the Baltic Sea with the river run-off. They supply the Baltic Sea with approx. 11 million tons of carbon annually. As much as 38% of this carbon load is attributed to organic carbon. Moreover, the river water entering the Baltic Sea is often significantly oversaturated with CO_2, disturbing the carbonate system and causing increased CO_2 partial pressure in seawater. Additionally, mineralization of the terrestrial organic matter in well oxygenated seawater contributes to higher CO_2 as well. Given all this, question mentioned above might actually be posed differently: Why is the CO_2 emission to the atmosphere so low? It definitely would be even higher in the Baltic Sea if the so called "biological pump" did not work so efficiently here. The biological pump is driven by phytoplankton activity. In the course of photosynthesis, phytoplankton organisms bind the CO_2 dissolved in a seawater, turning it into organic matter and, eventually, incorporating it into the food web. The assimilated CO_2, already as an organic carbon, is transported through the food chain. Some part of this organic carbon is released back to the water column as CO_2 being the by-product of respiration. However, a part of it settles to the sediments as detritus where is buried and thus excluded from the actual carbon cycle. Organic carbon burial is strengthened by the high organic matter accumulation rates observed at the depositional areas of the Baltic Sea and frequent anoxic conditions that occur in the bottom areas. Thus the Baltic Sea acts as a buffer absorbing most of a significant input of carbon from land.

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Magnetic-field-induced superconductivity in the antiferromagnetic, heavy-fermion superconductor $Eu(Fe_{0.81}Co_{0.19})_2As_2$

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The distinct difference between BCS-type and unconventional triplet superconductivity manifests itself in their responses to external magnetic fields. An applied field easily extinguishes s-wave singlet superconductivity by both the paramagnetic and orbital pair-breaking effects. On the other hand, the field hardly destroys a triplet superconducting state because the paramagnetic effect is not so efficacious, owing to spins of the Cooper pairs readily aligned with the field. This suggests that the triplet superconductivity may be more easily modified by the orbital effect. Appropriately if one can break down the orbital effect, then one can recover the superconductivity. This fact suggests that the triplet superconductivity will be much more sensitive to the effects associated with the orbital movement of carriers in an applied magnetic field. This means that if we can weaken the orbital effect then we will able to increase the critical temperature. Recently, we have shown that this phenomenon occurs in an antiferromagnetic, heavy-fermion $Eu(Fe_{0.81}Co_{0.19})_2As_2$ superconductor.

The single crystals of $Eu(Fe_{0.81}Co_{0.19})_2As_2$ we investigated were grown using tin as a flux. To control sample quality we used transmission and scanning electron microscopy (TEM and SEM) and x-ray diffraction techniques. The SEM picture of the largest grown crystal with dimensions of 0.7×2.5x3.5 mm^3 (Fig. 1 a) has the chemical composition $Eu(Fe_{0.81\pm0.02}Co_{0.19\pm0.02})_2$. Analysis of the x-ray pattern of powdered small crystals reveals a tetragonal $ThCr_2Si_2$-type structure (space group I4/mmm) and lattice parameters a = 0.39115(4) nm and c = 1.20805(2) nm.

The low-temperature properties of $Eu(Fe_{0.81}Co_{0.19})_2As_2$ were investigated by measuring ac-magnetic susceptibility, dc magnetization, magnetic torque, specific heat, electrical resistivity, magnetoresistance, and the Hall effect. The obtained data indicate multiple phase transitions in zero magnetic field – from structural distortion (SD) and spin density wave at $T_{SD/SDW}$ = 80K, through a canted antiferromagnetic order (C-AF) at T_N = 16.5±0.5K, and finally to superconducting state (SC) at T_c = 5.2±0.05 K (Fig. 1 b). The mechanism responsible for the canting structure in $Eu(Fe_{0.81}Co_{0.19})_2As_2$ and in other Co-doped alloys has been discussed in terms of the Fert-Levy model, which includes the Ruderman-Kittel-Kasuya-Yosida interaction and spin-orbit coupling between conduction electrons and nonmagnetic Co ions. Notably, results from the specific heat and Hall effect measurements justify the conclusion that $Eu(Fe_{0.81}Co_{0.19})_2As_2$ with distinctly enhanced effective mass m^* ~ 80 m_e, with a low mobility μ_H = 35 m^2/Vs, and with a large magnetic penetration depth λ = 350 nm is a new heavy-fermion superconductor.

Under applied fields, both the C-AF and SC phases evolve unusually. A magnetic field visibly affects the canted spins, causing a separation of C-AF into two new phases: C-AF and ferromagnetic (F). However, an important finding is the coexistence of magnetism and superconductivity, for the latter an increase of T_C occurs by application of a magnetic field parallel to the *ab*-plane. It is observed that in fields above 0.4 T, T_C reaches 6.65±0.05K, i.e., T_C is increased by 27% in comparison to that in zero field. This discovery makes $Eu(Fe_{0.81}Co_{0.19})_2As_2$ an interesting example as only the fourth such case known in the literature, after $Eu_xSn_{1-x}Mo_6S_8$, λ-[bis(ethylenedithio)tetraselenafulvalene]$_2FeCl_4$ and URhGe. In the case of $H \parallel c$, T_C shows a sudden drop at a magnetic field ~0.4 T. The behavior of the upper critical fields, presented in the H-T phase diagrams for $H \parallel c$ and $H \parallel ab$ (Fig. 2), can be interpreted as being due to a change in the pair-breaking orbital effect. Especially, for $H \parallel ab$ magnetic-field-induced superconductivity is caused by a vanishing ferromagnetic component of the Eu^{2+} ions along the *c*-axis.

Such field-induced superconductivity is expected in unconventional triplet superconductors, where the superconductivity of the Cooper pairs (from the electrons of Fe^{2+} with spins on the ab-plane) can be tuned by suitable alignments of localized moments (of the Eu^{2+} ions in the case of $Eu(Fe_{0.81}Co_{0.19})_2As_2$).

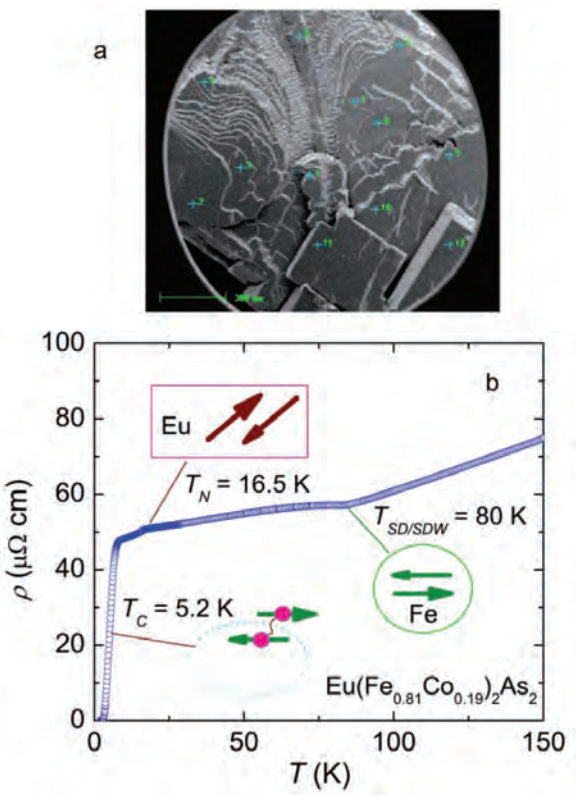

Fig. 1. a) SEM image of a single crystal $Eu(Fe_{0.81}Co_{0.19})_2As_2$. The chemical composition of the sample was determined from energy dispersive x-ray (EDX) spectra collected at the denoted points. b) Temperature dependence of the electrical resistivity $Eu(Fe_{0.81}Co_{0.19})_2As_2$ of phase transitions. $T_{SD/SDW}$ – Temperature of structural distortion (SD) and spin density wave (SDW), T_N – Antiferromagnetic ordering temperature of the Eu^{2+} moments with canted angle ~55° with respect to the *c*-axis, T_C – Critical temperature of the Cooper pairs formed from the electrons of iron

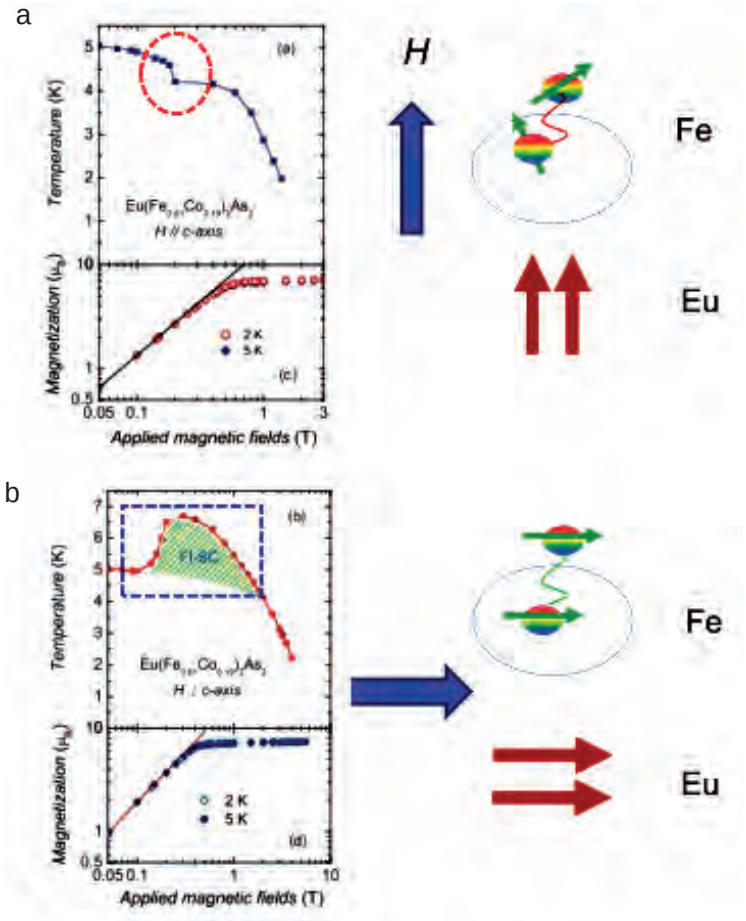

Fig. 2. a) *H-T* phase diagram and magnetization for $H \parallel c$. The critical temperature shows a sudden drop at the magnetic field, where spin-flop occurs. The phenomenon is related to the appearance of an additional magnetic field from the Eu^{2+} moments. b) *H-T* phase diagram and magnetization for $H \parallel ab$. Field-induced superconductivity is interpreted as a weakening of the orbital-breaking effect, as a result of the vanishing ferromagnetic component of the Eu^{2+} ions along the *c*-axis

We believe that field tuning superconductivity may open new possibilities leading towards the fabrication of field-controlled devices.

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Engineering Sciences

As of the end of 2012, Division IV: Engineering Sciences had 73 national members (39 ordinary and 34 corresponding) as well as 37 foreign members. One foreign member, Prof. R. A. Young passed away during the year.

Two plenary meetings of PAS Division IV were held in 2012. The Dean of Division IV summoned the spring plenary session on 14 April at the Staszic Palace in Warsaw. Attendees listened to an interesting presentation by Prof. Józef Dubiński, director of the Central Mining Institute in Katowice, entitled "Challenges Faced by the Mining Sciences, Given the Future Needs of the Polish Economy."

A report by the Division's Awards Commission, chaired by Prof. Romuald Będzinski, was discussed and a resolution was adopted on enacting new by-laws for the Division IV Awards. Next, five new Award Sub-Commission chairs were selected: Prof. Władysław Włosiński (general), Prof. Zenon Mróz (A: mechanics), Prof. Wiesław Woliński (B: electronics and information technology), Prof. Ryszard Pohorecki (C: chemical technology), and Prof. Piotr Korcelli (D: architecture and construction) were elected.

A report by the Division's Sections Commission, presented by its chair Prof. Ryszard Pohorecki, was likewise discussed. Prof. Michał Kleiber pointed out that the appropriate creation of sections within Division IV was very important for the better integration of its research fields and for harnessing the advantage of synergy. An important part of the session involves presentations of the scientific research fields of four new elected (15 December 2011) members of the Young Academy: Asst. Prof. Magdalena Rucka (Gdańsk University of Technology), Dr. Katarzyna Agnieszka Rutkowska (Warsaw University of Technology), Asst. Prof. Roman

From left: Prof. Marian Kaźmierkowski, Prof. Marek Chmielewski, Dr. Łukasz Dębowski, Asst. Prof. Jarosław Guziński, Prof. Michał Kleiber, Dr. Kinga Skalska, Asst. Prof. Katarzyna Kowalczyk-Gajewska, Asst. Prof. Damian Słota, Asst. Prof. Adam Smoliński, Prof. Piotr Korcelli (M. Mlekicki)

Asst. Prof. Jarosław Guziński from Gdańsk University of Technology, laureate of the Division IV Scientific Award (M. Mlekicki)

Dr. Kinga Skalska from the Łódź University of Technology, laureate of the Division IV Scientific Award (M. Mlekicki)

Szewczyk (Warsaw University of Technology and Industrial Research Institute for Automation and Measurements, Warsaw), and Asst. Prof. Tomasz Markiewicz (Warsaw University of Technology).

The autumn session was held on 18 October at the PAS Nałęcz Institute of Biocybernetics and Biomedical Engineering. Debate concentrated on selecting candidates for the Division's research awards, which were conveyed as follows: to Asst. Prof. Katarzyna Kowalczyk-Gajewska from the PAS Institute of Fundamental Technological Research for her DSc (*habilitation*) thesis on *Micromechanical Modeling of Metals and Alloys of High Specific Strengths*; to Asst. Prof. Damian Słota from the Silesian University of Technology, Gliwice, for a set of ten papers presenting an original algorithm solving the inverse Stefan problem; to Dr. Łukasz Dębowski from the PAS Institute of Computer Science for a set of individual authored papers on computational linguistics; to Asst. Prof. Jarosław Guziński from the Gdańsk University of Technology for his DSc (*habilitation*) thesis on *Electric Drive Systems with Induction Motors Fed by Inverters with Output Filters: Selected Problems*; to Dr. Kinga Skalska from the Łódź University of Technology for her PhD thesis on *Investigation of the Nitrogen Oxide Ozonation Process*; and to Asst. Prof. Adam Smoliński from the Central Mining Institute for his DSc (*habilitation*) thesis on *Unconventional Methods of Hard Coal Utilization in Hydrogen-Rich Gas Production*; the ceremonial presentation of these awards was held at the seat of the Division on 6 December. Attendees also listened to a presentation about research and projects by Prof. Eugeniusz Mokrzycki, director of the PAS Mineral and Energy Economy Research Institute in Kraków.

In 2012 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: *Topology optimization and sensitivity analysis* (Vol. 60, No. 2), *Data mining in bioengineering – Selected problems of robot control* (Vol. 60, No. 3), *Laser technology and applications – Papers based on selected presentations at the 11th National Conference of Electronics* (Vol. 60, No. 4). The first issue in 2012, *Varia* (Vol. 60, No. 1), included papers from different fields of engineering science. The quarterly has been rated 41 in the world in the field of *Engineering* and it has been the only Polish periodical in technical sciences to hold a Q1 index. The Bulletin's impact factor for 2011 was 0.966.

In 2012 the Dean of PAS 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 PAS-coordinated cooperation, wherein the Polish side is represented by a research institute of the Division.

The Dean of the Division as well as the Chair of its 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.

Academy members belonging to Division IV received a number of honors and distinctions in 2012. *Honoris causa* honorary doctorates were granted to Prof. Romuald Będziński by the Medical University of Wroclaw, to Prof. Zenon Mróz by Bialystok University of Technology, to Prof. Józef Dubiński by the AGH University of Science and Technology, to Prof. Michał Białko by Koszalin University of Technology, Prof. Tadeusz Kaczorek by Rzeszow University of Technology, to Prof. Michał Kleiber by the Casimir the Great University in Bydgoszcz, and to Prof. Marian Kaźmierkowski by the University of Zielona Gora. Prof. Władysław Findeisen was honored with the highest Polish state distinction, the Order of the White Eagle. He was also distinguished with a decoration from the Holy See – the Order of St. Gregory the Great: Knight Commander with Star. Prof. Józef Korbicz was distinguished with the Knight's Cross of the Polonia Restituta Order, and Prof. Bogusław Major was decorated with the Officer's Cross of the Polonia Restituta Order. Profesor Władysław Włosiński earned a medal from the Warsaw University of Technology. Prof. Tadeusz Kaczorek and Prof. Jacek Błażewicz received the title of IEEE Fellow, and Prof. Błażewicz was also distinguished with the *Copernicus Prize*. Prof. Tadeusz Chmielniak received the Prize of the Polish Minister of Science and Higher Education for Lifetime Achievements. The Japanese Government awarded Prof. Michał Kleiber the Order of the Rising Sun: Golden and Silver Star, while the Committee for the Promotion of German-French-Polish Cooperation honored him with the Adam Mickiewicz Award. Prof. Józef Dubiński received the *Laurel of Merit* Award from the Association of Mining Engineers and Technicians. Prof. Józef Korbicz was decorated with the Golden Badge of the Polish Theoretical and Applied Electronics

Society. The Czech Mechanical Engineering Society honored Prof. Romuald Będziński with the Leonardo da Vinci Medal. Prof. Jacek Marecki received the "Apollo" statuette for scientific contribution to the development of the field of energy. Poznań University of Technology honored Prof. Czesław Cempel with the title of *distinguished professor*. Prof. Bogusław Major received the diploma of *AGH Material Science School Honorary Professor* and was appointed member of the World Academy of Materials and Manufacturing Engineering.

The Council of Provosts of PAS Division IV completed its second year of activity. Its main focus in 2012 was on the following issues: (1) further refinement of the rules for evaluating the scientific committees affiliated with Division IV, (2) initiating and conducting competition procedures for appointing new directors of the Division IV institutes, (3) collaborating with the Dean of Division IV on conducting the process of electing new national and foreign members of the Academy, including the development of new rules and procedures to ensure the more efficient conduct of the election process, (4) initiating the processes of evaluating the institutes and scientific committees of Division IV, (5) analyzing and resolving other problems within the jurisdiction of the Council of Provosts.

