

Annual
ANNUAL REPORT

Report

2010

POLISH ACADEMY of SCIENCES

Contents

Address by PAN President Professor Michał Kleiber	3	Medical Sciences	79
Presidium of the Polish Academy of Sciences	5	Earth and Mining Sciences.....	90
Members of the Polish Academy of Sciences	6	International Relations.....	103
Social Sciences.....	13	Educational and Promotional Activity	108
Biological Sciences	32	The “Polish Nobel Prizes” for 2009	113
Mathematical, Physical, and Chemical Sciences	44	Selected Statistics.....	117
Technical Sciences	51	Foreign Scientific Centers.....	119
Agricultural, Forestry, and Veterinary Sciences	64	Scientific Institutes and Branches.....	120
		Scientific and Task Force Committees.....	126

Scientific Council:

Władysław Włosiński – Editor-in-Chief
Miroslawa Drozd-Piasecka
Wiesław Bogdanowicz
Jerzy Zabczyk
Adam Borkowski
Zygmunt Reklewski
Sławomir Majewski
Ryszard Marcinowski

Published by:

Office of Science Promotion

Edited by:

Elżbieta Jamroz
Albert Rokosz
Katarzyna Rydzewska

Translated and proofread by:

Daniel J. Sax

Graphic design:

Robert Dobrzyński

Computer setting:

Dariusz Górski, Elżbieta Malik

Publication costs partly covered by the Ministry of Science
and Higher Education

© Copyright 2010
Polish Academy of Sciences

Office of Science Promotion
PKiN, Pl. Defilad 1, 00-901 Warsaw, Poland
www.pan.pl

ISSN 1640-3754

On the cover:

Photograph: Hydro-electric power generators,
© iStockphoto.com/Eliza Snow

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
Photographical Documentation Archives
of the Institute of Art, PAN.

Printed and bound by:
Warszawska Drukarnia Naukowa PAN
00-656 Warszawa, ul. Śniadeckich 8
phone/fax: 48 (22) 628 76 14

Address by PAN President Professor Michał Kleiber

The activities of the Polish Academy of Sciences in 2009 focused on the following most crucial threads: on the continuation of ongoing research efforts and expert-opinion related work by the Academy's research establishments, councils, committees, and workgroups, and on legislative and organizational preparations for a package of new laws regulating science in Poland, including an act on the Polish Academy of Sciences.

The high degree of dynamism and effectiveness of the research work carried out by the units of the Polish Academy of Sciences in 2009, some prominent results of which are profiled in the various individual sections of this *Annual Report*, are a source of great satisfaction.

The scientists and scholars of the Polish Academy of Sciences participated in 2009 in numerous research projects and undertakings aimed at boosting public awareness of science; many of these achievements are listed and described in this volume. Just three examples that merit separate mention show well just how spectacular they can be, illustrating at the same time just part of the broad range of the Academy's overall activities. Scientists from the Academy's Museum and Institute of Zoology in Warsaw participated in an international research project involving interdisciplinary explorations of the remains of Nicolaus Copernicus, sparking a lively reaction from both the scientific community and the public at large. Another great success worth stressing was achieved by the *My, berlińczycy! Wir Berliner!* exhibition dealing with the history of Polish-German relations as neighbors, prepared by the Academy's Center for Historical Research in Berlin – it won one of the most prestigious international prizes, the “Red Dot Award 2009.” Lastly, as part of “World Brain Awareness Week” the Academy's regional branch based in Poznań, together with the Committee on Human Genetics and Molecular Pathology, initiated a cyclical event entitled “Brain Awareness Week in Poznań,” promoting greater knowledge about nervous system research.

Aside from such top-notch research initiatives, the Polish Academy of Sciences was also the host for a number of important scholarly events of international scope in 2009. At the initiative of Prof. Andrzej Górski, vice-president of the Academy, a research seminar was held on “Openness in Science: Open Access and Other Models,” gathering together Polish and



A. Jaskot

foreign scholars dealing with these issues. The seminar addressed matters of great importance in substantive, social, and economic terms. Openness in science is a crucial condition for garnering public trust and support for science.

An international conference on “Promoting Education on Dual Use Issues in the Life Sciences” was organized in Warsaw, jointly by the Polish Academy of Sciences and the American National Academy of Sciences, with the objective of raising public awareness of the wide range of scientific and social aspects

pertaining to the dangers arising from the possible dual use of research findings contrary to their original intent, and pointing out the ethical challenges that scientific progress gives rise to. Representatives of academies of science, higher-education institutions, non-governmental organizations, and governmental institutions from 25 countries in the world took part.

The presidents, vice-presidents, and other representatives of the academies of sciences in the Czech Republic, Poland, Slovakia, and Hungary met at the Forum of Science Academies from V4 Countries (organized by the Polish Academy of Sciences in Jabłonna), which addressed the reform of existing vehicles of cooperation and partnership, the impact of the world financial crisis on science in the region, and the possibility of creating regional research infrastructures.

The Polish Academy of Sciences organized the debate of the European Research Council (ERC), a body set up by the European Commission and to work out a new mechanism for funding the most ambitious research. Prof. Michał Kleiber is an elected founding member of the ERC.

The activities of the Academy on the international forum in 2009 were further augmented by its representatives' involvement in international bodies. The most important element of the Polish research community's collaboration with the European Science Foundation was the involvement of numerous research teams and individual scholars in the pursuit of 22 international Research Networking Programmes. Prof. Michał Kleiber serves as a member of this body's Steering Committee. The European Commission published a report by the MASIS group of experts (Monitoring Activities of Science in Society in Europe), entitled "Challenging Futures of Science in Society: Emerging Trends and Cutting-edge Issues." One of the MASIS experts is Prof. Andrzej Górski, vice-president of the Polish Academy of Sciences. The objective of the report is to provide an overview of the social role of science in light of the ongoing transformations and challenges within Europe's scientific community and within broader society at large. Prof. Wojciech J. Stec, vice-president of the Academy, took part in the 16th Board of Governors of the International Center for Genetic Engineering and Biotechnology (ICGEB).

The year 2009 saw the publication of the findings of the "Poland 2020" National Foresight Program completed during the previous year. The program's Main Panel was chaired by Prof. Michał Kleiber, president of the Polish Academy of Sciences, and numerous members of the Academies and scientists working at

its research establishments served as experts. The findings of the program triggered broad public debate and also constitute an important methodological and analytical basis for future oriented government projects, envisioning scenarios for Poland's future development.