As concerns the first issue, the Council of Provosts of Division IV proposed a set of rules for evaluating scientific committees, based on the general guidelines proposed at meetings among all the Academy's divisions, albeit adapted to the specifics of engineering sciences. The rules proposed by Division IV were subsequently slightly modified (in both qualitative and quantitative aspects) to suit the needs and specifics of evaluating the scientific committees of other Academy divisions, then accepted as a general framework to be employed within the Academy at large.

Another important part of the activities of the Division IV Council of Provosts has consisted in initiating and conducting competitions to identify new directors for those institutes where the appointed terms of the directors have come to an end. More specifically, in 2012 it successfully completed competitions for the post of director at the following institutes: the PAS Institute of Environmental Engineering in Zabrze, the PAS Institute of Hydroengineerings in Gdańsk, and the PAS Mineral and Energy Economy Research Institute in Kraków. The individuals so elected were, respectively: Dr. Fransiszek Pistelok, a newly elected director, as well as Prof. Andrzej Sawicki and Prof. Eugeniusz Mokrzycki, re-elected for a second term. The nominations were then conveyed by Prof. Marek Chmielewski, Vice-President of the PAS, according to a longstanding tradition. The outcomes of these election procedures have met with satisfaction from the respective scientific communities.

Another important aspect of the involvement of Division IV Council of Provosts was the presence of its chairman, Prof. Janusz Kacprzyk, at the 60th Anniversary of the PAS Institute of Metallurgy and Materials Science, held in Kraków in November 2012. This visit had provided an opportunity to better know the Institute, its collaborators, laboratories, and many examples of its successful research and organizational activities. Moreover, that very well organized event provided an opportunity to meet representatives of virtually all university departments and scientific and research institutes in the fields of materials science, metallurgy, and related ones.

One additional activity of the Division IV Council of Provosts in 2012 which has certainly had a very important impact involved the further strengthening of the Center of Laser Metal Technologies, a joint research unit of the Polish Academy of Sciences and the Kielce University of Technology. A new statute has been adopted and a new scientific council appointed. It is worth noting the very positive assessment of the Center's activities and educational and research results.

And last but not least, the Division IV Council of Provosts was also actively involved in the 60th Anniversary of the Polish Academy of Sciences, notably in the portion involving the scientific program and presentation of results of the best teams and researchers of various institutes of Division IV. This contributed to the undisputed success of the anniversary events, which highlighted the great achievements and leading role of the Polish Academy of Sciences to the scientific community, politicians, media, and general public.

Modular construction of cut-free sequent calculi for paraconsistent logics

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Intelligent information systems (IIS) are a great challenge of modern times. They represent the next generation of information systems, integrating artificial intelligence and database technologies. A great role in constructing IIS is played by logic. The aim of the research described below was to develop advanced logical methods for reasoning with inconsistent information, which is a ubiquitous phenomenon that IIS must cope with.

Though large knowledge bases virtually always contain some inconsistencies, they can still produce useful answers to queries, for inconsistencies affect only a small part of data. However, ordinary logic, called *classical* (CL), cannot be used for drawing conclusions from the information contained in such databases, because in CL any inconsistency makes non-trivial reasoning impossible. Accordingly, over the last decades there has been a growing interest in computer science applications of *paraconsistent logics*, which allow non-trivial reasoning in the presence of contradictions. Such applications include, for instance, integration of information from multiple sources in large knowledge bases, negotiations among agents with conflicting goals, and complex software specifications in which different parties have incompatible requirements. We believe that the results described below can open the door to the construction of efficient IIS using this type of paraconsistent logics for reasoning under inconsistent information.

The said results concern logics known as *C-systems,* an important class of paraconsistent logics developed by the famous Brazilian logician Newton da Costa. His idea was to allow the use of classical logic whenever safe, but handle contradictions completely differently. This led to the introduction of the family of Logics of Formal (In)consistency (LFIs), where propositions are divided into "normal" (consistent) ones, and "abnormal" (inconsistent) ones. While classical logic is applied freely to normal propositions, its use for the abnormal ones is restricted. *C*-systems are the most important class of LFIs, where normal formulas are distinguished using a special connective ○.

Since the introduction of *C*-systems in the 1960s in terms of so-called Hilbert-style systems, the main obstacle to their efficient use has been the lack of uniform analytic calculi for them. Though over the years some analytic calculi have been introduced for a few *C*-systems, each of them was tailored to some specific *C*-system, their rules were introduced in a rather ad-hoc manner, and had no uniform structure. Therefore, any modification in the axioms of a given *C*-system would imply the necessity to look for the corresponding analytic calculus almost from scratch.

This problem is eliminated by the results given in Avron, Konikowska & Zamansky (2012a, 2012b), obtained in cooperation with Prof. A. Avron and Dr. A. Zamansky from Israel. They provide a *uniform*, *modular* method for *systematic* generation of sequent calculi without the cut rule for a large family of paraconsistent logics, which includes practically every *C*-system ever studied in the literature. (The sequent is a well-known logical construct representing consequence between sets of formulas).

The said method is based on providing new, uniform semantics for this family using so-called *non-deterministic matrices* (Nmatrices), a generalization of standard multi-valued logical matrices where the truth-value assigned to a complex formula is chosen *non-deterministically* out of a given non-empty set of options. The starting point is the axiom system **BK** adopted in virtually all *C*-systems, which is obtained by adding to a standard Hilbert system for classical positive propositional logic the axioms (**t**), (**b**), (**k**). Here (**t**) says that either a formula or its negation holds, (**b**) – that each formula is either normal or abnormal, and (**k**) asserts that if both a normal formula and its negation hold, then any other formula holds. We give **BK** semantics based on a three-valued Nmatrix M^3, and using the algorithm from [1] obtain a cut-free sequent system *G* sound and complete for M^3 and equivalent to **BK**, whose rules have a uniform form similar to that used in classical logic.

Next, we provide non-deterministic three-valued semantics for all systems **BK**[**A**] obtained by extend-

ing **BK** with any coherent set **A** of axioms for *C*-systems not containing certain special axioms denoted by **(l), (d)**. The semantics are *modular*. Namely, from each axiom in **A** we automatically extract certain semantic conditions, which after imposing on the basic Nmatrix M^3 lead to its refinements reducing the level of non-determinism. The semantics of **BK** [**A**], represented by an Nmatrix M^3[**A**], is obtained by combining the semantic effects of all the axioms from **A**. Finally, we translate the semantic effect of each extra axiom into the corresponding sequent rules. The resulting sequent system *G*[**A**] is sound and complete for M^3[**A**] and equivalent to **BK**[**A**].

If the axiom set **A** of a given *C*-system contains any of the axioms **(l), (d)**, the above method does not apply, for such a *C*-system has no finite semantic characterization based on an Nmatrix. However, it has an infinitely-valued characterization of this kind (sufficient to guarantee decidability), which can be used to extract a cut-free sequent calculus while preserving the crucial property of *modularity* of our method.

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Restoration using the hypolimnion removal method (Olszewski tube): Successful results at Pławniowice Reservoir (Upper Silesia region, south of Poland)

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Overloading a limnic ecosystem with excessive amounts of nitrogen and phosphorus (eutrophication) causes unwelcome changes in water quality and the general environmental condition of a reservoir. Intensive development of phytoplanktonic organisms, *Chlorophyta* and, lastly, cyanobacteria (*Cyanophyta*) can lead to a water reservoir being excluded from any type of utilization.

The flooding of the Taciszów IV stowing sand borrow pit (Silesian Voivodship) began in 1974 and gave rise to the Pławniowice Reservoir. It has an area of 225 ha, volume of 29 million m^3, and maximum depth of 15 m. The Pławniowice Reservoir, Dzierżno Małe Reservoir (110 ha, 10 million m^3), Dzierżno Duże Reservoir (650 ha, 95 million m^3) and the Gliwice Canal together form what is known as the Western Water Node of the Kłodnica River (total water table area – approx. 1000 ha; total volume – 140 million m^3). The reservoir water is discharged into the Kłodnica River below the weir in Pławniowice.

Limnological research has been conducted in Pławniowice Reservoir since its establishment. Research carried out in 1993-1998 revealed progressive deterioration of the reservoir. A process of internal enrichment, consisting in the release of phosphates under anoxic conditions, led to hypertrophication. Oxygen depletion was observed in the hypolimnion, reaching as deep as 4 m below the water surface. Water transparency ranged between 0.8 and 1.0 m during the summer stagnation period. At the same time, the water pH reached 10.7 as a result

of intensive primary productivity. Consequently, restoration of the reservoir became necessary.

The hypolimnion removal method was chosen for improving the situation. It was first used by Professor Przemysław Olszewski in Lake Kortowskie (near the city of Olsztyn) in 1956. By raising the water level in the lake, he obtained hydrostatic pressure which pushed out the bottom water (hypolimnion) through a wooden tube placed on the bottom of the lake (Olszewski tube). Importantly, the cost of using this method was very low. Additionally, it could work without any failure for a long time. Pławniowice Reservoir met the requirements for the Olszewski tube application. The topographic features enabled gravitational water outflow from the reservoir into the Kłodnica River and then into the Gliwice Canal.

Fig. 1. Outlet of the spillway weir – Pławniowice Reservoir

The restoration began in December 2003. Three plastic tubes were installed at the existing surface spillway weir, each of identical length (350 m) and internal diameter (500 mm). A decompression chamber was installed to protect the mechanism during tube closure.

The maximum hydraulic capacity of 16.5 million m^3/year was reached. Research into the changes caused by the restoration processes has been conducted since the Olszewski tube was installed. The systematic negative phosphorus balance (with nutrient removal prevailing nutrient introduction) caused a steady decline in the internal enrichment process (Fig. 2). The research demonstrated that the phosphate concentration in the reservoir hypolimnion gradually decreased during the summer stagnation period.

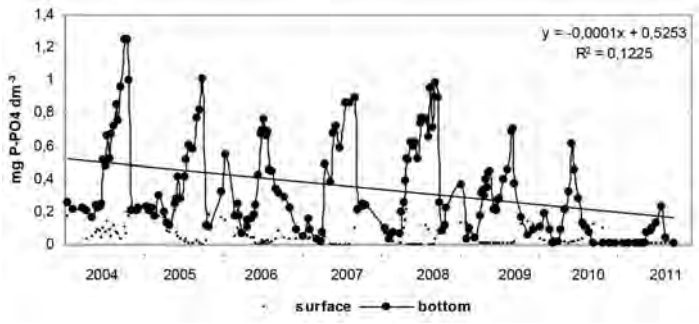

Fig. 2. Changes in phosphate concentrations, 2004-2011

In specific research years, the amount of the total phosphorus removed was approx. twice as large as the amount of phosphorus introduced into the reservoir. Phosphate phosphorus was prevalent in the total content. Its removed amount was between 2.5 and 3 times larger than that introduced. The balance of phosphorus compounds shows that the phosphorus content of the reservoir decreased by 27 tonnes in the years 2004-2012 (first eight years of restoration) due to the Olszewski tube application. Phosphates constituted 26 tonnes (96%) of that amount. Hence, the oligotrophication of the reservoir began (Fig. 3).

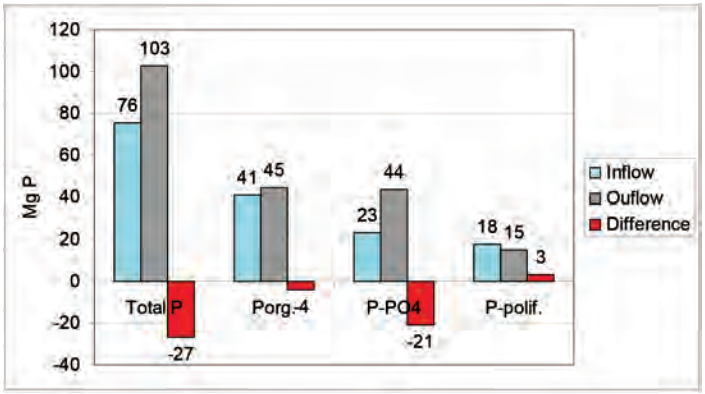

Fig. 3. Total phosphorus balance in Pławniowice Reservoir, 2004-2011

In the years 2004-2010, restoration processes caused a negative hydraulic capacity with phosphorus, which ranged between -0.48 and -3.3 g P/m^2/year. The internal enrichment process gradually diminished. The rate constant of phosphorus release from bottom sediments decreased from 0.0069 mg $P\text{-}PO_4/d^3$ in 2004 to 0.0025 mg $P\text{-}PO_4/d^3$ in 2011.

Water transparency is one of the most significant indicators for the changes in water quality. The research conducted in the years 1993-1998 demonstrated the lowest visibility of the Secchi disk. It was

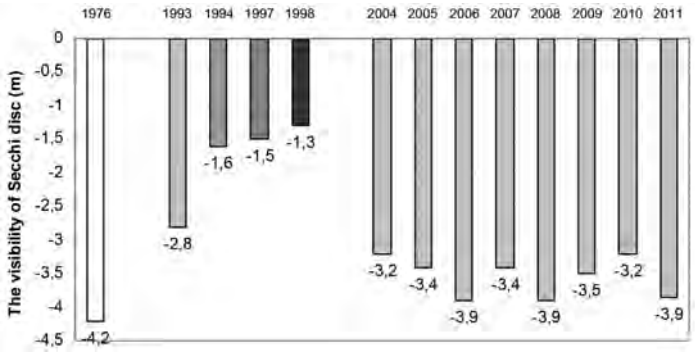

Fig. 4. The Secchi disc visibility in the summer stagnation period, 1976-2011

between 0.8 and 0.9 m during the summer stagnation period. The average values ranged between 2.8 and 1.3 m at that time (Fig. 4).

The visibility of the Secchi disk increased rapidly after the restoration process began. The Secchi disk was normally visible at a depth of 3-4 m for eight years. The maximum visibility of the Secchi disk was observed in July 2012 (7.5 m).

The application of the hypolimnion removal method (Olszewski tube) in Pławniowice Reservoir has therefore been successful, achieving its oligotrophication, i.e. lowering the nutrient content in the ecosystem. Oligotrophication resulted in improvements in water quality, such as a declining internal enrichment process and increased water transparency. The hypolimnion removal apparatus not only enhanced environmental condition of the reservoir, it also constituted a permanent defense mechanism against eutrophication.

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Continuum and atomistic modeling of crystal defects

P. Dłużewski | J. Cholewiński | Institute of Fundamental Technological Research | Polish Academy of Sciences

The rapid development of experimental techniques such as High Resolution Transmission Electron Microscopy (HRTEM) and tomography has recently allowed for the exploration and examination of material structure in a very wide spectrum of length scales, starting from the picometer through atomistic to the macro scale. In many cases, the nano scale, at which single atoms gather together into more-or-less ordered structures, takes the fundamental role.

The Computational Materials Science Division at the PAS Institute of Fundamental Technological Research specializes in modeling interdisciplinary problems situated on the border of solid mechanics, physics, chemistry, crystallography, and materials science. Special attention is focused on residual

stresses and crystal defects. Such defects significantly affect many physical and chemical properties of real materials, such as semiconductors and nanostructures. Although the main tool of computational materials science lies in computational methods, a crucial role in making progress is played by the theory of constitutive modeling and programing skills. Constitutive modeling is used to solve the problem of how to employ new important data extracted from experimental examination on materials as feedback into research on their characterization and production technology. The method developed at the PAS Institute of Fundamental Technological Research is based on the extraction of tensor and/or scalar fields from experimental images, e.g. lattice distortions or chemical concentrations, and using them in the next step in solving the boundary-value problems by the Finite Element method (FE).

If a structure is more complex than its meshing and the input of tensor fields is of different order into nodes compose more complex problem. As a consequence, prices of good computer programs for preprocessing input data with the FE method often exceed the prices of programs used in the main finite element calculations. Things seem to look no better for preprocessing input data for atomistic and *ab-initio* modeling. For example, there are no numerical methods or programs available using which the atomistic model of a 3D dislocation network with fixed, arbitrary chosen angles between dislocation elements could be preprocessed. By comparison, in preprocessing based on molecular dynamics, the random dislocation networks are generated by the inelastic deformation of initially perfect crystal structures. Figure 2 shows an example of reconstructed atomistic and FE models of a GaN quantum dot nucleated next to an edge dislocation piercing the AlN layer. Such a structure was observed experimentally.

One attempt at multiscale, finite element–atomistic pre-processing of input data is the Visual Editor of Crystal Defects (VECD), developed at the PAS Institute of Fundamental Technological Research (Fig. 1). The computer program gathers together: the processing of experimental data, FE meshing, and a reconstructed atomistic model of crystal defects. Through computer processing of the HRTEM image, a tensor field of lattice distortion can be extracted from computer image processing, and next such a tensor field can be input into a FE mesh. The

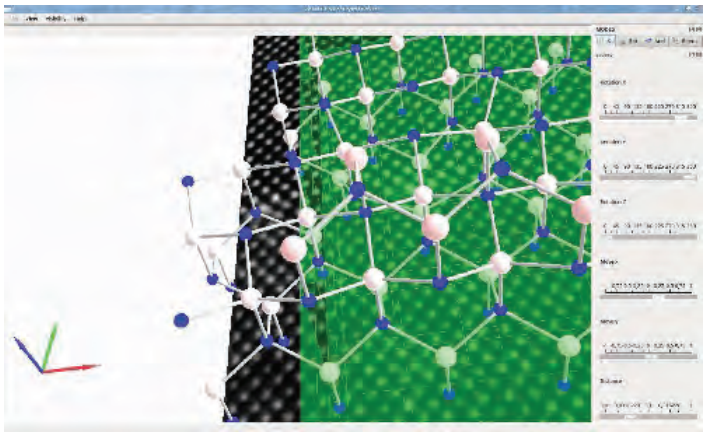

Fig. 1. Visual Editor of Crystal Defects – a program for reconstructing atomistic and finite element models of crystal defects

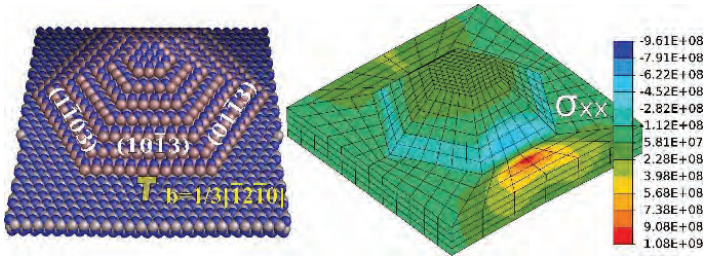

Fig. 2. Atomistic model of GaN quantum dot situated at the border of a threading edge dislocation piercing an A1N layer. The map of resultant residual stresses σ_{xx} has been visualized on the FE mesh

mesh is generated together with an atomistic model of crystal defects visible on the HRTEM image.