As in previous years, numerous members and employees of the Academy were commended with prestigious prizes and awards, which viewed together jointly constitute a token of societal recognition for the Academy's research achievements. The 2009 prizes of the Foundation for Polish Science were won by Józef Barnaś, corresponding member of the Academy, in the field of hard sciences; Bogdan Marciniak, corresponding member of the Academy, in the field of technical sciences; and Jerzy Strzelczyk, corresponding member of the Academy, in the field of humanities and social sciences. The Minister of Science and Higher Education conferred distinctions upon Bogdan Marciniak, corresponding member of the Academy (in the category of "research for science") Roman Kaliszan, corresponding member of the Academy (in the category of "research for social development"), and upon Romuald Będziński, corresponding member of the Academy (in the category of "research for economic development"). The Prime Minister honored a numerous group of members and employees of the Polish Academy of Sciences: Andrzej Biały, corresponding member of the Academy (in physics) and Gerard Labuda, full member of the Academy (in history) for their overall work, Prof. Andrzej Jerzmanowski (from the Institute of Biochemistry and Biophysics and Warsaw University) for his outstanding research achievements, plus 10 scholars, including young scientists, for outstanding PhD or higher-doctorate (*habilitation*) theses.

The authorities of the Academy and its elected members participated in 2009 in the work of parliamentary commissions, governmental bodies, and social institutions involved in shaping the new laws regulating the field of science and research in Poland. These efforts, often also taking the form of public statements made by the authorities of the Academy and its elected members, were guided by an unchanging imperative: concern for ensuring Poland's coequal contribution to the worldwide advance of science and civilization, for ensuring the right conditions to foster a knowledge-based economy, and to develop and reinforce the highest caliber of research work and educational activity.

Michał Kleiber

President of the Polish Academy of Sciences

Presidium of the Polish Academy of Sciences

President

- **Michał Kleiber**,
Full Member of the Academy

Vice-Presidents

- **Andrzej Górski**,
Corresponding Member of the Academy
- **Karol Modzelewski**,
Full Member of the Academy
- **Wojciech J. Stec**,
Full Member of the Academy

Members of the Presidium

- Professor **Daniel J. Bem**,
Full Member of the Academy
- Professor **Jerzy M. Brzeziński**,
Full Member of the Academy
- Professor **Mieczysław Chorąży**,
Full Member of the Academy
- Professor **Czesław Cierniewski**,
Full Member of the Academy
- Professor **Jan Gliński**,
Full Member of the Academy
- Professor **Andrzej Grzywacz**,
Full Member of the Academy
- Professor **Jerzy Haber**,
Full Member of the Academy
- Professor **Zbigniew S. Herman**,
Corresponding Member of the Academy
- Professor **Jerzy Jankowski**,
Full Member of the Academy
- Professor **Janusz Jurczak**,
Full Member of the Academy
- Professor **Jerzy Klamka**,
Corresponding Member of the Academy
- Professor **Wojciech Kostowski**,
Corresponding Member of the Academy
- Professor **Andrzej B. Legocki**,
Full Member of the Academy
- Professor **Bogdan Marciniak**,
Full Member of the Academy
- Professor **Jacek Marecki**,
Full Member of the Academy
- Professor **Stanisław Mossakowski**,
Full Member of the Academy
- Professor **Bogdan Ney**,
Full Member of the Academy
- Professor **Witold Rużyłło**,
Corresponding Member of the Academy
- Professor **Henryk Samsonowicz**,
Full Member of the Academy
- Professor **Henryk Szymczak**,
Full Member of the Academy
- Professor **Ryszard Tadeusiewicz**,
Corresponding Member of the Academy
- Professor **Janusz Tazbir**,
Full Member of the Academy
- Professor **Marian Truszczyński**,
Full Member of the Academy
- Professor **Andrzej Trzebski**,
Full Member of the Academy
- Professor **Stanisław Waltoś**,
Full Member of the Academy
- Professor **Jan Węglarz**,
Full Member of the Academy
- Professor **Stefan Węgrzyn**,
Full Member of the Academy
- Professor **Władysław Włosiński**,
Full Member of the Academy

Members of the Polish Academy of Sciences

DIVISION I Social Sciences

■ Full Members

[Juliusz Bardach](#) | Jan Baszkiewicz |
Marian Biskup | Jerzy M. Brzeziński | Jacek Fisiak |
Michał Głowiński | Franciszek Grucza |
Maria Janion | Jerzy Kmita | Józef Koziński |
Czesław Kupisiewicz | [Gerard Labuda](#) |
Ewa Łętowska | Henryk Markiewicz |
Władysław Markiewicz | Karol Modzelewski |
Stanisław Mossakowski | Wincenty Okoń |
Henryk Olszewski | Hubert Orłowski |
Zbigniew Radwański | Henryk Samsonowicz |
Jan Strelau | Jerzy Szacki | Piotr Sztompka |
Stanisław Tabaczyński | Janusz Tazbir |
Andrzej Walicki | Stanisław Waltoś

■ Corresponding Members

Jerzy Axer | Henryk Chołaj | Stanisław Filipowicz |
Stanisław Gajda | Wiesław M. Grudzewski |
Jan Hertrich-Woleński | Andrzej K. Koźmiński |
Zbigniew Kwieciński | Mirosława Marody |
Karol Myśliwiec | Edward Nęcka | Ryszard Nycz |
Aleksander Posern-Zieliński | Janusz Reykowski |
Andrzej Rottermund | [Wiesław Sadowski](#) |
Zdzisław L. Sadowski | [Krzysztof Skubiszewski](#) |
Piotr Skubiszewski | Jerzy Strzelczyk |
Aleksander Welfe | Władysław Welfe |
Alina Witkowska | Elżbieta Witkowska-Zaremba |
Bogdan Wojciszke

■ Foreign Members

Jeffrey C. Alexander, USA | Oskar Anweiler,
Germany | Girolamo Arnaldi, Italy |
Maurice Aymard, France | Daniel Beauvois,
France | Karol Berger, USA | Manfred Bietak,
Austria | Paul André Crépeau, Canada |
Tomas DaCosta Kaufmann, USA |
Wolfgang Frühwald, Germany |
Jean-Claude Gardin, France | Jacques le Goff,
France | Jakub Goldberg, Israel | Sante Graciotti,
Italy | Joachim Herrmann, Germany |
Jaroslav Isajevich, Ukraine | Eberhard Jäckel,
Germany | Christoph Klessmann, Germany |
Emmanuel Le Roy Ladurie, France |
Guoguang Liu, China | Giorgio Lombardi, Italy |
Sven Lundkvist, Sweden | Luigi Marinelli, Italy |
Bernd von Maydell, Germany |
Manfred Mayrhofer, Austria | Joseph Méléze
Modrzejewski, France | Grayham E. Mizon,
Great Britain | Arent van Nieuwerkerken, Holland |
Riccardo Picchio, Italy | Sigurd Schmidt, Russia |
Imre Szabo, Hungary | Bazaryn Szirendyb,
Mongolia | Alain Touraine, France |
Piotr S. Wandycz, USA | Dethard von Winterfeld,
Germany | Tatiana Zaslavskaja, Russia |
Klaus Zernack, Germany