At the first step, positions of atoms forming a given dislocation net are reconstructed using a linear theory of dislocation, according to which the displacement of each atom from its initial position X can obtained by the use of the analytical formula $u_j(X)$ corresponding to the formation of the j^{th} elemental dislocation of the dislocation network,

$$u^{o} = \sum_{j=1}^{n} u_j(X)$$

Figure 3, as an example, shows a fragment of a preprocessed atomistic model of a misfit dislocations net formed between copper crystal and sapphire. In subsequent steps, the displacements are iterated to the analytical solution for lattice distortion determined in relation to the so called spatial configuration according to the following scheme:

$$\Delta u^{i+1} = -[1- \beta(X + u^{i})]^{-1} [u^{i} - f(X + u^{i})],$$

where β and f are the analytical functions determined in the linear theory of dislocation, Δu^{i+1} is the

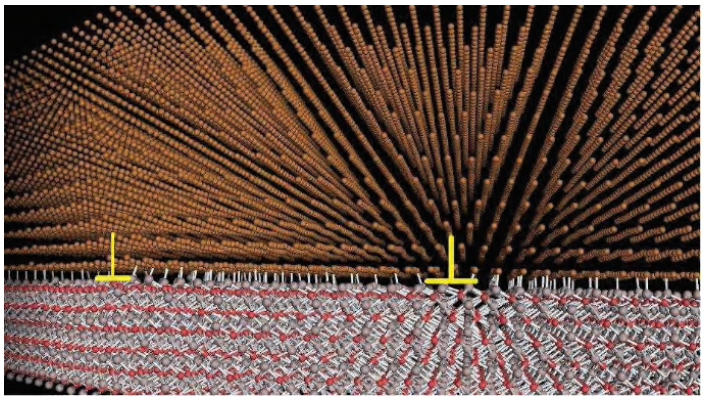

Fig. 3. Atomistic reconstruction of misfit dislocation net in the interfacial zone of Cu/Al_2O_3 heterostructure

shift of a given atom in the i^{th} + 1 iteration. Instead of the aforementioned analytical approach corresponding to solving an implicit equation set, the position of atoms can be fitted directly to positions determined from the HRTEM image and/or to numerical solutions obtained by solving a FE boundary-value problem for chemo-, electro-, and/or -mechanical fields coupled with the residual stresses induced by crystal defects.

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An outline of the mechanics of granular soils

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Sawicki's book (2012) summarizes the results of research on the mechanics of non-cohesive (granular) soils conducted at the PAS Institute of Hydro-Engineering. The author discusses experimental and theoretical investigations of the behaviour of dry and saturated soils before the limit state is reached and under extreme conditions, as well as some theoretical models of soils and the applications of these models for the analysis of important practical problems. His book offers a pioneering perspective on the mechanics of granular soils, unprecedented in the available literature, since it deals with such subjects as the liquefaction of soils and their subsequent resolidification, phenomena associated with the lifting of objects from saturated ground, soil stability, and some elements of seabed dynamics.

Granular soils, such as silts, sands, and gravels, especially when saturated, exhibit certain characteristics that clearly distinguish them from liquids and solids. That is why they are sometimes even referred to as the fifth state of matter. Saturated ground

Fig. 1. A building disaster in Japan caused by soil liquefaction (University of Washington. The Soil Liquefaction website http://www.ce.washington.edu/~liquefaction/html/main.html)

Fig. 2. A seaside restaurant and a street were inundated as a result of land slide caused by liquefaction following an earthquake in Kocaeli, Turkey, in 1999. The street lamps mark the flooded street to the restaurant (A. Sawicki)

possesses some properties of a solid body on which structures can be founded. Under certain conditions, however, for instance, during earthquakes, such ground behaves like a liquid, which results in landslides, the sinking of structures in the ground, etc. Economic losses due to soil liquefaction are measured in billions of U.S. dollars. Figure 1 shows a building disaster in Japan caused by the liquefaction of the underlying soil after an earthquake. Some of the buildings partly sank, others conspicuously tilted. Figure 2 shows a coastal area in which soil liquefaction caused part of the embankment to slide into the sea. The flooded street lamps mark the way to an exclusive Turkish restaurant on the Marmara Sea coast that was completely inundated after a catastrophic earthquake in Kocaeli in 1999. The PAS Institute of Hydro-Engineering has developed models of the above phenomena and conducted numerical simulations to reconstruct their course. The mechanics of soil liquefaction is of considerable significance for seismic engineering, as it provides tools for analyzing the interaction between structures and the underlying soil during earthquakes. Along with geophysical methods, it can also be used for assessing the liquefaction susceptibility of specific soils.

One important element of the book involves popularizing a model describing the behavior of granular, dry, and saturated soils before they reach the limit state, that is, before they lose their bearing capacity. This model is described by a simple set of equations for increments in the components of the strain tensor. The equations are integrated for a given stress history, which yields specific values of strains in dry or saturated soils in which water can flow freely through the pores. If drainage is impeded, an additional water pressure is generated in the pores of the soil, which reduces the strength of the soil and, in the extreme case, leads to its liquefaction. This model applies to these phenomena as well. The book describes a calibration procedure carried out in a laboratory and presents theoretical predictions of the model for various stress histories, which are subsequently compared with experimental results. The above procedure is an element of the verification of the model. While not rejecting the approaches applied hitherto in soil mechanics, this model differs from them mainly in its simplicity and efficiency. It also lends itself to relatively simple investigations of fairly complex problems concerning the stability of loose soils, taking into account their initial state, original anisotropy, etc. For cyclic loading, the book presents a theory of soil compaction and liquefaction developed at the PAS Institute of Hydro-Engineering, as well as the seismic applications of the theory in geotechnical engineering.

An approach to the modelling of atypical problems of soil mechanics by classical methods is also

presented by describing the process of detaching objects from a saturated soil and the phenomenon of wave-induced pore pressure changes in the seabed. The former problem has practical importance for the lifting of wrecks from the seabed, for dead anchors, and for modern foundation methods. The phenomenon consists in the fact that the force required to lift an object from the seabed is greater than the weight of the object because of the suction forces generated in the process. The model, formulated in the form of a set of differential equations, describes the mechanism whereby these forces are generated. In the case of the model describing changes in pore water pressure in the seabed, the book shows how to rectify some of the shortcomings of the classical approaches used in maritime engineering.

The main part of the book is preceded by a short history of soil mechanics and a list of the basic concepts of soil mechanics and the mechanics of continuous media. One of the chapters is devoted to soil modelling techniques. It is emphasized that the models applied in soil mechanics can be treated a set of tools, classical or still relatively unknown, each of which serves to solve a narrow class of specific problems. The book may also prove useful to specialists in other fields who study granular media, such as grains or powders. The models developed at the PAS Institute of Hydro-Engineering have already been applied in the field of agricultural engineering to determine the mechanical properties of cereal grains, and even in the field of orthopaedics, in which powdered bones are used.

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Location study for a Hot Dry Rocks system in the Sudety Mountains

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Research on the present and future use of geothermal energy in Poland is mainly oriented towards thermal energy production. However, that does not rule out the possibility of electricity production based on Hot Dry Rock (HDR) technology and binary cycle systems, especially in the area of the granite Karkonosze Pluton (Bujakowski et al. 2012, 2013).

HDR technology is a geothermal technology harnessing the heat of rocks that are isolated from underground water circulation, generating temperatures exceeding 100°C. The geological structures that can be utilized with HDR technology usually occur at depths of 3-5 km, and they accumulate heat generated inside the Earth, as well as the heat produced by the decay of radioactive elements contained in certain component minerals. Some such structures may be useful for electricity generation, mainly in binary cycle power plants. These are systems which generate electricity by harnessing two different liquids that are hydraulically separated from each other: the liquid circulating in the rock mass and delivering geothermal energy is characterized by a higher evaporation temperature than the low-boiling working liquid that powers a turbine, which in turn drives the electricity generator's shaft. The main objective of the project presented here was to develop a spatial temperature distribution in the Karkonosze Pluton (Sudety region) to indicate optimum locations for HDR systems (Fig. 1, 2).

The model describing the geothermal conditions of the Karkonosze Pluton covers the area of approx. 2400 km^2 (40 x 60 km), with Cieplice Śląskie-Zdrój located at the center of the modelled area. The town

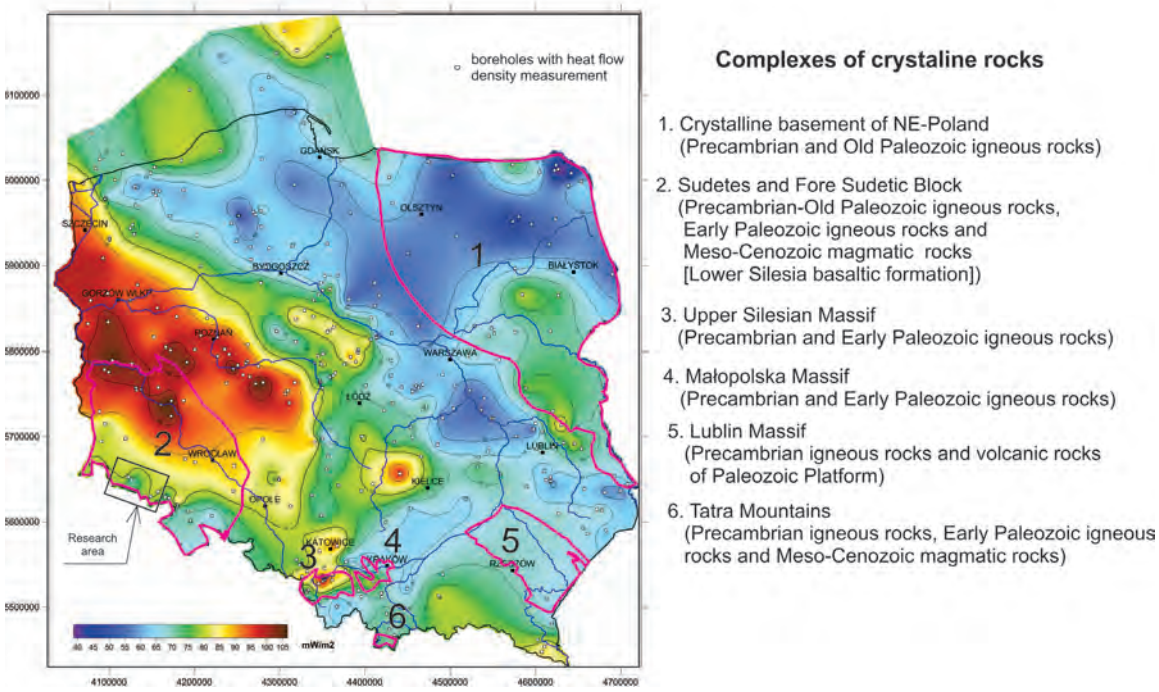

Fig. 1. Complexes of crystalline formations in Poland at 3000 m b.s.l., shown against the map of heat flow density (Szewczyk and Gientka, 2009)

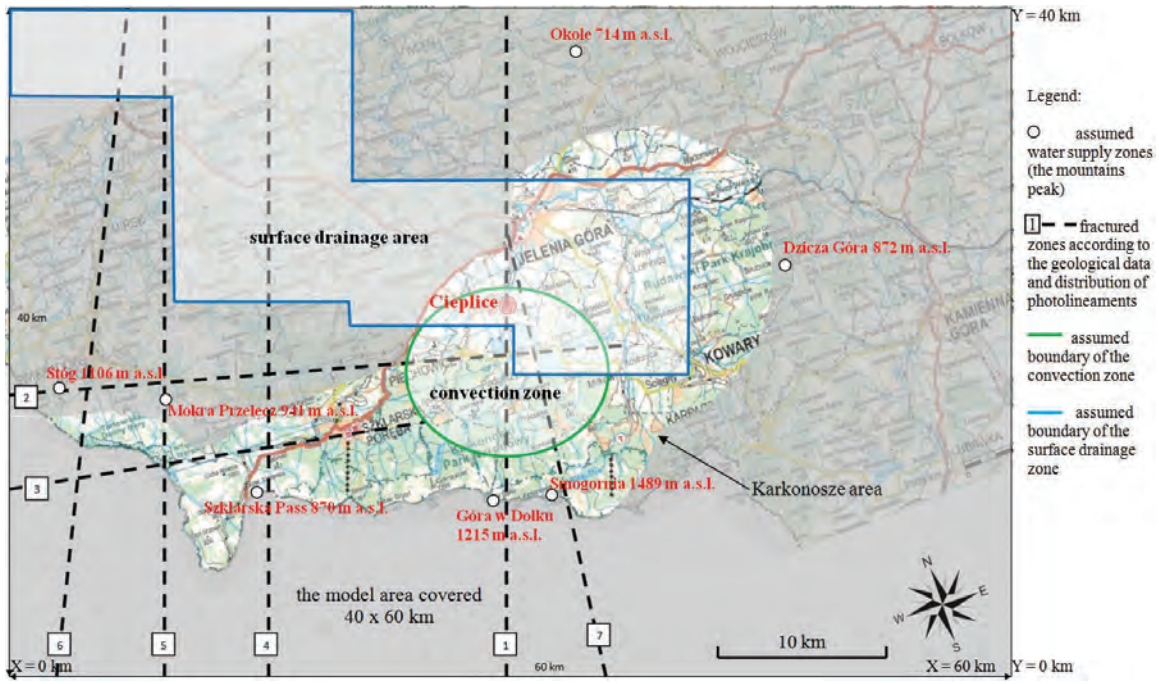

Fig. 2. The Karkonosze Pluton and surrounding area, with the locations of main fracture and fault zones, overlaid by the numerical model

is the location of a shallow, positive geothermal anomaly. The courses of the main tectonic deep fissures were assumed in the modelled area – these are the pluton fracture zones identified mainly based on the photolineament courses. It was assumed that the main fissures had a regional range, with their outcrops in the mountain areas, and that they continued in the lower areas; some of them fulfilled the conditions that were favorable for water flows and displayed considerable permeability. It was further

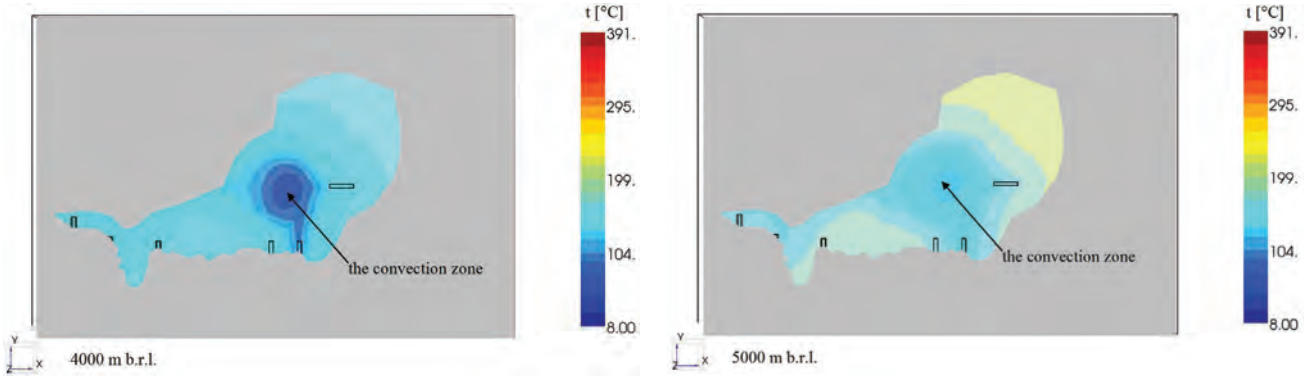

Fig. 3. Horizontal temperature cross-sections of the Karkonosze Pluton area being modelled, for the depths of 4 and 5 km b.r.l., a result of numerical modelling

assumed that some of the fractures cut through each other directly or indirectly, creating extensive zones with increased permeability. It was assumed in the model that this type of structure composition is characteristic for the whole pluton volume and also occurs in the Cieplice Śląskie-Zdrój area, where two potential fracture zones probably cross: (1) a zone running from the northwest, with its outcrop (recharging area) in the vicinity of Stóg Mountain (1106 m a.s.l.), (2) a zone running from the south, with its outcrop (feeding area at the height of ca. 800 m a.s.l.) in the vicinity of the Smogornia Mountain (1489 m a.s.l.). It was assumed that the convection area was hydraulically connected with the surface drainage area, draining the waters migrating from deep zones to the surface water courses. Moreover, a hypothesis was formulated that the fractured convection area running from NE (or from the Stóg Mountain area) to Cieplice Śląskie-Zdrój was most probably responsible for the existence of the positive shallow geothermical anomaly in the Cieplice Śląskie-Zdrój area.

During the past decade, a surge has been noted in global geothermal energy harnessing. Technological development and increased efficiency of the systems used as well as environmental and economic considerations have played a fundamental role in this process. The study results presented in this paper address part of the complex research on an HDR system location in Poland.

The model presented here offers just one possible hypotheses for explaining the origin of the Cieplice Śląskie-Zdrój thermal anomaly. At the same time, as regards the HDR technology aspect, it indicates that the Szklarska Poręba area seems to be more promising than the Cieplice Śląskie-Zdrój area, and likewise for the NE areas of pluton, as indicated by the horizontal temperature cross-sections presented on Figure 3.

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Remote-control system for monitoring the inclination of engineering structures

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A researcher from the PAS Strata Mechanics Research Institute has devised a wireless system for monitoring the condition of engineering structures, based on 3D measurements of their inclinations. The system accounts for online observations and the buildings' responses to ongoing mining activities.

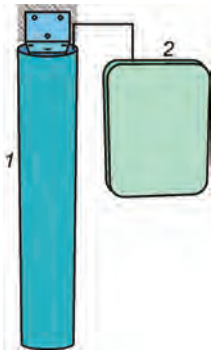

Fig. 1. Inclinometer 1 and a VW meter TMS-1

Figure 1 shows a schematic diagram of the system intended for monitoring the inclinations of engineering structures, comprising a deflection sensor- and inclinometer (1) and a telemetric vibrating-wire meter (VW) TMS-1 (2). The inclinometer is to be fixed to an engineering structure. The telemetric VW meter is an 8-channel device, 3 of these channels being used by the inclinometer. The remaining ports can be used to connect to other wire sensors.

The telemetric VW meter TMS-1 (Fig. 2) is an automatic measuring device, enabling data recording and transmission by radio. TMS-1 allows 8 transducers to be connected simultaneously, with a measurement system that can be activated every 0.75, 1.5, 3, 6, 12, 24, 48, and 96 hours. Data transmission uses the GSM network and the measurement data coded as SMS can be supplied via an Internet gate to the programmed address, in the form of e-mail messages. The powering battery and tight-proof housing enable the device to function service-free under field conditions for at least 6 months.

The inclinometer provides spatial measurements of the inclinations of engineering structures. Its

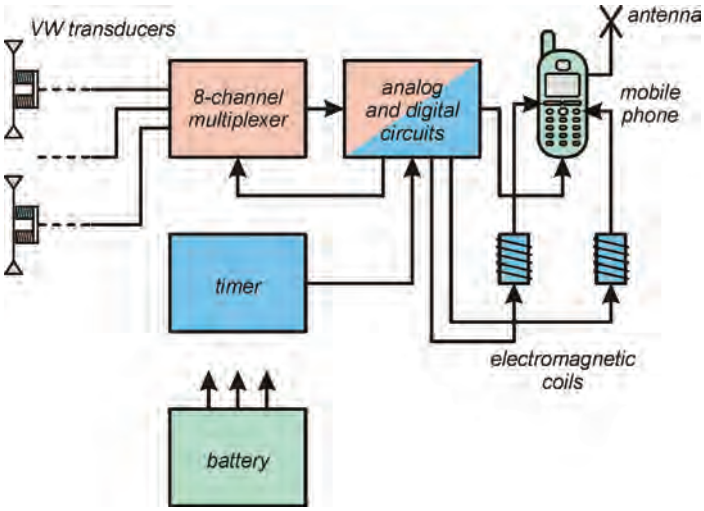

Fig. 2. Block diagram of a telemetric wire meter TMS-1

design is based on a novel technique, incorporating three wires that determine the plane and enable the measurement of its inclinations and rotations during the observation cycle.

In December 2011 the measurement system was installed in the tower of an old church, in an area affected by ongoing mining operations. In accordance with the adopted schedule, the measurements were repeated 8 times a day at first and 4 times a day from July 2012. In September 2012 the frequency of measurements was further reduced to 2 times a day. Throughout each cycle, the periods of vibration of particular wires in the inclinometer were measured four times, making it possible to estimate the repetitiveness of the measurements and computing the mean values. 2200 data packages were thus obtained by the end of February 2013.

The results indicate the occurrence of highly complex processes revealed by changes in the inclination of the church tower and its azimuth, which would vary depending on the longwall progress with respect to the church neighbourhood, on the location of old abandoned mine workings and the occurrence of tremors.

Figure 3 shows the schematic plan of the church and its layout with respect to panels of longwall 72a and 92a, which were mined out in 2008 and 2010,

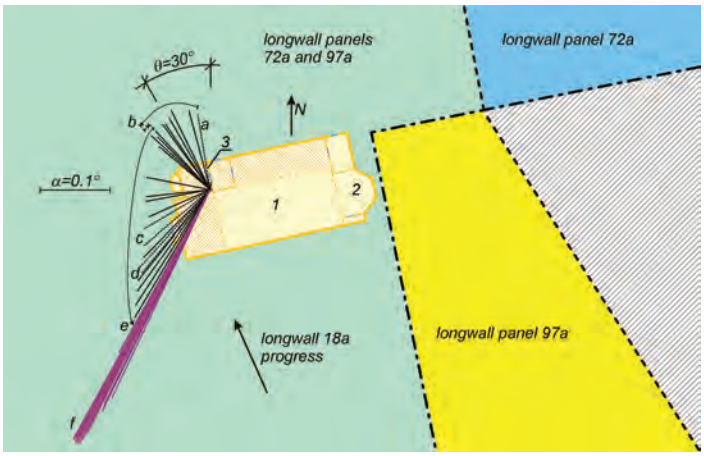

Fig. 3. Plan of the church building and its location with respect to longwall panels, variations of the inclination of the church tower: 1 – main aisle, 2 – presbytery, 3 – church tower

and variations of the inclination of the church tower. The longwall 72a in the panel at the depth of 600 m, has the most unfavourable location since one of its edges (dot and dash line) is found in direct proximity of the church. The edge of longwall 97a of the panel at the depth of 700m (indicated by broken line) is located further away from the church. The church is in a roughly central position with respect to the panel of the longwall 18a, at the depth of 750m, which was mined in 2011-2012. The diagram shows the tower inclinations registered weekly and its variations due to vibrations sensed by humans.

One day after the measuring equipment was installed, a strong tremor occurred, the distance between the longwall progress and the church being 200 m. This tremor caused a rapid change in the tower inclination, its angle changed from 0.01 to 0.11° and the azimuth θ changed from 6.8 to -9.3°. These changes are illustrated by the pair of line sections 'a' in Fig. 3 (the first of them being very short, barely visible) plotted with a broken line. After that tremor, the inclination remained nearly the same yet the azimuth θ would successively increase, as indicated by arrow lines. It was only in early February 2012 that a reverse tendency in the azimuth θ variation was registered for a time (case 'b'). In the first days of March, the azimuth would approach –90°. At that time when the longwall face advanced underneath the church building, two strong tremors occurred on 21 and 28 March, plotted as pairs of broken line sections 'c' and 'd.' These two tremors gave rise to a slight increase in the inclination angle α and a sharp increase in the azimuth θ. The tremor that took place on 28 March ('e') did not cause any significant changes in tower inclination. Since that time the inclination angle has steadily increased, the azimuth remaining on a roughly the same level –150° (line section 'f'). Since September 2012 the inclination angle has stabilised and reached the value of 0.42° in December 2012.

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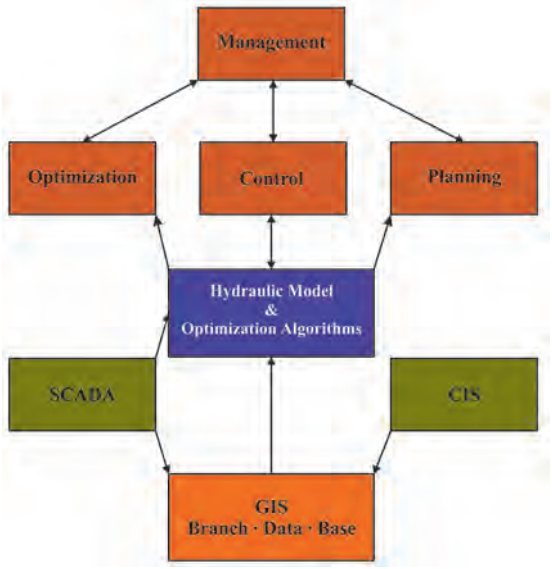
Integrated water network management system for secure local water economy

J. Studziński | Systems Research Institute | Polish Academy of Sciences

System overview

In conjunction with Intergraph Poland, the Faculty of Mechatronics at Warsaw University of Technology, and water management companies, the PAS Systems Research Institute carries out studies aiming at better management of water resources. The development and maintenance of water networks in urban areas is a very complex task, given such im-



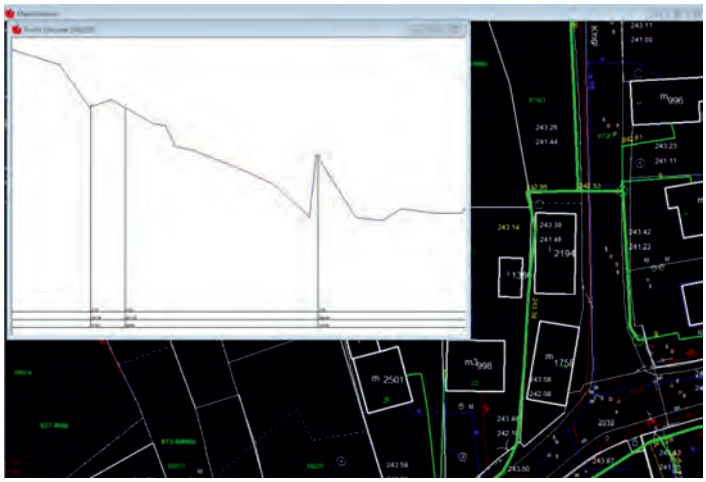
Structure of the system

portant issues as water quality or loss of limited environmental resources. In our research, a system has been developed that integrates novel techniques and methodologies with the use of modern engineering tools for an effective and efficient management of water resources in urban areas.

An effective water management system should help reduce waste of water and decrease network maintenance and design costs, while securing water availability and quality. Minimization of pipe breaks can save a lot of money spent on repairing, reorganizing traffic, etc.

A set of software tools developed at the PAS Systems Research Institute has been integrated into a seamless software system, also drawing upon a wide range of tools like SCADA, GIS (together with 3D digital terrain modeling), event registering databases, etc. The computational tools, based on advanced mathematical and artificial intelligence methods, generate crucial information for planning and maintaining water networks, focusing on:

- optimizing working parameters, particularly pressure levels across the network,
- decreasing loss of water by fast and efficient finding of water leakages,
- securing high quality of water delivered by solving the problem of "old water";
- saving energy by optimizing pump station work,
- calculating contaminated water flow; with additional data (e.g. time of contaminant decomposition), the system determines spatial extent of contamination threat,



Readings from a point in a network against the map

- locating water sources for fire brigades, important for municipal fire security.

Integration

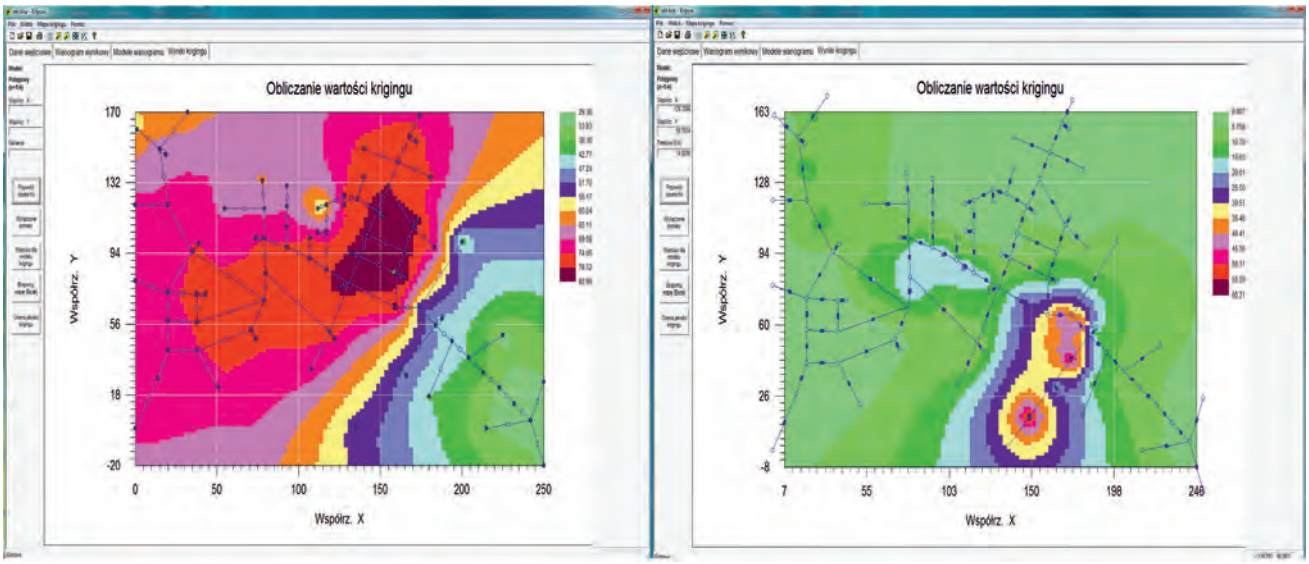
A typical utility company uses a lot of software tools for maintenance and design. This makes integration a real challenge. The system we have developed assumes that a main database stores most of the important data on the network and is an integration hub. The GIS G/Water system uses geographical data for displaying different maps, length profiles, detailed schemas, etc. Additionally, the system stores and serves data from different sources, such as the monitoring/SCADA system, customer information system, and GIS topographic data, together with industry specific information on infrastructure.

Hosted on remote servers with professional technical support, the system is properly maintained, allowing small companies to save money on IT staff and infrastructure.

System functions

The tasks performed by the system are:

- generating the network graph for the hydraulic model, based on the numerical map of the network,
- monitoring network operation,
- collecting periodic data on end-user water consumption,
- hydraulic calculations of typical functional parameters of the network, i.e. water flows and pressures in all nodes and pipes,
- optimization of network structure and functioning,



Visualization of water pressure (left) and flow in the network calculated with Kripow application using kriging approximation (right)

- monitoring of water uptake stations, reservoirs, and zonal pumping stations, to ensure reliability of operation, minimize operational costs, and assure supply of good quality water,
- computer aided planning of the network,
- minimizing water losses in the network through early identification and location of water leaks,
- increasing operational dependability through reduction of emergency rate as a result of generation of short- and long-term revitalization plans,
- planning of investment undertakings for the network,
- strategic management of the network regarding its development and pro-ecological activities.

A key component of the system is the Branch Data Base of the GIS module, recording all information with technical, technological and economic data on the water network, its elements, and water consumers connected to the network.

Fruitful cooperation

The system was developed at the PAS Systems Research Institute in collaboration with the company Intergraph Poland (www.intergraph.com), the respective team there being led by Robert Bryłka, and the Faculty of Mechatronics at Warsaw University of Technology, Institute of Automatic Control and Robotics, the collaborating team there being headed by Dr. Marcin Stachura (www.mchtr.pw.edu.pl). Besides collaboration with these teams, emphasis must be placed on the creative input from the staff at the waterwork companies, with whom the developers of the system carried out both research and implementation work. This highlights the necessity of involving multiple parties and competences in the development of similar products.

Awards

The system earned a number of national and international awards, including:

- a Gold Medal to Jan Studzinski: Systems Research Institute, Intergraph Poland, GWiK Głubczyce, for *Integrated IT system for complex management of reliability and dependability of municipal water supply systems* at the Belgian and International Trade Fair for Technological Innovation – Brussels Innova 2012, 19 November 2012,
- a Diploma from the Polish Minister of Science and Higher Education for the Systems Research Institute, Intergraph Poland and Waterworks in Głubczyce.

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Medical Sciences

PAS Division V: Medical Sciences represents the medical scientific and academic community in Poland (including universities, institutes, and the 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. The Division's dean is Prof. Jacek Zaremba (corresponding member of the Academy), a neurologist and geneticist. Prof. Jan Albrecht (corresponding member of the Academy), a neurobiologist, is the chairman of the Division V Council of Provosts.

As of the end of 2012 the Division had 34 national members (16 full and 18 corresponding members) as well as 23 foreign members. One foreign member of the Division passed away in 2012: Prof. Nathan Sharon.

Two plenary sessions of the Division took place in 2012. At the first session on 29 March, Prof. Henryk Skarżyński delivered a lecture on "Compensating the Opportunities of Children with Disturbed Communication – A Priority of the Polish Presidency of the Council of the European Union 2011: Before, During and Following the Presidency. A new award in the field of neurobiology, called the "Golden Neuron," was established for the best work carried out in Poland.

Prof. Anetta Undas, Collegium Medicum, Jagiellonian University, received the Division's Jędrzej Śniadecki Prize

The students Monika Turska, Medical University of Lublin and Michał Turski, Warsaw School of Economics, receiving the Doctor Wacław Mayzel Medical Laurel

The student Tomasz Jadczyk, Medical University of Silesia, receiving the Doctor Wacław Mayzel Medical Laurel; accompanied by Prof. Michał Tendera, head of the University's Third Chair of Cardiology

At the second session on 25 October, Prof. Tomasz Guzik, a member of the Young Academy, delivered a lecture on "The Role of the Immunity System in Arterial Hypertension." At the same session the Division awarded its scientific prizes as follows: the individual Jędrzej Śniadecki Scientific Prize went to Professor Anetta Undas from the Department of Cardiosurgery, Anaesthesiology, and Experimental Cardiology, Collegium Medicum, Jagiellonian University, for a series of publications on mechanisms

Dr. Anna Wilkaniec, Dr. Grzegorz Czapski and Dr. Agata Adamczyk from the Mirosław Mossakowski Medical Research Center, Warsaw, receiving the Division's Prize

of thrombo-embolic complications in the cardiovascular system involving the structure and properties of the fibrin network; the collective Scientific Award of the Division went to the research team: Dr. Agata Adamczyk, Dr. Anna Wilkaniec, Prof. Joanna Strosznajder, Dr. Grzegorz A. Czapski, and Prof. Barbara Gajkowska from the M. Mossakowski Medical Research Center in Warsaw for a series of papers on "The Role of Alfa-Synuclein and Peptides NAC in Molecular Pathomechanisms of Cellular Necrosis in Neurodegenerative Diseases;" and four honorary prizes for medical students – known as the Dr. Wacław Mayzel Medical Laurels – were awarded to Krzesimir Ciura (Medical University of Gdańsk), Tomasz Jadczyk (Medical University of Silesia, Katowice), Michał Turski (Warsaw School of Economics) and Monika Turska (Medical University of Lublin), Ariadna Zybek (K. Marcinkowski Medical University, Poznań).

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

Four scientific journals are published by the 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 Scientific Committee of Human Nutrition affiliated with the Division.