DIVISION II Biological Sciences

■ Full Members

Tadeusz Bielicki | Tadeusz Chojnacki |
Czesław S. Cierniewski | Jerzy Fabiszewski |
Zbigniew Maciej Gliwicz | Zofia Kielan-
Jaworowska | Wincenty Kilariski |
Romuald Z. Klekowski | Leszek Kuźnicki |
Andrzej B. Legocki | Adam Łomnicki |
Maria J. Olszewska | Włodzimierz S. Ostrowski |
Andrzej K. Tarkowski | Adam Urbanek |
January Weiner | Kazimierz L. Wierzchowski |
Lech Wojtczak | Kazimierz Zarzycki |
Maciej Żylicz

■ Corresponding Members

Grzegorz Bartosz | Barbara Bilińska |
Szczepan Biliński | Jerzy Duszyński | Jerzy Dzik |
Mariusz Jaskólski | Andrzej Jerzmanowski |
Leszek Kaczmarek | Marek Konarzewski |
Małgorzata Kossut | Jan Kozłowski |
Włodzimierz Krzyżosiak | Jacek Kuźnicki |
Jacek Oleksyn | Jacek Otlewski |
Stanisław Rakusa-Suszczewski |
Kazimierz Strzałka | Katarzyna Turnau |
Piotr Węgleński | Grzegorz Węgrzyn

■ Foreign Members

Angelo Azzi, Switzerland | Jan Bureš, Czech
Republic | François Chapeville, France |
Gustav Dallner, Sweden | Volker Erdmann,
Germany | Witold Filipowicz, Switzerland |
Marianne Grunberg-Manago, France |
Peter Gruss, Germany | Małgorzata Kloc-
Stępkowska, USA | Winfried Lampert, Germany |
William Z. Lidicker, USA | Robert M. Malina,
USA | Hubert Markl, Germany |
Zbyszek Otwinowski, USA | Nicholas John
Severs, Great Britain | Dawid Shugar, Poland |
Arne Strid, Sweden | Charles Susanne, Belgium |
Leonid M. Sushchenia, Belarus |
Wacław Szybalski, USA | Armen Tahtadzhjan,
Russia | Igor Tikhonovich, Russia |
Krystyna Urbańska, Switzerland | Ewald Weibel,
Switzerland | Robert D. Wells, USA |
Alexander Wlodawer, USA | Ryuzo Yanagimachi,
USA

DIVISION III

Mathematical, Physical, and Chemical Sciences

■ Full Members

Bogdan Baranowski | Czesław Bessaga |
 Andrzej Białas | Andrzej Białynicki-Birula |
 Iwo Białynicki-Birula | Adam Bielański |
 Bogdan Bojarski | Andrzej Budzanowski |
 Zbigniew Ciesielski | Wiesław Czyż |
 Tomasz Dietl | Wojciech Dziembowski |
 Zbigniew Galus | Robert R. Gałazka |
 Zbigniew R. Grabowski | [Jerzy Haber](#) |
 Andrzej Hryniewicz | Jerzy Janik |
 Janusz Jurczak | Jerzy Kołodziejczak | Jerzy Kroh |
 Wojciech Królikowski | Stanisław Kwapien |
 Bogdan Marciniak | Mieczysław Mąkosza |
 Jan Michalski | Marian Mikołajczyk |
 Stanisław Mrowec | Czesław Olech |
 Aleksander Pełczyński | Stefan Pokorski |
 Henryk Ratajczak | Czesław Ryll-Nardzewski |
 Andrzej Schinzel | Józef Siciak | Józef Smak |
 Lucjan Sobczyk | Ryszard Sosnowski |
 Wojciech J. Stec | Henryk Szymczak |
 Andrzej Trautman | Stanisław L. Woronowicz |
 Jerzy T. Wróbel | Andrzej K. Wróblewski |
 Kacper Zalewski

■ Corresponding Members

Józef Barnaś | Marek C. Chmielewski |
 Paweł Haensel | Ryszard Horodecki |
 Adam Hulanicki | Henryk Iwaniec |
 Bogumił Jeziorski | Jerzy Kaczorowski |
 Jan Kiszyński | Stanisław Kwapien |
 Henryk Kozłowski | Cyryl L. Latos-Grażyński |
 Janusz Lipkowski | Tomasz Łuczak |
 Kazimierz Łukasiewicz | Roman Micnas |
 Stanisław Pasynkiewicz | Stanisław Penczek |
 Marek Pfützner | Wiesław Pleśniak |
 Krzysztof Redlich | Jan Rychlewski |

Andrzej Skowroński | Adam Sobiczewski |
 Andrzej Staruszkiewicz | Józef Szudy |
 Andrzej Udalski | Małgorzata Witko |
 Aleksander Wolszczan | Henryk Woźniakowski |
 Jerzy Zabczyk | [Wojciech Zielenkiewicz](#) |

■ Foreign Members

Zhores Alferov, Russia | Guido Altarelli,
 Switzerland | Alexandr F. Andreev, Russia |
 Jerry L. Atwood, USA | Robert Blinc, Slovenia |
 Carl de Boer, USA | Jean Bourgain, USA |
 Savo Bratos, France | Robert Corriu, France |
 Joseph H. Eberly, USA | Gerhard Ertl, Germany |
 Ludvig Faddejev, Russia | Jaap J. M. Franse,
 The Netherlands | Artur J. Freeman, USA |
 Robert H. Grubbs, USA | Paul Hagenmüller,
 France | [Jack K. Hale](#), USA | Herbert A.
 Hauptman, USA | Friedrich Hirzebruch,
 Germany | Ralf Huisgen, Germany |
 Tadeusz Iwaniec, USA | Joshua Jortner, Israel |
 Henri Kagan, France | Jean-Pierre Kahane,
 France | Alan Roy Katritzky, USA |
 Philip Kocieński, Great Britain |
 Jean-Marie Lehn, France | Jean-Pierre Majoral,
 France | Gurij Marchuk, Russia | Krzysztof
 Matyjaszewski, USA | Bernard Meunier, France |
 Ben Mottelson, Denmark | Teruaki Mukaiyama,
 Japan | Achim Müller, Germany | Alex K. Müller,
 Switzerland | John Mydosh, The Netherlands |
 Siergiej Nikolskij, Russia | Ryoji Noyori, Japan |
 Charles O'Dell, USA | Roger Penrose, Great
 Britain | Gilles Pisier, France |
 C.N. Ramachandra Rao, India | Carlo Rubbia,
 Switzerland | Wolfgang Schmidt, USA |
 Jakov G. Sinai, Russia, USA | Frank Steglich,
 Germany | Richard Wielebiński, Germany |
 Chen Ning Yang, USA

DIVISION IV Technical Sciences

■ Full Members

Daniel J. Bem | Michał Białko | Jacek Błazewicz |
 Zbigniew Bojarski | Andrzej Burghardt |
 Witold Cęckiewicz | Zbigniew Ciok |
 Władysław Findeisen | Witold Gutkowski |
 Stefan Hahn | Janusz A. Kacprzyk |
 Jan M. Kaczmarek | Tadeusz Kaczorek |
 Jerzy Klamka | Michał Kleiber |
 Roman Kulikowski | Leon Łukaszewicz |
 Zdzisław Marciniak | Jacek Marecki |
 Zenon Mróz | Roman Pampuch |
 Włodzimierz J. Prosnak | Andrzej Rakowski |
 Jerzy Seidler | Kazimierz Sobczyk |
 Czesław Strumiłło | Jan Szargut |
 Wojciech Szczepiński | Tadeusz Śliwiński |
 Kazimierz Thiel | Zenon Waszczyszyn |
 Zbigniew Wesolowski | Jan Węglarz |
 Stefan Węgrzyn | Władysław Włosiński |
 Wiesław L. Woliński | Tadeusz Zagajewski

■ Corresponding Members

Romuald Będziński | Tadeusz Burczyński |
 Czesław Cempel | Tadeusz Chmielniak |
 Mirosław Dąbrowski | Adam Gierek |
 Józef Głomb | Maciej W. Grabski | Adam Janiak |
 Marian P. Kaźmierkowski | Lech K. Kobylński |
 Józef Korbicz | Henryk Krawczyk |
 Adolf Maciejny | Bogusław Major |
 Krzysztof Malinowski | Edmund Małachowicz |
 Roman Maniewski | Jarosław Mikielwicz |
 Józef Modelski | Janusz Mroczka |
 Andrzej Nowicki | Henryk Petryk |
 Ryszard Pohorecki | Antoni Rogalski |
 Leszek Rutkowski | Roman Słowiński |
 Ryszard Tadeusiewicz | Andrzej W. Weryński |
 Jan M. Wójcicki

■ Foreign Members

Shun-ichi Amari, Japan | Yoshiaki Arata, Japan |
 Qian Wei Chang, China |
 William A. Gambling, Great Britain |
 Paul Germain, France | Dietmar Gross, Germany |
 Jurij Gulajev, Russia | Klaus Humpert, Germany |
 Michele M. Jamiolkowski, Italy | Dov Jaron,
 USA | Tapani Jokinen, Finland | Laszlo Keviczky,
 Hungary | Giulio Maier, Italy | Herbert A. Mang,
 Austria | Tadeusz B. Massalski, USA |
 Gerard A. Maugin, France | Dieter A. Mlynski,
 Germany | Klaus Moeller, Germany |
 Robert Nerem, USA | Jun-Ichi Nishizawa, Japan |
 Witold Pedrycz, Canada | Billie F. Spencer, USA |
 Bolesław Szymański, USA | John A. Tegopoulos,
 Greece | Tatsuo Togawa, Japan | Hans Georg
 Unger, Germany | Pierre Vidal, France |
 Dietrich Wolf, Germany | Binshi Xu, China |
 R.A. Young, USA | Lotfi A. Zadeh, USA |
 Józef Zwislocki, USA | Jacek Maciej Żurada, USA

DIVISION V **Agricultural, Forestry, and Veterinary Sciences**

Full Members

Ryszard Babicki | Eugeniusz Bernadzki |
Tadeusz Garbuliński | Jan Gliński |
Andrzej Grzywacz | Janusz Haman |
Adolf Horubała | Tadeusz Krzymowski |
Jerzy J. Lipa | Rudolf Michałek |
Stanisław Nawrocki | Zygmunt Pejsak |
Zygmunt Reklewski | Antoni Rutkowski |
Marian Saniewski | Andrzej Szujecki |
Franciszek Tomczak | Marian Truszczyński |
Jerzy Ważny | Teresa Żebrowska |
Maciej Żurkowski

Corresponding Members

Włodzimierz Bednarski | Ryszard J. Górecki |
Jan Kotwica | Zbigniew W. Kundzewicz |
Stefan Malepszy | Małgorzata Mańka |
Janusz Nowicki | Wiesław Oleszek |
Marian Różycki | Zdzisław Smorąg |
Wojciech Święcicki | Marek Świtoński |
Erwin Wąsowicz | Jerzy Wilkin | Adam J. Zięcik |
Jan Żmudziński

Foreign Members

Walther Aufhammer, Germany |
Josse De Baerdemaker, Belgium |
Robert S. Bandurski, USA | Winfried Erich
Hubert Blum, Austria | Marcel de Boodt,
Belgium | Frederick J. Bourne, Great Britain |
Walter Bushuk, Canada | János Holló, Hungary |
Gerald Isaacs, USA | Robert R. Kraeling, USA |
Jean Lambert, Belgium | Istvan Láng, Hungary |
Walter Liese, Germany | Ivan Lishtvan, Belarus |
Mykhaylo Lisovoy, Ukraine |
Thomas C. Mettenleiter, Germany |
Volker Moenning, Germany | Gerhard Oesten,
Germany | Egil Robert Ørskov, Great Britain |
Jan Pokorny, Czech Republic | Jan Rendel,
Sweden | Heriberto Rodriguez-Martinez,
Sweden | Dieter Spaar, Germany | Junichi Ueda,
Japan

DIVISION VI Medical Sciences

■ Full Members

Stefan Angielski | Mieczysław Chorąży |
Kornel Gibiński | Ryszard J. Gryglewski |
Irena Hausmanowa-Petrusewicz |
Włodzimierz Januszewicz | Aleksander Koj |
Franciszek Kokot | Janusz Komender |
Stanisław Konturek | Maria Kopeć |
Eugeniusz J. Kościelak | Bohdan Lewartowski |
Olgierd Narkiewicz | Adam Nowosławski |
Kazimierz Ostrowski | Edmund Przegaliński |
Włodzimierz Ptak | Andrzej Szczeklik |
Andrzej Trzebski | Marek Zembala