The Division supervises the activity of 12 scientific committees (with over 300 members in total), representing the medical sciences in Poland. The chairpersons of the committees, mostly non-members of the Academy, participate in plenary sessions of the Division and enjoy equal rights with the Academy's members except with regards to electing candidates to become new Academy members. The committees organized or co-organized many Polish and international conferences in 2012.

The Division organizes the international representation of medical and biomedical disciplines in Poland via national committees of the Polish Academy of Sciences, representing medical and other international bodies. Prof. Jan Żeromski represents the Academy on the European Academies Science Advisory Council (EASAC). Prof. Anna Członkowska represents the Polish Academy of Sciences to the European Medical Research Councils Standing Committee of the European Science Foundation (EMRC ESF). 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 Academy is also represented by 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 149 papers in 2012, primarily in high-caliber international scientific journals, organized and actively participated in many meetings and conferences.

Do NBN gene mutations influence DNA synthesis and the expression of DNA repair?

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D. Januszkiewicz-Lewandowska | Institute of Human Genetics | Polish Academy of Sciences | Poznań University of Medical Sciences

The complex of *MRE11*, *RAD50*, and *NBN* genes plays a pivotal role in repairing DNA double-strand breaks (DSB) (Fig. 1). Homozygous mutation of the *NBN* gene results in Nijmegen breakage syndrome with characteristic clinical symptoms, including increased cancer predisposition. Apart from homozygous *NBN* mutation, heterozygous c.657-661del, p.I171V, and p.R215W mutations of *NBN* also play a role as cancer risk factors. In our previous work we showed that heterozygous carriers of the I171V mutation of the *NBN* gene have a significantly increased risk of solid malignant tumors in adults, and also acute leukemias in children. Patients with homozygous c.657-661del are extremely sensitive to ionizing radiation, resulting in a number of chromosome aberrations. Whether patients with heterozygous c.657-661del, p.I171V, and p.R215W are also prone to irradiation remains an open question.

To investigate the effect of *NBN* gene mutations on DNA synthesis and the expression of DNA repair genes, we used immortalized lymphoblastic cell lines (LCLs) with heterozygous c.657-661del, p.I171V, and p.R215W mutations, as well as with homozygous c.657-661del mutation of the *NBN* gene. Each cell line was exposed to different doses of irradiation (1, 2, 5 and 8 Gy). Then cells were cultured and harvested 3, 24, and 48 hours after irradiation. The following parameters were evaluated for each of these time intervals: the viability of the cells, DNA synthesis, and *NBN, RAD50*, and *MRE11* gene expression. Cell viability was calculated by the try tan blue exclusion test. DNA synthesis was measured in terms of the level of ^{3}H-thymidine incorporation into the cultured cells. Expression of the studied genes was analyzed in terms of real-time PCR with specific fluorochrome labelled probes and oligonucleotide primers. The absolute expression was presented as Ct (cycle threshold) value. To compare the expression of genes analyzed, the relative expression was calculated as the Ct value from irradiated cells minus the Ct from non-irradiated cells. In addition, the relative expression of the genes studied was also normalized to a reference gene beta actin.

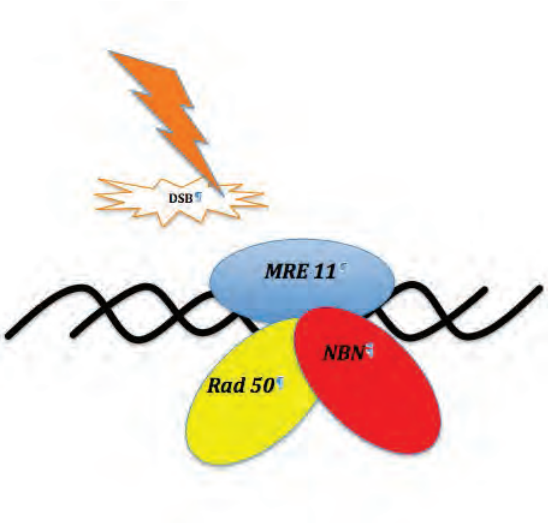

Fig. 1. *MRE11/RAD50/NBN* complex as a DNA repair gene system

Cell viability measured 3 hours after irradiation did not differ with respect to various doses of irradiation. Even the highest applied dose (8 Gy) did not influence the cell viability during three-hour culture (Fig. 2). Attenuated cell viability was observed in 5 and 8 Gy irradiated homozygous c.657-661del and heterozygous p.R215W cells after 24 hours and was the most pronounced after 48 hour culture.

DNA synthesis as measured by ^{3}H-thymidine incorporation was the highest in homozygous and heterozygous c.657-661del cells, irrespective of irradiation dose, after 3-hour culture in comparison to all other cell lines (Fig.2). A gradual decrease in DNA synthesis was paralleled by increased dose of irradiation both in immortalized muted and PBL cells.

The next step of our study was to find out whether homozygous and heterozygous *NBN* gene mutations affect expression of *NBN, MRE11*, and *RAD50* genes. The expression of all three DNA repair genes was assessed as the Ct value of irradiated cells as

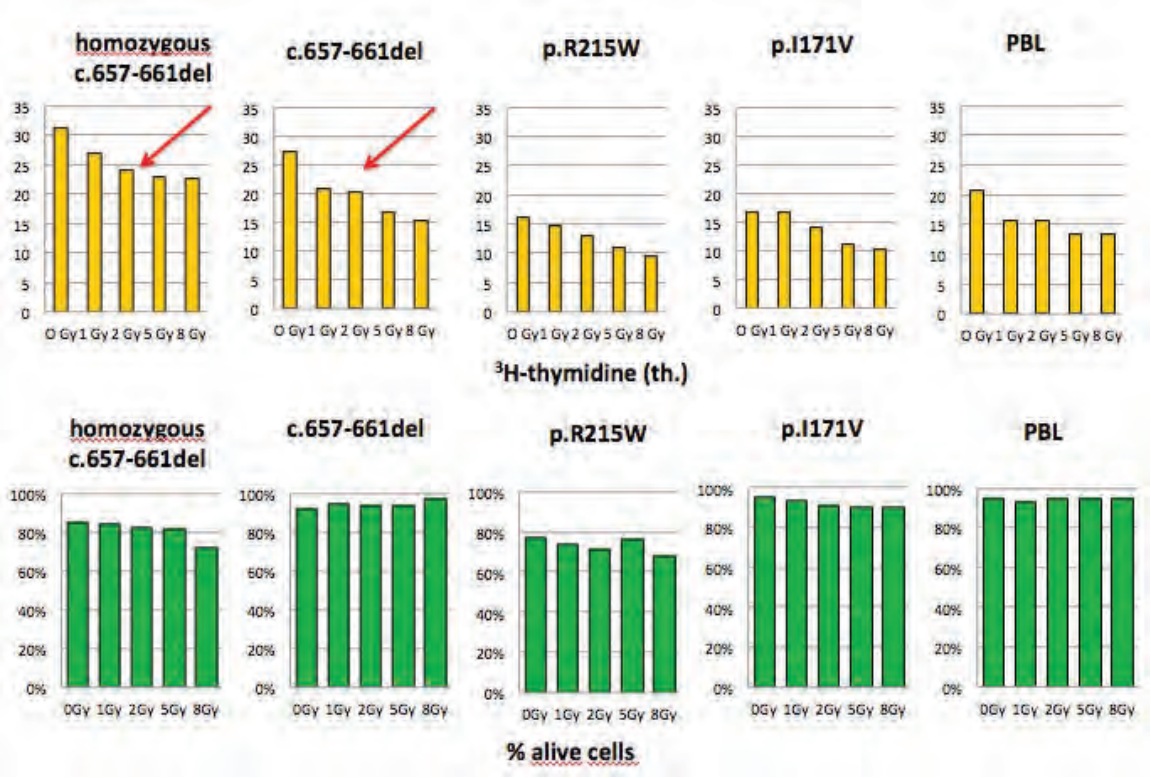

Fig. 2. Cell viability and DNA synthesis in immortalized irradiated cell lines with homo- and heterozygous *NBN* gene mutations after three-hour culture

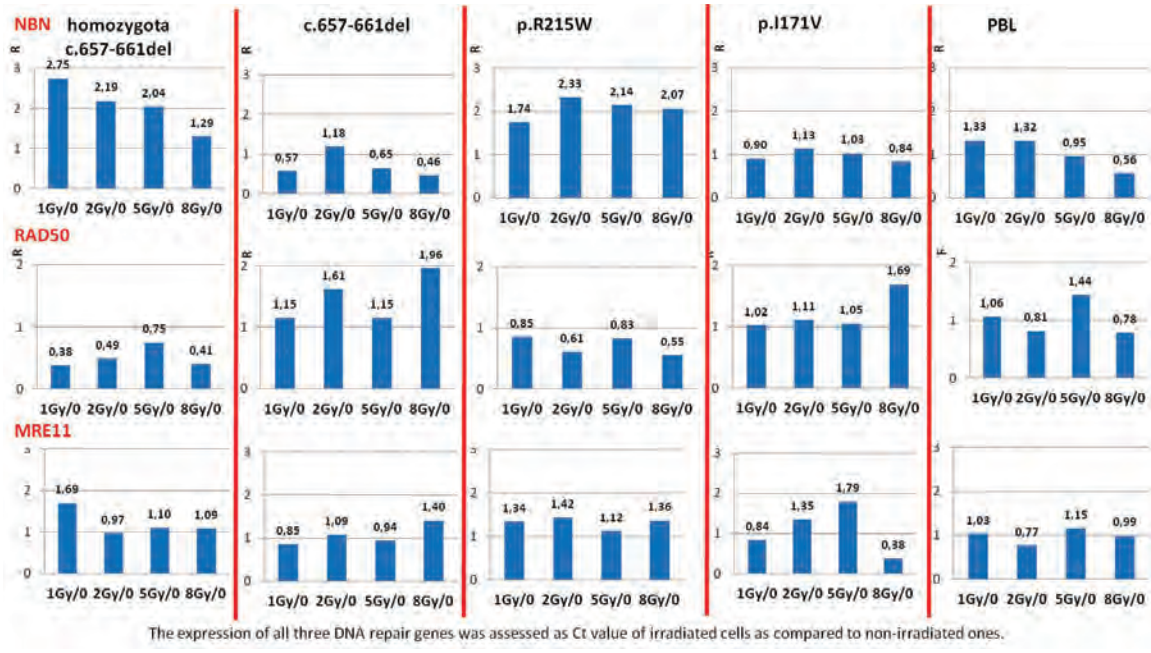

Fig. 3. Relative expression of *NBN, RAD50*, and *MRE11* genes in immortalized irradiated cell lines with homo- and heterozygous *NBN* gene mutations after three-hour culture

compared to non-irradiated ones. The most spectacular results were observed in *NBN* expression in homozygous c.657-661del and heterozygous p. R215W cells 3 hours after irradiation (Fig. 3). The relative expression of *NBN* (Ct irradiated cells – Ct non-irradiated cells) was approximately two times higher in homozygous c.657-661del and heterozygous p. R215W cells as compared to heterozygous c.657-661del and p. I171V cells, and also compared to control immortalized PBL. At the same time the relative expression of *RAD50* in homozygous c.657-661del and heterozygous p.R215W cells was nearly half that seen for the rest of studied cell lines. Notably, the relative expression of *MRE11* did not differ between all the cell lines studied, including normal immortalized cells.

These results support the conclusion that neither homozygous nor heterozygous mutations influence *NBN* gene expression. Higher levels of DNA synthesis and higher *NBN* gene expression after irradiation were observed in homozygous c.657-661del and heterozygous p.R215W cells in comparison to the other cell lines studied. This observation may suggest relatively high DNA repair activity processes in these cell lines.

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Transcription of the PXE gene – the mystery revealed

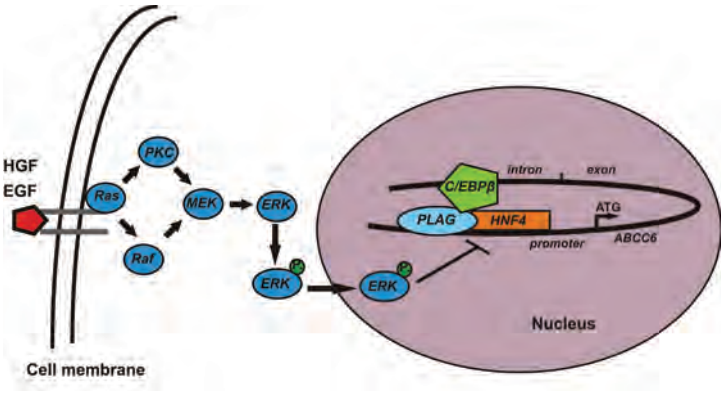
M. Ratajewski | Ł. Pułaski | Institute of Medical Biology | Polish Academy of Sciences

Pseudoxanthoma elasticum (PXE) is a recessive genetic disorder that is rare (occurring approximately once per 100,000 births) and characterized by aberrant elastic tissue calcification. The disease is typically of late onset, and patients are noted to have skin symptoms and ocular findings that include angioid streaks and retinal neovascularization which might lead to visual loss. Cardiovascular manifestations derive from calcification of the blood vessels, leading for instance to hypertension, decreased peripheral pulses, intermittent claudication, and in more severe cases coronary arterial disease. PXE is usually caused by mutations in the coding region of the *ABCC6* gene, which encodes a transmembrane transporter of as-yet unknown function that is highly similar to multidrug transporters responsible for chemotherapy failure in cancer patients. In *in vitro* systems, ABCC6 is actually able to transport small organic anions – standard substrates for multidrug transporters – and this function is lost in variants harboring disease-causing mutations. ABCC6 expression in the human body is restricted to the liver and, to a lesser extent, the kidney and intestine. As the expression sites of ABCC6 protein are divergent from the disease-affected sites, PXE is considered to be a metabolic disorder, probably caused by the lack of a metabolite of hepatic origin in the bloodstream. The intensive experimental search for such metabolite has so far proven spectacularly unsuccessful. Interestingly, a significant portion of PXE patients (up to 25%) are without specific mutations in the coding region of the *ABCC6* gene.

Studies carried out during the last several years at the Laboratory of Transcriptional Regulation of the Institute of Medical Biology (Polish Academy

of Sciences), in collaboration with the Institute of Enzymology (Hungarian Academy of Sciences), have aimed to identify factors that regulate the *ABCC6* gene and are involved in its strict tissue pattern of expression. Our achievements to date include: the first cloning and characterization of the *ABCC6* promoter, finding a central epigenetic mechanism responsible for silencing of the gene in non-hepatic tissues, and recently, identifying the liver-specific regulatory sequences in the gene that are major determinants of its tissue specificity. *ABCC6* gene expression is essentially absent in most human tissues. We found that this is due to hypermethylation of cytosines (located in CG rich regions called CpG islands) within the promoter sequence. Although methylation and consequent heterochromatinisation prevents binding of transcription factors to their sites in DNA, the hypomethylation of these cytosines would not necessarily lead to reactivated expression of the gene, e.g. due to the lack of specific transcription factors in the nuclear environment.

For almost 8 years, we and others had been trying to identify the factors that are essential for *ABCC6* expression in the liver. Recently, our efforts have at long last yielded a successful outcome! Our results showed that the *ABCC6* gene comprises two distinct regulatory elements: the main promoter, which binds PLAG and HNF4 proteins in a region overlapping with a previously identified CpG island, and the first intron of the gene, which is capable of binding another liver-enriched transcription factor, C/EBPβ.



Model of the transcriptional regulation of the human *ABCC6* gene. Growth factors (HGF, EGF) activate the ERK1/2 signaling pathway, which in turn reduces HNF4 binding to the promoter. C/EBPβ transcription factor binds intronic activator sequences and interacts with complex formed by PLAG and HNF4 proteins in proximal promoter in order to activate transcription of the gene

Furthermore, we demonstrated that the intronic activator interacts with the promoter and in order to develop full transcriptional activity, it requires PLAG and HNF4 transcription factors to occupy their binding sites located in proximal promoter of the gene. The whole transcription complex probably acts as a sensor of the hepatocyte metabolic state. The most important aspect of our recent studies was to describe the involvement of a physiologically relevant kinase signaling pathway in the regulation of *ABCC6* expression. We have shown that the activation of extracellular-signal related kinase 1/2 (ERK1/2) cascade by growth factors, e.g. epithelial growth factor (EGF) and hepatocyte growth factor (HGF), as well as by oxidative stress, decreases the ratio of transcription from *ABCC6* gene promoter by preventing the binding of HNF4. Prolonged activation of ERK signaling, e.g. by chronic oxidative stress often seen in *pseudoxanthoma elasticum* patients, may also lead to pathogenic calcification in cells that are not destined to calcify as part of their normal phenotype. Some β-thalassemic patients develop secondary PXE without mutations in *ABCC6* gene – our studies yielded a possible mechanistic explanation for this phenomenon, which is probably due to downregulation of *ABCC6* via oxidative stress. Overactivation of ERKs may also explain why, despite a homogenous genetic background, the phenotype of PXE can vary to a great extent between patients.

So in conclusion, our studies have not only broadened the general knowledge about PXE and *ABCC6*, explaining for the first time the regulatory network responsible for its pattern of expression, but also identified potential treatment targets that could be useful for planning therapeutic interventions. Such interventions could be based on the induction of *ABCC6* expression, e.g. in β-thalassemic patients or those PXE patients without mutations in the *ABCC6* gene coding region but suffering from its insufficient level, by using already available ERK1/2 pathway inhibitors.

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A new neurodevelopmental animal model of schizophrenia – behavioral, endocrine and immunological studies

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Schizophrenia is a common and chronic psychiatric brain disorder of neurodevelopmental origin, in which both genetic and environmental factors appear to play an important role. Some data from epidemiological and clinical studies suggest that viral or bacterial infection during pregnancy may enhance the risk of schizophrenia in adulthood. To verify this hypothesis we introduced a new schizophrenia-like model in rats using repeated bacterial endotoxin – lipopolysaccharide (LPS) administration in specific periods of pregnancy in rats. LPS injections in rats started from the 7th day of pregnancy and were continued every second day until delivery, the timeframe during which it has been suggested that infections in humans may increase the risk of developing schizophrenia in adult life. Behavioral, histological, and immunological changes were assessed in adult, 3-month-old offspring.