■ Corresponding Members

Jan Albrecht | Anna Członkowska |
Andrzej Górski | Zbigniew Herman |
Andrzej Januszewicz | Roman Kaliszan |
Paweł Kisielow | Wojciech Kostowski |
Marek Krawczyk | Janusz Limon |
Sławomir Majewski | Krzysztof Narkiewicz |
Wiesław W. Pawlik | Tadeusz Popiela |
Witold Rużyłło | Ewa Szczepańska-Sadowska |
Tomasz Trojanowski | Jerzy Vetulani |
Jacek Zaremba

■ Foreign Members

Nikolaus Blin, Germany | Jean-Claude Czyba,
France | Zbigniew Darżynkiewicz, USA |
Malcolm Andrew Ferguson-Smith, Great Britain |
Detlev Ganten, Germany |
Józefa Gądek-Węsierski, Austria |
Helge Gyllenberg, Finland | Harald zur Hausen,
Germany | August Heidland, Germany |
Jørgen Kieler, Denmark | Hilary Koprowski,
USA | Jerzy Kupiec-Węgliński, USA |
Tadeusz Malinski, USA | Shaul G. Massry, USA |
Felix Mitelman, Sweden | Gerard Orth, France |
Gerhard Pulverer, Germany | Arne Schousboe,
Denmark | Piotr Siciński, USA | Paul Snowden
Russel, USA | Nathan Sharon, Israel |
E. Donnell Thomas, USA | Karl J. Ulrich,
Germany | Walther Vogel, Germany |
Tadeusz Wieloch, Sweden

DIVISION VII **Earth and Mining Sciences**

Full Members

Krzysztof Birkenmajer | Henryk Bystron |
Jerzy Dera | Ryszard Domański | Czesław Druet |
Ryszard Gradziński | Aleksander Guterch |
Jerzy Jankowski | Stanisław Knothe |
Piotr Korcelli | Janusz Kotlarczyk | Jan R. Kutek |
Stanisław Massel | Bogdan Ney | Roman Ney |
Andrzej Smolarski | Leszek Starkel |
Michał Szulczewski | Roman Teisseyre |
Wacław Trutwin | Jerzy Znosko

Corresponding Members

Jan Burchart | Józef Dubiński | Marek Grad |
Krzysztof E. Haman | Andrzej Hopfer |
Adam Kotarba | Piotr Kowalik |
Ryszard Bogdan Marcinowski |
Lucjan Pawłowski | Paweł Rowiński |
Jakub Siemek | Andrzej Witkowski |
Andrzej Żelaźniewicz

Foreign Members

Victor R. Baker, USA | Liu Baoshen, China |
Ewald Brückl, Austria | Adam Chrzanowski,
Canada | James Clement J. Dooge, Ireland |
Michel Durand-Delga, France |
Adam M. Dziewoński, USA | Günter B. Fettweis,
Austria | Randy G. Keller, USA |
Zygmunt Kowalik, USA | Helmut Moritz,
Austria | Mircea Sandulescu, Romania |
Hideki Shimamura, Japan | Vijay P. Singh, USA |
Christian Sucksdorff, Finland |
Jürgen Sündermann, Germany | Otton Heinrich
Walliser, Germany | Yaroslav Yatskiv, Ukraine |
Arnold Zeiss, Germany | Peter A. Ziegler,
Switzerland

Social Sciences

Division I – Social Sciences embraces a wide range of both the social sciences and the humanities. The Division consists of 13 institutes, 2 units, and 25 scientific committees. The institutes and the committees publish their own journals and book series. During the current term of office, the Division has been headed jointly by its chairman, Prof. Stanisław Mossakowski, and by two deputy chairs: Prof. Mirosława Drozd-Piasecka and Prof. Andrzej Wiatrak.

As of the end of 2009 the Division had 47 national members (25 full members and 22 corresponding members), plus 36 foreign members of the Academy. It is with deep sorrow that we note that full members of the Academy Leszek Kołakowski and Kazimierz Polański, corresponding member Leszek Nowak, and foreign members of the Academy Ralf Dahrendorf and Torsten Husen passed away in 2009.

Four plenary sessions of the Division and one election meeting of foreign members of the Academy were held in 2009.

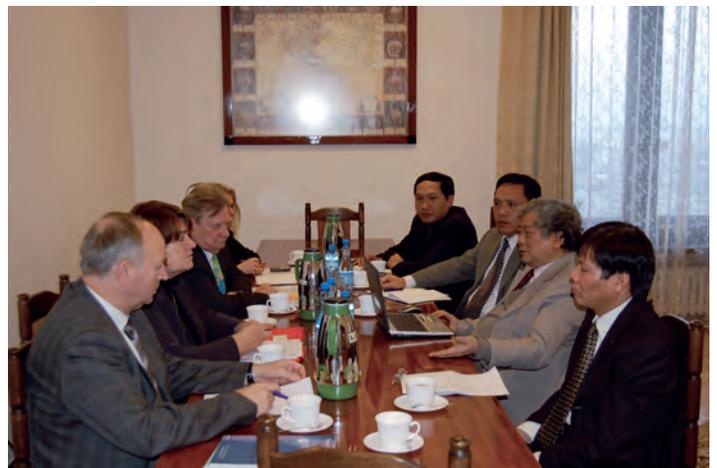
During the first plenary session, held on March 12, the activities of the Institute of Art and the Institute of the History of Science were evaluated, the Commission for Evaluating scientific institutes of Division I was appointed, and the disciplines in which the Division would bestow its annual awards were decided. During the same session Prof. Irena Bajerowa and Prof. Jadwiga Puzynina were appointed honorary members of the Committee on Linguistics and the candidacy of Prof. Zbigniew Jasiewicz to be an honorary member of the Committee on Ethnological Sciences was considered.

The second plenary session, held on June 4, focused on the following issues: evaluating the Institute of Archaeology and Ethnology as well as the Center for Studies on Non-European Countries, appointing Prof. Hanna Taborska and Prof. Lucjan Suchanek as honorary members of the Committee on Slavic Studies as well as Prof. Stanisława Borkowska as honorary member of the Committee on Labor and Social Policy Sciences, and considering the candidacy of Prof. Urszula Płowiec to be honorary chair of the Committee on Economic Sciences. The Division selected its representatives to serve on the Com-

petition Commission to fill the post of director at the Institute of Literary Research. Prof. Andrzej Wiatrak, deputy chair of the Division, gave a report on the financing of publications and scientific conferences by scientific committees in 2009.

During the third plenary session, held on October 8, the rules for selecting national members of the Academy were discussed. It was decided that scientific disciplines would not be taken into account while selecting new national members of the Academy.