Behavioral tests revealed that males and females prenatally treated with LPS showed age- and sex-dependent disturbances in cognitive processes, as reflected by deficits in sensorimotor gating, a long-lasting disruption of prepulse inhibition (PPI), and elevation of locomotor activity. Administration of LPS caused increased exploratory activity, basic locomotor activity, and activity stimulated by amphetamine. In social interaction tests, an increased time and number of aggressive behaviors was observed, while social episodes were decreased. Chronic administration of a new antipsychotic drug (clozapine) normalized all these disturbances in the animals' behavior, while administration of a classic neuroleptic (chlorpromazine) halted only the hyperactivity.

The aim of the next stage was to evaluate the impact of prenatal LPS treatment on the effects of a psychotomimetic agent, dizocilpine (MK-801). The prenatally LPS-treated rats showed hypersensitivity to MK-801, as evidenced by the enhancement of acoustic startle amplitude, reduced disturbances in prepulse inhibition (PPI), and enhanced locomotor activity. These behavioral effects were accompanied by changes in neurotransmitter concentrations, such as decreased dopamine and augmented serotonin content in the frontal cortex. These data indicate that the activation of the immune system in the prenatal period led to persistent behavioral hypersensitivity to the psychotomimetic action of MK-801 and induced attention/information processing deficits. Thus, the prenatal administration of LPS models some of the clinical aspects of schizophrenia and these behavioral effects are connected with neurochemical changes (Basta-Kaim et al. 2011a).

A number of schizophrenic patients are hypercortisolemic, and glucocorticoids may be involved in the pathogenesis of schizophrenia. Therefore, the aim of our second study was to evaluate whether schizophrenia-like behavioral changes in the neurodevelopmental model are associated with alterations

in the level of plasma corticosterone, the concentration of glucocorticoid receptors, and the amount of the immunophilin FKBP51 (the glucocorticoid receptor co-chaperone) in the hippocampus and frontal cortex. We found that the adult offspring of prenatally LPS-treated rats showed an elevated plasma level of corticosterone and a decrease in both the glucocorticoid receptor level in the hippocampus and the protein FKBP51 concentration in the frontal cortex. Most of these changes were reversed by the atypical antipsychotic drug clozapine, whereas chlorpromazine had no effect on PPI but diminished the amphetamine-induced hyperactivity and normalized the hippocampal level of glucocorticoid receptors. The changes in the level of corticosterone and cortical FKBP51 were attenuated by chlorpromazine in female offspring only. These data support the hypothesis of hypothalamic-pituitary-adrenal (HPA) axis hyperactivity in schizophrenia and suggests that this hyperactivity results from a decrease in the hippocampal glucocorticoid receptor level and a decrease in FKBP51 in the frontal cortex (Basta-Kaim et al., 2011b).

In a third study, we sought to answer the question of whether behavioral changes in the neurodevelopmental model of schizophrenia in rats are accompanied by alterations in proliferative activity of splenocytes and pro- and anti-inflammatory cytokine levels. Age-dependent behavioral and immunological changes were studied when control and prenatally LPS-pretreated offspring male rats were 30 and 90 days old. Chlorpromazine or clozapine was administered chronically (21 days) after behavioral verification to 3-month-old offspring males. Results revealed that prenatally LPS-pretreated rats showed PPI deficit only at 90 but not at 30 days of age, whereas an enhancement of mitogen-stimulated proliferative activity of splenocytes was observed at both time points. The concentration of proinflammatory cytokines (IL-1β, IL-2, IL-6, TNF-α) in prenatally LPS-pretreated rats was enhanced when they were 30 days old and remained elevated in 90-day-old offspring. No changes in IL-10 level were found. Both chlorpromazine and clozapine reduced the deficit in PPI deficit in prenatally LPS-treated rats. Moreover, chlorpromazine normalized both T and B lymphocyte proliferation, whereas clozapine B affected the lymphocyte activity only. The disturbances in T cell-mediated immunity as well as cytokine production were long-lasting, preceded behavioral deficit, and were attenuated by antipsychotic drug administration. All in all, the obtained data support the hypothesis that prenatal immune overactivation can be a causative factor in pathogenesis of schizophrenia and that the proposed animal model can be suitable for preclinical testing of potential antipsychotic drugs (Basta-Kaim et al., 2012).

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New aspects of the initiation of *Helicobacter pylori* chromosome replication

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Replication, i.e. synthesis of new DNA, is a biological process occurring in every living cell prior to its division, ensuring faithful inheritance of the genetic material by the descendant generation. The first step of DNA replication is called initiation – at this stage the synthesis of the new chromosome is controlled so that new DNA is not synthesized unless the conditions favor the growth and survival of the daughter cells. The initiation of bacterial chromosome replication is thought to be the simplest and best characterized mechanism amongst all living organisms, including archaebacteria and eukaryota. In bacteria, the initiator protein DnaA recognizes and binds to a specific chromosomal region – the replication origin *oriC*. DnaA-*oriC* interactions lead to the unwinding of DNA and the formation of replication forks, which are the entry site for other enzymes synthesizing new strands of DNA. Most of what is known about bacterial chromosome replication comes from studies on the model microorganism *Escherichia coli*, which has been adopted as a universal bacterium for studying prokaryotic processes, including the initiation of chromosome replication. At present it is known that though some basic initiation factors are conserved in bacteria, there are important distinctions between bacterial species concerning the number or activity of initiation proteins, the organization of *oriC*, or the dynamics of the formation of the initiation complex. Because of these differences the course of the initiation process is unique for each species and might be similar only for closely related microorganisms. Thus, studying the initiation mechanism in different bacteria not only broadens our knowledge about the initiation process itself, but also allows for the identification of initiation factors specific to indi-

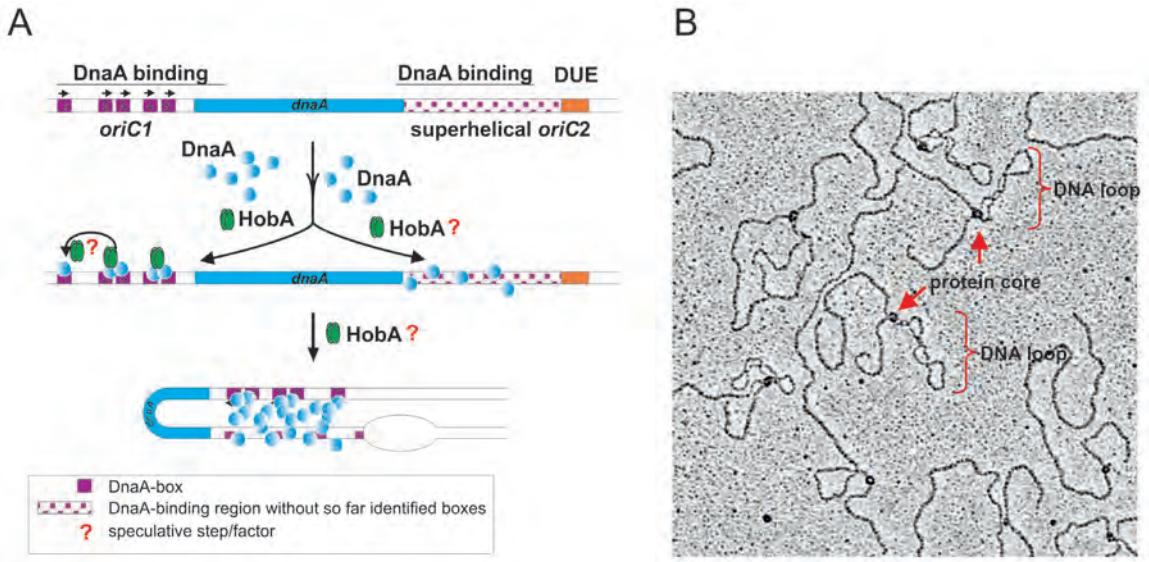

Fig. 1. Initiation of *H. pylori* chromosome replication. A) Scheme presenting the first steps of *H. pylori* chromosome replication. The DnaA protein binds two *oriC* subregions (*oriC*1 and *oriC*2). The accessory HobA protein helps DnaA to bind to *oriC*1 by increasing the DnaA affinity towards DnaA boxes. It is not known whether HobA participates in DnaA-*oriC*2 interactions. B) Micrograph presenting DnaA binding to *oriC*1 and *oriC*2 with DNA loop formation between the DnaA-*oriC*1 and DnaA-*oriC*2 subcomplexes

vidual species, which might become targets for new drugs inhibiting DNA synthesis and, consequently, the growth of harmful bacteria.

The studies conducted at the Microbiology Department of the Ludwik Hirszfeld Institute of Immunology and Experimental Therapy, Polish Academy of Sciences in Wrocław concern the initiation of chromosome replication in selected bacteria such as *Helicobacter pylori* – the Gram-negative pathogenic microorganism responsible for severe gastrointestinal disorders, mainly gastric and duodenal ulcer and gastric cancer. We identified and characterized its crucial initiation factors: the DnaA protein and the *oriC* region. Our studies on *H. pylori* have recently turned up two unexpected features of the initiation of its bacterial chromosome replication: the bipartite structure of the Gram-negative bacterium's *oriC* region, and topology-sensitive DnaA binding to *oriC*. It has been assumed that bipartite origins occur in only a few Gram-positive bacteria species, such as *Bacillus subtilis*. Our work has shown that the *H. pylori oriC* is composed of two subregions – *oriC*1 and *oriC*2 – separated by the *dnaA* gene (Fig. 1A), both necessary for *H. pylori* growth. The DnaA protein interacts specifically with each of the subregions, but also links the *oriC*1-DnaA and *oriC*2-DnaA subcomplexes by the formation of a protein core and a DNA loop (Fig. 1AB). The role of the loop formation phenomenon has not been explained, but it has been suggested to be important in regulating the initiation of chromosome replication. Surprisingly, *oriC*2 is bound exclusively as a supercoiled DNA, which directly shows the importance of the DNA topology in DnaA-*oriC* interactions, akin to the findings previously presented only for initiator-origin interactions in archaea and some eukaryota. The DNA topology depends on both the physiological state of the cells and the environmental conditions. Thus epigenetics, such as DNA topology, might be important for the regulation of bacterial processes, including the control of the chromosome initiation.

The results of our research broaden what is currently known about the initiation of chromosome replication, revealing both the universal aspects of the process in bacteria as well as those unique factors characteristic for particular species, such as *H. pylori*. They have been published in several international journals, such as *Journal of Molecular Biology*, *Molecular Microbiology* and *Nucleic Acids Research* – the latter publication presents our recent data concerning bipartite *oriC* structure and topology sensitive DnaA-*oriC* interactions.

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The International Relations of the Polish Academy of Sciences

Joint conference of the Leibniz Association and PAS in Wierzba, September 2012

P. Madajczyk | Institute of Political Studies | Polish Academy of Sciences

Despite the fact that Poland and Germany are rapidly developing ever-closer ties of scientific cooperation, certain limitations are nevertheless still encountered. As a case in point, the Polish Academy of Sciences and the Leibniz Association (*Leibniz-Gemeinschaft*) have faced the problem of a certain shortage of information about each other's organizational structure, interests, and conducted research, which unfortunately has an impact on their mutual contacts. The Leibniz Association has its roots in West Germany and in the agreement of 1949 on the principle of financing scientific institutions from associated countries, whose individual budgets cannot support such scientific activity. This principle also specifies the type of scientific institutions, 46 at the beginning and now 81 large research centers, that are associated within the *Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz*.

A joint gathering organized in Wierzba in September 2012 had the aim of intensifying cooperation between the two institutions, which signed a cooperation agreement in 2010. Participants formulated a long list of agenda points for improving bilateral cooperation within the humanities and social sciences, improving information flow, and initiating discussion on practical problems of collaboration. Better coordination of activities will enable us to better shape science policy, including on the European level. Polish-German scientific projects will be developed on this level, focused around which scientific networks drawing in re-

The second day of the conference in Wierzba was dedicated to group work. Shown here: Group 4 (M. Quinkenstein)

Participant of a trip through the Masurian Lake District contemplating cultural landscape of the region (M. Quinkenstein)

search centers from other European countries will be established. Such scientific networks are of particular importance to the Polish Academy of Sciences, which hopes that through them future cooperation with Belarusian, Ukrainian, and Russian research centers can be improved.

During the meeting in Wierzba the participants discussed on the following topics: the possibilities for intensifying the exchange of scientists, organizing regular meetings and visits aimed at paving the way for joint research projects, and intensifying research cooperation. They also gave some thought to the idea of publishing a new bulletin carrying information on projects in preparation, employment possibilities, conferences, and calls for papers. The exchange of information must above all draw attention to the possibilities for cooperation and to the kinds of research being done at various institutes. The other side's experience in implementing structural solutions aimed at interdisciplinary collaboration should be fully harnessed.

One crucial objective is to boost the mobility of researchers, especially those just starting their scientific careers, including PhD students. While taking the initiative in this area should be the responsibility of specific scientific institutions, on the other hand such efforts should be supported by the Polish Academy of Sciences and the Leibniz Association. This requires a mechanism to support individual initiatives in seeking such opportunities and to promote a "welcome culture."

The participants of the conference pointed out the potential usefulness of establishing think-tanks and expert forums, with the aim of achieving more public visibility in promoting proposals for bilateral scientific cooperation. They also expressed the opinion that the potential to improve cooperation between the PAS and the Leibniz Association is particularly great in the humanities and social sciences. The brainstorming meeting in Wierzba and the fruitful discussions it stimulated will help to develop the best mechanisms to take advantage of these opportunities in the future. Certainly, not all of the proposals can be achieved, yet it is now clearer how big the opportunities for bilateral and European cooperation truly are.

The conference in Wierzba and trip through Masurian region was a good opportunity to establish direct contacts between researchers from different countries and representing different disciplines. Among the participants of the conference were professors from Japan working on the Polish-Japanese-German project (M. Quinkenstein)

Moreover, the meeting in Wierzba was an occasion for scientists from the Polish Academy of Sciences and the Leibniz Association to establish direct contacts, to discuss research and educational projects now underway or currently being planned, to consider the existing opportunities for cooperation, and to raise any issues that have been encountered. We hope that these discussions will, in due time, result in much fruitful joint research and many joint projects. As meeting participants agreed, the exchange of information should be an ongoing endeavor and discussions will be continued at a next meeting, to be held in September 2013 at the PAS Center for Historical Research in Berlin.

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International scientific collaboration of the PAS Mammal Research Institute in Białowieża

K. Niedziałkowski | Mammal Research Institute | Polish Academy of Sciences

Since its beginnings, the Mammal Research Institute of the Polish Academy of Sciences in Białowieża (MRI) has been open to international cooperation. Cross-border scientific contacts were initiated back in the 1950s, when the international scientific journal *Acta Theriologica* was founded. For more than 60 years, the Institute's staff have carried out numerous projects with outstanding foreign scientists and institutions and have trained countless students from foreign universities.

In recent years, the Institute has been especially active in international collaboration, which has been facilitated by European funding. In 2003, the Institute became an EU Centre of Excellence in Biodiversity Conservation and Mammal Research under the 5th EU Framework Programme (FP). Under the 6th FP, it organized summer-schools in ecology and biodiversity and exchanged staff with recognized European research centers. The 7th edition of the FP has contributed to the development of the Institute's research capacity. International scientific collaboration has been a leading thread in all of those projects. Consequently, the Institute has developed a strong scientific network including 50 institutions from 29 countries.

The main objectives of the ongoing BIOCONSUS project (Research Potential in Conservation and Sustainable Management of Biodiversity, 2009-2014) include developing new strategic partnerships with high-level research centers in Europe, supporting and mobilizing human resources through two-way secondment of staff between the MRI and nine scientific centers in Europe, as well as reinforcing the Institute's scientific potential by recruiting top-caliber experienced researchers from abroad and organizing international conferences and workshops. By the end of 2012, the Institute seconded 14 researchers to its nine partner institutions and hosted 12 guest researchers, which created new links and a joint research agenda. In addition, the Institute hired 14 outstanding foreign researchers to reinforce the Institute's scientific potential. New staff joined the existing research teams at the MRI, bringing new skills and research perspectives, and improving the Institute's scientific output in the form of papers published in international journals.

Dr. Jacinta Mullins, a specialist in population genetics and molecular ecology, employed at the MRI within the BIOCONSUS project (MRI Archive)

Opening of the 7th International Moose Symposium (I. Banaszczyk)

During the BIOCONSUS project the MRI organized two international workshops and three international scientific conferences: "Landscape Genetics" (October 2011), which gathered together 48 scientists from 16 countries, "European Bison Management" (October 2012), attended by 35

Białowieża National Park

Scientists from the MRI and Ilia Chavchavadze State University during a field trip in the Caucasus Mountains in Georgia (B. Jędrzejewska)

scientists from 8 countries, and the "7th International Moose Symposium" (August 2012), attended by 180 delegates from 12 countries.

The Symposium was organized by the MRI together with the PAS Committee on Zoology, the University of Białystok, the Białowieża National Park, and the Biebrza National Park. The participants, some of which came from such distant locations as Alaska and Yakutia, included researchers, foresters, national park staff, students, and representatives of public bodies and non-governmental organizations. The Symposium featured 41 oral presentations divided into 5 thematic sessions and 35 posters, covering moose population genetics, demographics, food and habitat selection, migrations and ecological links between the moose and its environment, as well as moose population management. The conference also included trips to moose habitats in the Białowieża National Park and the Biebrza National Park. The Symposium created a forum for exchange of knowledge and experience concerning moose research and management between specialists from Central and Eastern Europe, Scandinavia, Canada, and the USA.

International cooperation with Russia and other countries to the east of Poland is supported under another 7 FP project, BIOGEAST (Biodiversity of East-European and Siberian Large Mammals on the Level of Genetic Variation of Populations, 2011-2014). It is aimed at building a network of research centers in Central and Eastern Europe and Siberia for broad scale genetic investigation of seven species of large mammals: wolf, lynx, brown bear, moose, red deer, roe deer, and wild boar. This is being carried out through joint research, exchange visits, and collaborative workshops. In addition to the MRI, the project includes partners from Estonia, the Ukraine, Georgia, and Russia. Visits of Polish researchers to Russia and Georgia and of Russian, Estonian, Georgian, and Ukrainian colleagues to Białowieża have resulted in new research avenues and provided a wealth of research material for joint analyses.