Two sessions were held on November 5, a plenary and an election meeting. The following new foreign members of the Academy were appointed: Karol Berger (USA, musicology), Manfred Bietak (Austria, archaeology), Christoph Klessmann (Germany, history), and Arent van Nieuwerkerken (the Netherlands, literary studies). The Medal of the Polish Academy of Sciences, which is awarded by the Academy's president to prominent representatives of the scientific community for their outstanding contributions to the development of Polish and world science, was conferred to Prof. Marek Kołodziński, longtime director of the Institute of Rural and Agricultural Development, Polish Academy of Sciences. Professor Edward Tryjarski was appointed a honorary member of the Committee on Oriental Studies. At the same plenary session, Division I granted its annual awards and appointed



Prof. Andrzej Wiatrak (deputy chair of Division I) meets with a delegation from the Vietnamese Academy of Social Sciences (A. Jaskot)



Laureates of Division I Scientific Awards for 2009. From left: Prof. Henryk Jankowski, Prof. Marian Arszczyński, Prof. Stanisław Mossakowski (full member of the Academy and chairman of Division I) and Dr. Henryk Meyza

a Polish Biographical Dictionary team, including Ewa Łętowska, corresponding member of the Academy, Janusz Tazbir, full member of the Academy, and Stanisław Waltoś, full member of the Academy. The competition to fill the post of director of the Institute of Economic Sciences of the Polish Academy of Sciences ended in the appointment of Prof. Leszek Jasiński for a 4-year term.

The 19th Session of the Standing Joint Commission of Economists of the Polish Academy of Sciences and Russian Academy of Sciences and a scientific conference entitled “State and Economy in Poland and Russia: Lessons of the 20th Century and Perspectives for the 21st Century” were held in Warsaw and Poznań in June 2009. The papers delivered during the conference addressed the following issues: propositions and visions of economic models, the role of state economic policy, the state’s function in solving problems in different management areas (under the conditions of the global economic crisis, state interventionism was analyzed in the fields of public finances, the banking sector, the allocation of foreign capital in the public services sphere, enterprise development, scientific and technological progress, and regional development issues).

Division I, the Institute of Rural and Agricultural Development, and the Committee on Statistics and Econometrics jointly organized an Interna-

tional Summer School entitled “Modeling in Rural Development Policy” in Warsaw in September 2009, aimed at presenting economic and econometric methods for modeling agricultural and rural-area policies to young researchers. The exhibition entitled “*Mysł wolna jest – Wydawnictwa drugiego obiegu ze zbiorów Biblioteki Instytutu Badań Literackich PAN*” (“Thought is Free” – Underground Publications from the Library Collections of the Institute of Literary Research, Polish Academy of Sciences) co-organized by Division I, the Institute of Literary Research, and the Committee on Literature Studies, was opened on 18 December 2009 at the Adam Mickiewicz Museum of Literature in Warsaw.

The Division conferred its annual scientific awards to the following scientists: **the Erazm Majewski Award in archaeology** went to Dr. Henryk Meyza from the Research Center for Mediterranean Archaeology, Polish Academy of Sciences, for his book entitled *Cypriot Red Slip Ware – Studies on a Late Roman Levantine Fine Ware*; **in history of culture** to Assoc. Prof. Marian Arszczyński, Professor at the Mikołaj Kopernik University in Toruń, for the work *Idea – Pamięć – Troska. Rola zabytków w przestrzeni społecznej i formy działania na rzecz ich zachowania* (Idea – Legacy – Preservation: The Role of Monuments in Public Space and Preservation Policies); **in oriental studies** to Prof. Henryk Jankowski from the Adam Mickiewicz University in Poznań for the work *A Historical-Etymological Dictionary of Pre-Russian Habitation Names of the Crimea*; **the Władysław Spasowski Award in pedagogy** to Prof. Lech Witkowski from the Kazimierz Wielki University in Bydgoszcz for the work *Edukacja wobec sporów o (po)nowoczesność; Nowe (kon)teksty dla nowoczesnych nauczycieli; Między pedagogiką, filozofią i kulturą* (Education in the Face of Disputes on (Post)Modernity; New (Con)Texts for Modern Teachers; Between Pedagogy, Philosophy, and Culture).

Members of Division I received numerous awards and distinctions in 2009. The title of *doctor honoris causa* was bestowed upon the following members of the Division: **Ewa Łętowska** by the Maria Grzegorzewska Academy of Special Education, **Karol Modzelewski** by the Kazimierz Wielki University in Bydgoszcz, **Hubert Orłowski** by the University of Warmia and Mazury in Olsztyn, **Henryk Samsonowicz** by Opole University, and **Jerzy Szacki** by the Maria Curie-Skłodowska University in

Lublin. The Publication Award of the Minister of Science and Higher Education went to **Andrzej K. Koźmiński** for the book *Zarządzanie od podstaw. Podręcznik akademicki* (Fundamentals of Management – An Academic Textbook) co-authored by Dariusz Jemielniak, and to **Piotr Sztompka** for the book *Socjologia codzienności* (Sociology of Everyday Life) co-authored by Małgorzata Bogunia-Borowska; **Andrzej Walicki** was nominated for the Award of the Polish Minister of Science and Higher Education for his outstanding research achievements furthering the development of society. **Jan Strelau** won the Prize of the Prime Minister of Poland for his outstanding scientific achievements, the Teofrast Award from *Charaktery* magazine for the best academic textbook of the year – *Psychologia* (Psychology) co-authored by Dariusz Doliński – and the Polish Psychological Society’s Diploma for “his vast contribution to the first hundred years of the development of Polish psychology.” Other awards, distinctions, and honors were conferred upon the following individuals: **Maria Janion** received the Award of the Minister of Culture and National Heritage, **Zbigniew Kwieciński** received honorary citizenship of Lubraniec, **Gerard Labuda** received the “*Lednicki Orzeł Piastowski*” honorary award bestowed by the Marshal of the Wielkopolska Region, **Henryk Markiewicz** received the “*Kowadło Kuźnicy*” honorary award and the University of Szczecin Medal, **Andrzej Rottermund** received the “*Officier dans l’Ordre des Arts et des Lettres*” distinction bestowed by the French Minister of Culture, and **Stanisław Waltoś** won the Award of the President of Jagiellonian University. **Piotr Skubiszewski** celebrated the republication of his doctorate at Adam Mickiewicz University. The Commander’s Cross of the Order of Polonia Restituta was conferred upon **Aleksander Welfe**.

Overall, 955 members participated in the work of the 25 committees of Division I in 2009. At their plenary sessions the committees discussed organizational and publishing matters, presented papers, discussed scientific problems concerning their disciplines, formulated formal opinions (i.e. on classroom textbooks), drew up expert reports, and performed many other statutory tasks of a thematic scope difficult to cover in a few sentences. Here, we limit ourselves to mentioning the initiatives and activities of the committees in connection with their scientific conferences, organized and co-organized with other Polish Academy of Sciences institutes,

universities, and research centers. We consider this kind of activity to be the best indicator of the committees’ scope of interests. Materials from the conferences are usually published.

The **Committee on the History of Science and Technology** and the Commission on the History of Social Sciences organized a conference entitled “The Ethos of Chivalry in History, Culture, and Literature.” The Commission on the History of Natural Sciences co-organized a conference on “Polish Botanists Towards Charles Darwin.” The Commission of the History of Technology, the Museum of Technology (NOT) in Warsaw, the Technical University of Częstochowa, and the University’s society of alumni organized a conference entitled “Monuments of Old Metallurgy as Heritage of European Culture.”

Five conferences were held under the patronage of the **Committee on Linguistics**, including “Polish Language – Yesterday, Today, and Tomorrow” and “Poznań Linguistic Meeting.” Overall, 179 papers were delivered.

The **Committee on Demographic Studies** together with the Economic Forecasts and Analyses Department of Wrocław University of Economics hosted a conference on “Social and Economic Consequences of Changes in Demographic Processes.” The Committee’s Regional Demography Section worked on the Polish census of 2011.

The **Committee on Economic Sciences** and Division I jointly organized the 19th Session of the



Prof. Mirosława Drozd-Piasecka (deputy chair of Division I) delivering a paper during a conference entitled “Political Anthropology and Politics in Anthropology” in Będlewo near Poznań

Standing Joint Commission of Economists of the Polish Academy of Sciences and Russian Academy of Sciences.

The **Committee on Ethnological Sciences**, the Institute of Archaeology and Ethnology of the Polish Academy of Sciences, and the Adam Mickiewicz University organized a conference entitled “Political Anthropology and Politics in Anthropology” in Będlewo, which brought together 70 participants. During the plenary sessions 7 papers were delivered. Four sections of the Committee presented 38 papers. A conference on “Summer in the City – Different Faces of Culture” was held in Kraków, at which 16 papers were delivered.

The **Committee on Philosophical Sciences** co-hosted a conference on “Assertions and Refutations – Conventionalism and Its Philological Heritage.”

The **Committee on Historical Sciences** held 16 meetings of its commissions and national-scale scientific conferences, such as a conference on “State and Perspectives of Research on the History of Slavdom” organized by the Commission on Slavic Studies during the 18th General Convention of Polish Historians in Olsztyn. The Commission on the History of Culture hosted an interdisciplinary conference on “Records of Suffering” attended by participants from abroad.

The **Committee on Financial Sciences**, at the beginning of its activity within Division I, organized

3 conferences with the Wrocław University of Economics and the University of Szczecin, namely: “The Teaching of Finance at Finance and Accounting Faculties,” “Finance Departments,” “Current Problems of the Banking Sector in Poland and Russia.”

The **Committee on Cultural Studies** co-hosted 2 conferences, the Convention of the Polish Cultural Association and “Cultural Boundaries: Lifestyles and Customs in the Perspective of Changes of Cultural Values.”

The **Committee on Ancient Culture** together with the “Artes Liberales” Institute of Interdisciplinary Research organized an International Session entitled “150th Anniversary of the Birth of Tadeusz Zieliński.”

The **Committee on Literature Studies** discussed matters concerning the future Convention of Polish Studies Specialists, acted as co-organizer of 3 conferences, and provided patronage for a publication entitled *Dzienniki Marii Dąbrowskiej* (Maria Dąbrowska’s Diaries).

The **Committee on Labor and Social Policy Sciences**, the Institute of Labor and Welfare, the Office of the Ombudsman for Children, and the Karol Adamiecki University of Economics in Katowice organized 2 conferences: “International Social Policy – Comparative Aspects” and “Children’s Situation in Poland – Twenty Years of Transformation.”



Gathering commemorating the 150th anniversary of classical philologist Tadeusz Zieliński’s birth

The **Committee on Organizational and Management Sciences** provided patronage for the following conferences: “Strategic Management – Problems, Research Areas,” “Cooperation and Competitiveness as Determinants of Contemporary Enterprise Development,” “Organizational Success – Signs and Determinants,” “Pro-social Instruments of Organization Management,” and “Management in Conditions of Uncertainty.”

The **Committee on Oriental Studies** held a sinological conference on “Old China, Contemporary China.”

The **Committee on Art Studies** together with the Institute of Art of the Polish Academy of Sciences and Musikhistorische Kommission der Bayerischen Akademie der Wissenschaften organized a conference entitled “*Traditio Iohannis Hollandrini*.” The Committee also co-hosted a conference “*Il futurismo. 1909-2009*” with the Institute of Art, Polish Academy of Sciences, the Center for Contemporary Art in Warsaw, and the Italian Cultural Institute.

The **Committee on Pedagogical Sciences** co-organized 4 conferences: “Pedagogy – Twenty Years Later – The Question of the Transgression and Transgenerationalism of the Discipline” (with the University of Lower Silesia), “Art in the Service of Education” (with the PEDAGOGIUM Higher School of Social Rehabilitation Teaching), “2nd West Pomeranian Educational Congress” (with the School of Higher Education in Humanities in Szczecin, the University of Szczecin, the Institute for Educational Research, and the Institute for Sustainable Technologies – National Research Institute), and “General Pedagogy – Discourses on Scientific and Didactic Status” (with the Kazimierz Wielki University in Bydgoszcz).

The **Committee on Political Sciences** held the following conferences: “Disputes Around Theory and Practice of Law-governed State” (with the Committee on Legal Sciences), “1st National Political Congress” (during which 516 individuals participated, 14 plenary sessions and 72 panel discussions took place, and 367 papers were delivered), “European Neighborhood Policy” (with the Committee on Legal Sciences and the Institute of Political Studies of the Polish Academy of Sciences).

The **Committee on Prehistoric and Protohistoric Sciences** and the Institute of Archaeology and Ethnology of the Polish Academy of Sciences organized a conference on “45 Years of Combined Prehistoric Expedition” devoted to the biggest and the

longest world expedition, which goes back in time to the rescue mission, which aimed at saving Nubian monuments threatened by the construction of the Aswan High Dam.

The **Committee on Legal Sciences** and the Committee on Political Sciences held a conference on “Disputes Around Theory and Practice of Law-governed State,” which was attended by 70 individuals.

The **Committee on Psychology**, the Warsaw School of Social Sciences and Humanities section in Sopot, and the Institute of Psychology of the University of Gdańsk organized 18th Psychological Colloquium “Perception of the Social World.” The Committee announced new edition of competition for the Andrzej Malewski Award bestowed to young researchers for their outstanding achievements in theory, psychological and interdisciplinary research, and sociological methodology. This year’s winner of the Andrzej Malewski Award is Dr. Michał Bilewicz from the Psychology Department of the University of Warsaw.