Active scientific collaboration between the MRI and research centers in Europe, North America, and in the Asian part of Russia provides opportunities for initiating broad scale and cutting edge scientific projects significant on a global scale. Taking advantage of its location and new opportunities provided by European funding, the Institute has successfully facilitated cooperation between the scientists from different parts of the World, whose research offers complementary insights into transboundary natural processes and patterns.

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Poland's accession to ESA – chance for space research and industry

M. Banaszkiewicz | Space Research Center | Polish Academy of Sciences

On 19 November 2012, Poland became the 20th member of the European Space Agency (ESA). This event marked the culmination of the long-term efforts of the Polish space community to join one of the most advanced R&D organizations in Europe.

The ESA was established by 10 founding countries back in 1975 as a successor to two earlier European organizations – the ELDO, dedicated to developing launching capabilities, and the ESRO, pursuing a space research program. The agency is governed by a Board of Ministers from Member States, who are responsible for space activity in their respective countries. The yearly ESA budget, amounting to €4.28 billion in 2013, comes mostly from contributions from the member states. The mandatory fee, which is proportional to the GNP of each member state, is spent on administrative issues, on maintaining the agency's infrastructure, and on scientific missions and general technology development. The optional fee, which is usually 2-3 larger than the mandatory fee, is used (in keeping with to the priorities and preferences of the member states) to fund such programs as navigation, telecommunications, Earth observations, human spaceflight, space situational awareness, launchers, and exploration. ESA tenders are preferentially allocated to industry, although research organizations can also apply and win contracts, especially for space mission analysis, feasibility studies, and technology demonstration at low readiness levels (prototypes). The ESA's main principle of operation, which makes the agency different from other international bodies, is the rule of "geographical return," a principle whereby the value of contracts awarded to each country's industry and research units will, to the extent possible, be close to 85% of that country's contribution to the ESA budget. The remaining 15% is spent on maintaining the agency and on general costs.

ESA programs are carefully planned and prepared through internal discussions and external consultations. This especially applies to space missions that usually take 20-30 years of preparation and execution. A good example of this is the Cassini-Huygens mission to Saturn, a joint ESA-NASA enterprise

Poland exchanged Accession Agreements on the ESA Convention on 13 September 2012 at the Copernicus Science Center in Warsaw

that was initiated in 1984, developed over the next 12 years, and launched in 1997. The spacecraft reached the Saturn system in 2004 and after a successful landing of Huygens on the surface of Titan, Saturn's large satellite, in January 2005, it still continues to provide a wealth of interesting scientific data about the planet, its satellites, the rings of Saturn and its magnetic and plasma environment. Incidentally, Huygens was the first ESA mission that carried a Polish sensor, THP, dedicated to measure the temperature profile and thermal properties of the atmosphere.

Poland, although formally a newcomer among ESA member states, has a long tradition of experimenting in space and developing scientific instruments. Starting from 1972, when the first Polish space experiment, an X-ray spectrophotometer from the Wrocław heliophysics group, was launched on a Soviet-made Vertical rocket, Poland was an active member of the Interkosmos organization. Polish institutes developed more than 30 space instruments flown on Soviet missions. After the transformation, even before the Interkosmos program was closed, Polish scientific groups, mostly but not exclusively from the PAS Space Research Center, participated as a partner (subcontractor) in ESA research teams and took part in the majority of the agency's plan-

etary and astronomical missions: Cassini-Huygens, Integral, Rosetta, Mars-Express and Venus-Express, Herschel, Solar Orbiter and Bepi Colombo. Now, the Polish space community has a full access to all ESA missions and cooperates and competes on equal footing with the teams from other member states. We are already involved in the accepted large-class mission to Jupiter (JUICE) and in two potential medium-class missions, LOFT and ECHO.

The main challenge the Polish space sector faces at present is how to efficiently develop the industrial sector, the main shareholder potentially benefiting from ESA contracts (80-90% of tenders going to industry). Another challenge is to consolidate the space-industrial and space-research capacity in Poland. With a current number of about 140 institutions subscribed to ESA tender system, Poland is the record holder in this category among all ESA members and surpasses France and Germany, which spend 40-50 times more on space than our country.

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Educational and Promotional Activity within the Polish Academy of Sciences

The educational activity of the Division I Scientific Committees

The educational activity of the Scientific Committees affiliated with PAS Division I: Humanities and Social Sciences is aimed at promoting the disciplines represented by the committees, disseminating and popularizing the results of related research, and above all supporting and stimulating the academic development of young scholars.

To support young researchers in their studies on population, the **PAS Committee on Demographic Studies** organizes an annual conference drawing together the community of young demographers, known as the *Latająca Szkoła Demografii*. In 2012, the Scientific Conference of Young Demographers entitled "Applied Demography: On New Methods of Analysis and Research Needs" was organized at the Warsaw School of Economics. This conference fostered discussion on the research challenges faced by young scientists, concerning methods of analysis, data sources, and research issues, and served as a forum enabling young Polish demographers to present the results of their work. A total of 25 young researchers presented the work they are performing towards preparing their PhD or DSc (*habilitation*) dissertations, including six presentations in English. They received helpful comments and constructive criticism from invited guests, Polish university professors, and other young researchers. Some of the papers were selected to be published in *Studia Demograficzne*, a periodical issued by the PAS Committee on Demographic Studies.

The conference "D-Finance – Finance Didactics at Higher Education Institutions," a forum for the exchange of teaching experience among university teachers, is a joint venture of the **PAS Committee on Financial Sciences** and the Department of Banking at Wrocław University of Economics. The Conference framework facilitates exchanging knowledge and experiences, which is especially important for younger teachers, who have a chance to discuss and validate their own original ideas. The post-conference publication is also an important part of this framework, as is its web page (www.d-finanse.ue.wroc.pl) covering many different subjects in the field of finance didactics. In 2012 the Conference focused on the best practices for the implementation of the Framework for Higher Education Qualifications (KRK).

Prof. Maria Dudzikowa, the academic supervisor of the 26th Summer School for Young Pedagogues, receiving flowers from the event organizers in gratitude for her assistance and efforts to oversee the event (M. Makiewicz)

The **PAS Committee on Labour and Social Policy Sciences** established a "Human Capital Development" Youth Panel in 2012, tasked with preparing one plenary session of the Committee annually. The first such meeting was held on 28 September 2012, its theme being "Contemporary Determinants of Intellectual Capital Quality in the Polish Economy." Panel members prepared seven papers presented at the meeting, which served as a point of departure for further discussion. The overarching theme of the Panel's work in 2013 is the "Development of Intellectual Capital in the Polish Economy." Other proposed research areas include issues related to the role of human capital in the process of creating value

in the organization and the role of the competence of employees in the knowledge-based economy. An important goal of the team is also developing and strengthening cooperation between different research centres in Poland by initiating joint activities and research projects.

The **PAS Committee on Pedagogical Sciences** organizes a Summer School for Young Pedagogues, with the basic aim of supporting and stimulating the academic development of young teachers, creating opportunities for deepening their knowledge, enriching their own research techniques, presenting academic achievements, and promoting the most gifted individuals. Also, it importantly serves to help create conditions conducive to the integration of the teaching community and tightening intergenerational contacts. The 26th Summer School for Young Pedagogues was held in the town of Supraśl, with the theme "Worlds in the Everyday Life of Participants of Educational Interactions: Explorations, Analyses, Interpretations." Academic supervision of the School's organization on behalf of the PAS Committee on Pedagogical Sciences was exercised by Prof. Maria Dudzikowa, and the event was hosted by the Faculty of Pedagogy and Psychology at the University of Białystok. The 26th Summer School was attended by 39 MA degree holders and 27 PhD degree holders from centers in all over Poland, who presented their research concepts and results during a "(Va)nity/riety Exchange" session. Young Pedagogues' texts were published in the 17th Notebook of the Forum of Young Pedagogues, bearing the same title as the Summer School session, and the best texts were published in *Rocznik Pedagogiczny*.

The educational activity of the **PAS Committee on Psychology** focuses on drawing young and promising researchers with doctoral and postdoctoral degrees into the work of the Committee. This gives them the opportunity to meet experienced researchers and to join in the Committee's efforts, including taking part in academic discussions and conferences. The international achievements of young researchers are promoted by the annual competition for the Andrzej Malewski Prize, in which the prize committee selects a winner with major international publications to his or her credit. The winner receives the prize and a statuette at the Psychology Colloquia conference and is asked to deliver a lecture. In 2012, the Andrzej Malewski Prize was won by Dr. Magdalena Senderecka. The Committee's educational activity also consists in creating an atmosphere conducive to the development of young people's careers and in seeking a legal framework that better promotes academic development in the best sense of the word.

Opening ceremony of the 26th Summer School for Young Pedagogues under the patronage of the PAS Committee on Pedagogical Sciences, in Supraśl, 2012. From right: Asst. Prof. Jerzy Halicki (Deputy Rector for Teaching and Student Affairs, University of Białystok), Asst. Prof. Mirosław Sobecki (Dean of the Department of Pedagogy and Psychology, University of Białystok), Prof. Bogusław Śliwerski (Chairman of the PAS Committee on Pedagogical Sciences), Prof. Maria Dudzikowa (Deputy Chair of the PAS Committee on Pedagogical Sciences and academic supervisor of the 26th Summer School for Young Pedagogues), and Dr. Alicja Korzeniecka-Bondar (academic secretary of the 26th Summer School for Young Pedagogues) (M. Makiewicz)

Publications evidencing the productive scientific output of the Summer School for Young Pedagogues (M. Makiewicz)

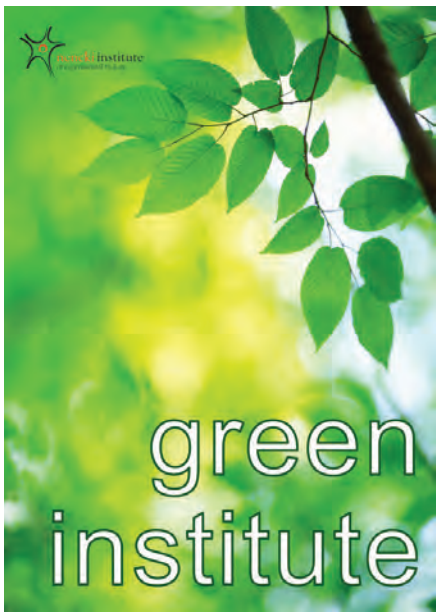
A series of events known as the "Doctoral Workshops in Econometrics and Statistics," created and organized by Prof. Aleksander Welfe, constitutes the main form of activity of the **PAS Committee on Statistics and Econometrics** aimed at promoting young scientists and furthering their education. The

aim of the Workshops is to showcase and openly discuss the research projects and results of individuals working on PhD or DSc (*habilitation*) dissertations. The discussions are led by professors with authority, specialists in different applications of mathematics and statistics in the fields of economics, finance, and management. The event is held each year for three days, between the end of May and the middle of June. Since 2000, thirteen such conferences have been organized at various venues in Poland, with over 280 registered participants (representing all the main research groups in Poland) and 263 presentations delivered. The next, 14th such meeting will be held this year from June 4 to June 8.

Prepared by Division I: Humanities and Social Sciences.

The Nencki "Green" Institute

A. Szewczyk | Nencki Institute of Experimental Biology | Polish Academy of Sciences



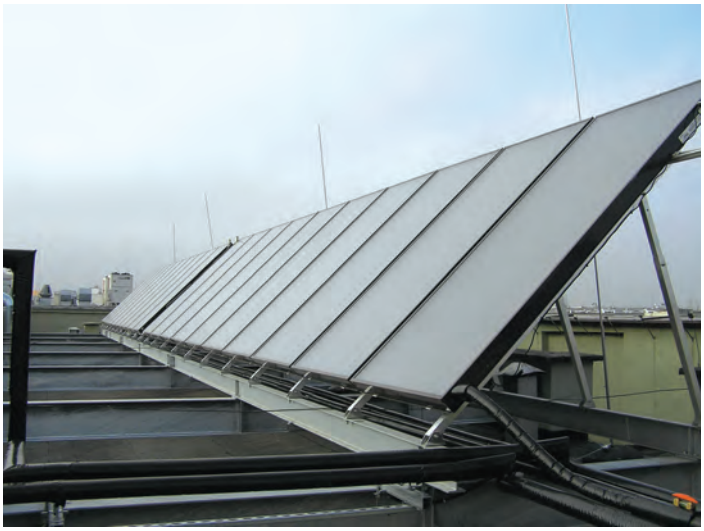
Every scientific institution, especially one involved in life-science research, should act responsibly towards the natural environment. In keeping with this maxim, since 1 June 2011 the Nencki Institute of Environmental Biology of the Polish Academy of Sciences in Warsaw has been implementing a "Green Institute" program, the goal of which is to minimize the environmental footprint of the Institute's activity.

This program has been underway for two years now. Its stated objective, as described in a detailed "Green Institute" declaration, is to minimize all aspects of the Institute's functioning that could exert a negative impact on the environment. "It should be emphasized that, already for a long time now, our institute has been engaged in waste segregation and utilization of chemical waste produced during the scientific experiments performed under our research projects," says Prof. Adam Szewczyk, director of the Nencki Institute.

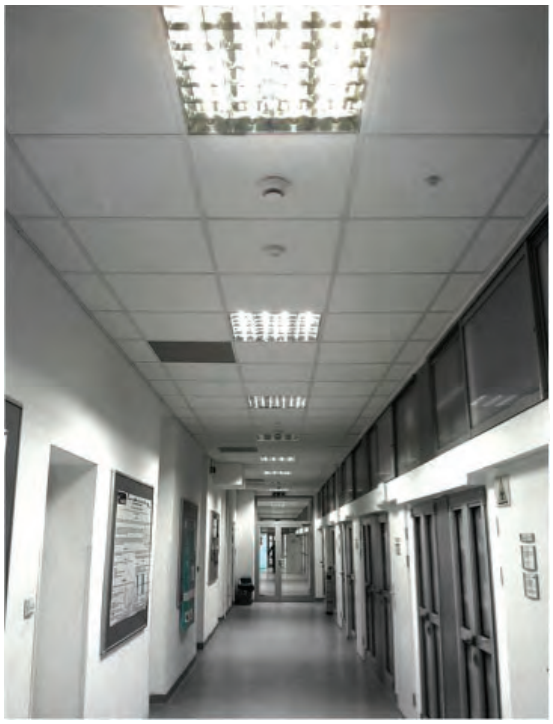
Under the Green Institute program, numerous organizational and functional changes have been introduced at the Nencki. For instance, automatic light regulators help achieve better energy management, while automatic toilet fittings limit the daily use of water. Furthermore, on 1 February 2012 the Institute signed an agreement with the National Fund for Environmental Protection and Water Management to finance a project called "Thermo-Modernization of the Structures of the Nencki Institute of Experimental Biology of the Polish

Roof insulation

Modernized heating system



Sun collectors on the Institute's roofs



New, low-energy lighting

Waste segregation

Academy of Sciences" under the Green Investment Scheme, or GIS. Various thermo-modernization work has been carried out under this agreement, such as ceiling insulation, heating system modernization, the installation of sun collectors on the roofs, and replacing the lighting. In connection with this, the Nencki Institute was required to achieve the ecological effect of lowering its CO2 emissions by 439 Mg/year. Modernization work was completed in December 2012 and the Institute building, which was constructed back in the 1950s, now proudly meets present-day environmental standards.

The Green Institute initiative sparked interest among the Nencki PhD students' self-government organization. In cooperation with the student government, additional waste segregation has been planned for labs producing waste as a result of scientific experiments. Joint activities have also been scheduled to promote pro-environmental habits in everyday lab work and in the various ways the Institute functions. In the near future the Institute will also strive to limit its use of paper, which will be achieved by gradually introducing an electronic system for document circulation.

The Nencki Institute of Experimental Biology of the Polish Academy of Sciences was established in 1918 and is the largest non-university center for biological research in Poland. Priority fields for the

Institute include neurobiology, neurophysiology, biology, cellular biochemistry, and molecular biology, at complexity levels ranging from tissue organisms through cellular organelles down to proteins and genes. There are 31 labs in the Institute, including a modern Laboratory of Confocal Microscopy, Laboratory of Cytometry, and Laboratory of Electron Microscopy, Behavioral and Electrophysiological Tests. The Institute is equipped with state-of-the-art research equipment and a modernized animal house, where lab animals (including transgenic animals) are bred in accordance with the highest standards. The quality of the experimentation performed here, the caliber of the resulting publications, and the staff's close ties with the international science community all help place the Institute among leading biological research institutions in Europe.

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The FNP Prizes for 2012

This year's prizes of the Foundation for Polish Science (FNP) were won by Prof. Krzysztof Palczewski, Prof. Mieczysław Mąkosza, Prof. Maciej Wojtkowski, and Prof. Ewa Wipszycka. The FNP awards have a reputation as the top-ranking and most prestigious scientific prizes in Poland. They are awarded in four separate areas to Polish scholars for their achievements and discoveries in the preceding four years, making a significant contribution to Poland's spiritual life and the advancement of civilization, as well as ensuring Poland a significant position in world science.

Prof. Krzysztof Palczewski has made major scientific contributions to the biology and chemistry of vertebrate vision. He is especially renowned for having first solved the crystal structures of inactive and photoactivated bovine rhodopsin, a prototype for G protein-coupled receptors (GPCRs), which comprise the largest, most diverse family of human drug targets. Similar research won the Nobel prize in chemistry in 2012. Together with one of the 2012 Nobel laureates, Prof. Palczewski and colleagues purified, microsequenced, cloned, and extensively characterized the enzymatic properties of rhodopsin kinase. Next he established that this GPCR specific kinase is a key regulator of rhodopsin function *in vivo*, including the identification of phosphorylation sites on rhodopsin using then-novel mass spectrometry methods.

Prof. Palczewski has discovered several key regulators of visual processes and described their properties, including the guanylate cyclase-activating protein family, a spliced form of arrestin called p44, a family of calcium-binding proteins called CaBPs, and another family of enzymes called retinol dehydrogenases. Beyond the field of vision, his additional scientific breakthroughs include solving the crystal structure of retinoid isomerase and discovering CaBP4, a regulator of synaptic function. Using advanced high-resolution two-photon excitation imaging techniques revealed toxic fluorophores that accumulate in retinal diseases and aging. Finally, he and his wife Grażyna developed repetitive dynamic imaging of these compounds in live wild type (WT) and genetically modified mice, through the pupil of the eye. Leveraging advanced adaptive optics (AO) and dispersion compensation, they developed a data acquisition algorithm (a new imaging technology). This highest resolution imaging of the retina has the potential to transform molecular imaging of retinas of patients with acquired or inherited blindness.

Importantly, Prof. Palczewski has engineered mutated visual cycle proteins in transgenic animal models to understand their roles in vision and devise therapies for human retinopathies. One such advance implicated all-trans-retinal accumulation in the retinas of mice with acute light-induced retinal dystrophy. Another mouse model, mimicking human Stargardt's disease and age-related macular degeneration, responded favorably to retinylamine, which slows the retinoid cycle. Finally, bypassing malfunctioning enzymes of the retinoid cycle, the artificial chromophore 9-*cis*-retinal partially restored vision in a transgenic mouse model and several patients with Leber's congenital amaurosis. These and other considerable accomplishments have established Prof. Palczewski as a world leader in his area of research.

Prof. Mieczysław Mąkosza earned his first degree in chemistry from the University of Leningrad (now St. Petersburg) in 1956. From the start of his research career he was affiliated with the Warsaw University of Technology, where he earned his PhD in 1963 followed by his DSc (*habilitation*) in 1967. In 1984 he earned the title of full professor. For 25 years (1979-2004) he was director of the PAS Institute of Organic Chemistry.

He has managed to successfully combine a prolific research career with numerous functions held within research institutions: he served as a member of the PAS Presidium, as chairman of the PAS Committee on Chemistry, as chairman of the Scientific Council of the PAS Center for Molecular and Macromolecular Studies, and as a member of the Poland's Central Committee for Degrees and Titles. He remains active within PAS institutions to this very day, now chairing the Scientific Council of the Institute of Organic Chemistry for the 2011-2014 term.

He is a member of four science academies: the Polish Academy of Sciences (PAS), the Polish Academy of Arts and Sciences (PAU), the German Academy of Sciences Leopoldina, and Academia Europaea. He has received six honorary doctorates, and has won numerous awards and medals for his outstanding achievements (including the Polish State Prize of the First Degree, the Polish Prime Minister's Prize, the Jurzykowski Prize, the Alexander von Humbolt Foundation Award, and others, as well as the Cavalier Cross, the Officer's Cross, the Commander's Cross, and the Commander's Cross with Star of the *Polonia Restituta* Order, the Konstanecki Medal, the Śniadecki Medal of the Polish Chemistry Society, and the Marie Skłodowska-Curie Science Medal of the Józef Piłsudski Institute of America).

Prof. Mąkosza's research output includes more than 390 research publications and 70 patents. He has served as the advisor for more than 150 master's students and 50 PhD students.

He earned the Prize of the Foundation for Polish Science for "developing a new reaction – vicarious nucleophilic substitution – and making it part of the canon of modern chemistry." Vicarious nucleophilic substitution of hydrogen (VNS) enables functionalized alkyl substituents, hydroxyl and amino groups, to be introduced into aromatic rings and has found broad application in organic synthesis. It is particularly widely utilized in the synthesis of heterocyclic compounds: indole, substituted piridines, etc. Apart from its great value for organic synthesis, this reaction makes it possible to study the significant properties of nitroarenes, especially in identifying the influence of substituents on their electrophilic activity.

Maciej Wojtkowski (b.1975) received his MSc and PhD in physics from Nicholas Copernicus University (NCU), Toruń, Poland. Presently he has a faculty position as associate professor at the Institute of Physics, NCU, Poland. His research interest includes optical coherence tomography and low coherence interferometry applied to biomedical imaging. He is active in the field of Optical Coherence Tomography (OCT) and its ophthalmic applications.

Dr. Wojtkowski has had a significant impact on the development of the Fourier domain OCT (FdOCT) technique. The first FdOCT instrument for in vivo retinal imaging was designed and constructed by Dr. Wojtkowski and his colleagues from the Medical Physics Group at Nicolaus Copernicus University Poland in 2001. Applying high speed OCT in the field of ophthalmology enabled the Toruń-based group to obtain retinal cross-sectional images with the shortest exposure times, thus confirming the Fourier-domain technique's advantage in terms of speed and sensitivity over the standard OCT method. Dr. Wojtkowski also contributed to the development and construction of three clinical prototype high-speed and high-resolution OCT instruments, which are in use at the following ophthalmology clinics: Collegium Medicum in Bydgoszcz, Poland, the New England Eye Center, Boston, and UPMC, Pittsburgh.

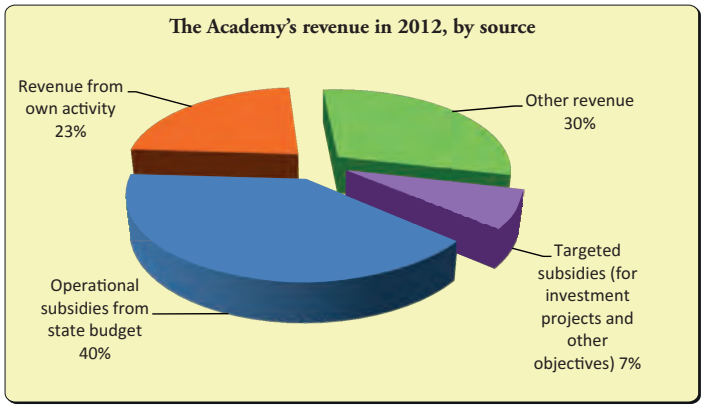
In his academic career Dr. Wojtkowski has served short internships at Vienna University and the University of Kent. He also worked for two years as a postdoctoral fellow on a joint project between Massachusetts Institute of Technology and the New England Eye Center.

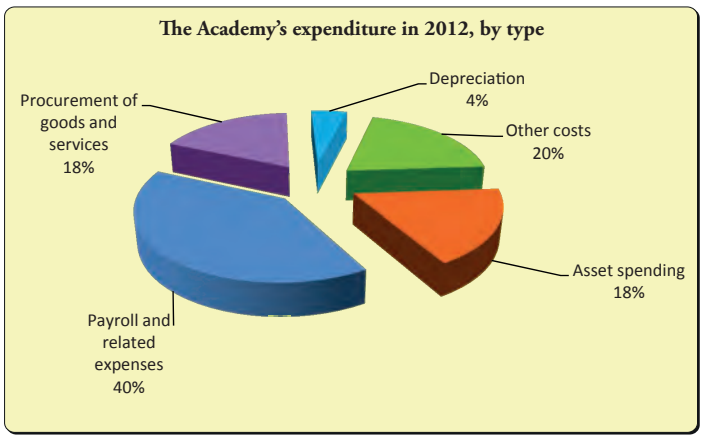
Ewa Wipszycka, professor at the Institute of Archaeology of the University of Warsaw, has dedicated her career to the study of Church history in Late Antique Egypt. She is today one of the most internationally renowned scholars in her discipline. Even if students of humanities rarely count citations, she is undoubtedly one of the most frequently quoted authorities, especially in the field of ecclesiastical institutions. An important part of her oeuvre has been devoted to the phenomenon of monasticism, which was born in Egypt and there also reached its developed form. The Foundation for Polish Science awarded her its Grand Prize for her book *Moines et communautés monastiques en Egypte (IV^{e}-VIII^{e} siècles)* published by the Raphael Taubenschlag Foudation in 2009. Mastering a great variety of sources (literary, documentary, archaeological, geographical), she has been able to conjure a synthetic image of monasticism unparalleled in its richness and complexity. Although she was originally trained as a historian, her extensive participation in excavations has refined her skills for interpreting the archaeological evidence, which her deep knowledge of the literary sources allows her to further illuminate.

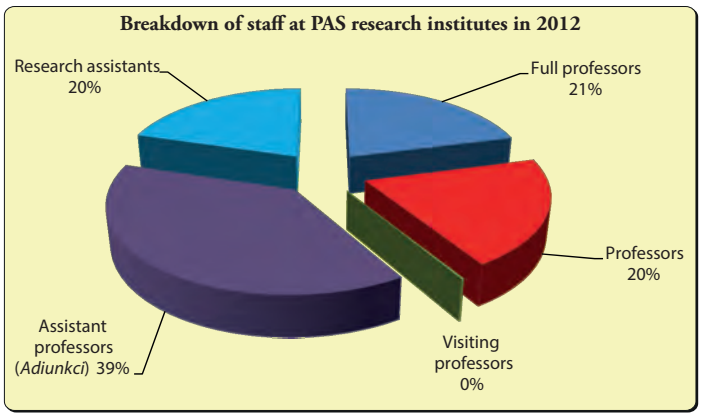
As a professor of the University of Warsaw she has taught ancient history to the students of history and archaeology, meeting their needs with numerous academic handbooks, developing for them a thoroughly new and personal form of instruction: a lecture combined with presentation of the scientific debate aiming at the introduction to the world of research from the very beginning of studies. She has also authored an acclaimed handbook for children, which is quite a rare case among professors of her academic standing.

Polish Academy of Sciences in 2012

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 funding allocated under research project agreements. The operational subsidies taken in as revenue by the Academy institutes in 2012 came to a total of 537.9 million PLN, whereas the operational subsidies, whereas 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 76.8 million PLN.

Employment at the Academy

There were a total of approx. 9,400 individuals employed by the Polish Academy of Sciences in 2012. More than 8,500, or 90%, of them were employed at PAS institutes, including approx. 3,700 research staff members. Another approx. 900 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.

Activities of the PAS committees in 2012

Conferences	462
Conference participants	60 744
Lectures, conference reports, articles	19 136
Expert's reports and opinions	35
Journal titles	163

Scientific degrees and titles granted by PAS units in 2012 (by PAS division)

	Scientific degrees and titles		
	Doctorate degrees	DSc (*habilitation*) degrees	Professorship nominations
Division I	24	15	11
Division II	39	21	8
Division III	43	21	16
Division IV	25	13	11
Division V	15	8	5
Total	**146**	**78**	**51**

Didactic activity of PAS scholars in institutions of higher education in 2012 (by PAS division)

	The number of people teaching in universities
Division I	438
Division II	206
Division III	439
Division IV	222
Division V	80
Total	**1 385**

Foreign Scientific Centers

CENTER FOR HISTORICAL RESEARCH OF THE POLISH ACADEMY OF SCIENCES IN BERLIN

ZENTRUM FŰR 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@panberlin.de
www.panberlin.de
Director: Robert Traba

POLISH ACADEMY OF SCIENCES SCIENITFIC 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 SCIENITFIC 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: PAN.Moskwa@mail.ru
www.panmoskwa.pl
Director: vacancy

POLISH ACADEMY OF SCIENCES SCIENITFIC 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: Zbigniew T. Kuźnicki

POLISH ACADEMY OF SCIENCES SCIENITFIC 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.it
www.rzym.pan.pl
Director: Piotr Salwa

POLISH ACADEMY OF SCIENCES SCIENITFIC 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@skynet.be
www.polsca.eu
Director: Jan Krzysztof Frąckowiak

Research Units and Branches of the Polish Academy of Sciences

Research Units

Division I: Humanities and Social Sciences

- **Institute of Archeology 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 Economic Sciences** (Warszawa)
  e-mail: inepan@inepan.waw.pl
  www.inepan.waw.pl

- **Institute of Legal Studies** (Warszawa)
  e-mail: inp@inp.pan.pl
  www.inp.pan.pl

- **Institute of Literary Research** (Warszawa)
  e-mail: sekretariat@ibl.waw.pl
  www.ibl.waw.pl

- **Institute of Mediterranean and Oriental Cultures** (Warszawa)
  e-mail: zaspan@zaspan.waw.pl,
  www.iksio.pan.pl

- **Institute of Philosophy and Sociology** (Warszawa)
  e-mail: secretar@ifispan.waw.pl
  www.ifispan.waw.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: ispan@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

- **Ludwik and Aleksander Birkenmajer Institute of the History of Science** (Warszawa)
  e-mail: ihn@ihnpan.waw.pl
  www.ihnpan.waw.pl

- **Tadeusz Manteuffel Institute of History** (Warszawa)
  e-mail: ihpan@ihpan.edu.pl
  www.ihpan.edu.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

- **Bohdan Dobrzański Institute of Agrophysics** (Lublin)
  e-mail: sekretariat@ipan.lublin.pl
  www.ipan.lublin.pl

- **European Regional Centre for Ecohydrology of the Polish Academy of Sciences** (Łódź)
  e-mail: erce@erce.unesco.lodz.pl
  www.erce.unesco.lodz.pl

- **Franciszek Górski Institute of Plant Physiology** (Kraków)
  e-mail: ifr@ifr-pan.krakow.pl
  www.ifr-pan.krakow.pl

- **Institute for Agricultural and Forest Environment** (Poznań)
  e-mail: isrl@man.poznan.pl
  www.isrl.poznan.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 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 Plant Genetics** (Poznań)
  e-mail: office@igr.poznan.pl
  www.igr.poznan.pl

- **Institute of Systematics and Evolution of Animals** (Kraków)
  e-mail: office@isez.pan.krakow.pl
  www.isez.pan.krakow.pl

- **Jan Kielanowski Institute of Animal Physiology and Nutrition** (Jabłonna)
  e-mail: office@ifzz.pan.pl
  www.ifzz.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

- **Roman Kozłowski Institute of Paleobiology** (Warszawa)
  e-mail: paleo@twarda.pan.pl
  www.paleo.pan.pl

- **Witold Stefański Institute of Parasitology** (Warszawa)
  e-mail: iparpas@twarda.pan.pl
  www.ipar.pan.pl

- **Władysław Szafer Institute of Botany** (Kraków)
  e-mail: ibpan@botany.pl
  www.botany.pl

Auxiliary research units supervised by Division II

- **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 Center for Ecological Research in Dziekanów Leśny***
  e-mail: cbe@cbe-pan.pl
  www.cbe-pan.pl

- **Polish Academy of Sciences Anthropology Unit in Wrocław** (Wrocław)
  e-mail: zapan@antro.pan.wroc.pl
  www.antro.pan.wroc.pl

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

- **Polish Academy of Sciences Research Station for Ecological Agriculture and Preservation of Native Breeds in Popielno** (Popielno)
  e-mail: sbpan@wp.pl
  www.popielno.pl

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

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

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

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

- **Henryk Niewodniczański Institute of Nuclear Physics** (Kraków)
  e-mail: dyrektor@ifj.edu.pl
  www.ifj.edu.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 Mathematics** (Warszawa)
  e-mail: im@impan.pl
  www.impan.pl

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

* The Centre for Ecological Research in Dziekanów Leśny has been put into liquidation

- **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: intlab@alpha.ml.pan.wroc.pl
  www.ml.pan.wroc.pl

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

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

- **Space Research Center** (Warszawa)
  e-mail: director@cbk.waw.pl
  www.cbk.waw.pl

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

- **Aleksander Krupkowski Institute of Metallurgy and Materials Science** (Kraków)
  e-mail: office@imim.pl
  www.imim.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: kanc@ipis.zabrze.pl
  www.ipis.zabrze.pl

- **Institute of Fundamental Technological Research** (Warszawa)
  e-mail: director@ippt.gov.pl
  www.ippt.gov.pl

- **Institute of Hydroengineering** (Gdańsk)
  e-mail: sekr@ibwpan.gda.pl
  www.ibwpan.gda.pl

- **Institute of Theoretical and Applied Informatics** (Gliwice)
  e-mail: office@iitis.pl
  www.iitis.pl

- **Maciej Nałęcz Institute of Biocybernetics and Biomedical Engineering** (Warszawa)
  e-mail: ibib@ibib.waw.pl
  www.ibib.waw.pl

- **Mineral and Energy Economy Research Institute** (Kraków)
  e-mail: centrum@min-pan.krakow.pl
  www.min-pan.krakow.pl

- **Robert Szewalski Institute of Fluid-Flow Machinery** (Gdańsk)
  e-mail: imp@imp.gda.pl
  www.imp.gda.pl

- **Stanisław Leszczycki Institute of Geography and Spatial Organization** (Warszawa)
  e-mail: igipzpan@twarda.pan.pl
  www.igipz.pan.pl

- **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
  www.ibspan.waw.pl

Division V: Medical Sciences

- **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.cbm.pan.pl

- **Institute of Pharmacology** (Kraków)
  e-mail: ifpan@if-pan.krakow.pl
  www.if-pan.krakow.pl

- **Ludwik Hirszfeld Institute of Immunology and Experimental Therapy** (Wrocław)
  e-mail: secretary@iitd.pan.wroc.pl
  www.iitd.pan.wroc.pl

- **Mirosław Mossakowski Medical Research Center** (Warszawa)
  e-mail: sekretariat@imdik.pan.pl
  www.imdik.pan.pl

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 Poznań** (Poznań)
  e-mail: poznan@pan.pl
  www.pan.poznan.pl

- **Polish Academy of Sciences Branch in Wrocław** (Wrocław)
  e-mail: wroclaw@pan.pl
  www.wroclaw.pan.pl

Other units

- **Henryk Frąckiewicz Center for Laser Technologies of Metals Kielce Technical University and the Polish Academy of Sciences** (Kielce)
  e-mail: cltm@tu.kielce.pl
  www.tu.kielce.pl

- **International Institute of Molecular and Cell Biology in Warsaw** (Warszawa)
  e-mail: secretariat@iimcb.gov.pl
  www.iimcb.gov.pl

Scientific and Task Force Committees

Task Force Committees

Committees affiliated with the Presidium of the Academy

- **The Committee on Bioethics**
  Uniwersytet Warszawski,
  Instytut Filozofii
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- **The "Poland 2000 Plus" Forecast Committee**
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  ul. Grzegórzecka 20, 31-531 Kraków
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Division II: Biological and Agricultural Sciences

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Division V: Medical Sciences

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