The **Committee on Theological Sciences** together with the Theological Department of the Opole University co-hosted a conference “Identity of Theology,” 4th from the series “Christianity’s Contribution to the Polish Culture.” The Committee also organized a conference on “Science vs. Supernatural Phenomena” with the help of the Division VI Theological Sciences of Lublin Scientific Society and the Institute of Fundamental Theology of the Catholic University of Lublin.

The two sessions of the **Committee on Science Studies** were combined with 2 conferences, namely, “The Application of the Results of the National Foresight Program ‘Polska 2020’ and State Department and Industry Programs in Times of Crisis” and “Science Management.” Overall, 34 papers were delivered.

The **Committee on Sociology**, the Institute of Philosophy and Sociology, Polish Academy of Sciences, and the Department of Sociology at the Ohio State University organized a conference on “Quantitative Analysis of Survey Data in Post-communist Europe.”

The **Committee on Statistics and Econometrics** acted as co-organizer of 7 conferences, among others: the Aleksander Zeliaś 3rd National Scientific Conference on “Modeling and Forecasting Socio-economic Phenomena,” “9th Doctoral Workshops on Statistics and Econometrics,” 8th Conference “Data



International working meeting of national committee chairs – members of the International Committee of Slavists held in Stara Leśna

Classification and Analysis. Theory and Practice.”

The **Committee on Slavic Studies** during its plenary sessions focused only on substantive issues within its scientific disciplines.

Overall, the Divisions' Committees published 34 journal titles and 5 books with a total circulation of 47,960 copies.

Issues of the following journals were published: *Onomastica*, *Stylistyka*, *Etnolingwistyka* (Onomastica, Stylistics, Ethnolinguistics) by the Committee on Linguistics; *Studia Demograficzne* (Demographic Studies), *Przeszłość Demograficzna Polski* (Poland's Demographic Past), *Zeszyty Sekcji Analiz Demograficznych* (Reports of the Demographic Analysis Section) by the Committee on Demographic Studies; *Ekonomista* (Economist) by the Committee on Economic Sciences; *Wiadomości Numizmatyczne* (Numismatic News), *Acta Poloniae Historica*, *Studia Maritima* (Maritime Studies) by the Committee on Historical Sciences; *Lud* (People) by the Committee on Ethnological Sciences; *Przegląd Filozoficzny* (Philosophical Review) by the Committee on Philosophical Sciences; *Przegląd Kulturoznawczy* (Cultural Studies Review) by the Committee on Cultural Studies; *Meander* by the Scientific Committee on Ancient Culture; *Rozprawy Literackie* (Literary Treaties) by the Committee on Literature Studies, *Problemy Polityki Społecznej. Studia i Dyskusje* (Social Policy Problems – Studies and Discussions) by the Committee on Labor and Social Policy; *Zagadnienia Naukoznawstwa* (Problems of Science Studies) by the Committee on Science

Studies; *Organizacja i Kierowanie* (Organization and Management) by the Committee on Organizational and Management Sciences; *Rocznik Orientalistyczny* (Oriental Studies Yearbook) by the Committee on Oriental Studies; *Rocznik Historii Sztuki* (History of Art Yearbook) by the Committee on Art Studies; *Rocznik Pedagogiczny* (Pedagogical Yearbook) by the Committee on Pedagogical Sciences; *Państwo i Prawo* (State and Law) by the Committee on Legal Sciences; *Polish Psychological Bulletin* and *Studia Psychologiczne* (Psychological Studies) by the Committee on Psychological Sciences; *Slavia Orientalis*, *Pamiętnik Słowiański* (Slavic Chronicle), and *Rocznik Slawistyczny – Revue Slavistique* (Slavic Yearbook – Revue Slavistique) by the Committee on Slavic Studies; *Studia Socjologiczne* (Sociological Studies) and *Kultura i Społeczeństwo* (Culture and Society) by the Committee on Sociology; *Przegląd Statystyczny* (Statistical Overview) by the Committee on Statistics and Econometrics; *Studia Nauk Teologicznych* (Studies on Theological Sciences) by the Committee on Theological Sciences; and *Finanse* (Finances) by the Committee on Financial Studies.

New volumes in the series published by the Committees included: *Wilno chemiczne do połowy XIX stulecia* (Vilnius Chemists Through the First Half of the 19th Century) by Ignacy Z. Siemion and *Między przeszłością a współczesnymi mediami. Z problemów historii kultury i edukacji* (Between Past and Contemporary Media – Issues in the History of Culture and Education) from the series *Rozprawy z dziejów nauki i techniki* (Treaties on History of Science and Technology) published by the **Committee on History of Science and Technology**; *Prace Komitetu Nauk Etnologicznych* (Papers of the Committee on Ethnological Sciences) vol. 18 entitled *Antropologia polityki i polityka w antropologii* (Political Anthropology and Politics in Anthropology), *Lato w mieście. Różne oblicza kultury* (Summer in the City – Different Faces of Culture) by the **Committee on Ethnological Sciences**; *Dzienniki Marii Dąbrowskiej* (Maria Dąbrowska's Diaries) by the **Committee on Literature Studies**; *Language and Logic in Ancient China: Collected Papers on the Chinese Language and Logic* from the series *Prace orientalistyczne* (Oriental Studies) by the **Committee on Oriental Studies**; and *Demokratyczna Polska w globalizującym się świecie* (Democratic Poland in a Globalizing World) by the **Committee on Political Sciences**.

Pradzieje Wielkopolski. Od epoki kamienia do średniowiecza *(Prehistory of Greater Poland: From the Stone Age to Medieval Times)*

M. Kobusiewicz | Institute of Archaeology and Ethnology | Polish Academy of Sciences

The preparation of this book was made possible by a grant from the Polish Committee for Scientific Research, as well as by financial support from the Marshal of the Greater Poland (Wielkopolska) province and from several other archaeological institutions in the region.

The book was written for all readers interested in prehistory – students of the humanities, teachers, high school students, and non professionals active in their regions. It represents the result of a collaborative effort by nine authors, who are all top caliber specialists and – with one exception – researchers from the Poznań Branch of the Institute of Archaeology and Ethnology of the Polish Academy of Sciences. The objective was to depict historical developments from the beginning all the way to the creation of the present-day province of Greater Poland. The first two chapters offer synthetic overviews, the subsequent chapters deal with successive periods in prehistory and are chronologically arranged starting from the Old Stone Age up to the Middle Ages.

The first chapter, written by Jarmila Kaczmarek, traces the history of archaeological research in the lands under consideration ever since the envoy of the Austrian Duke Ernest personally arrived to the place known as Nochowo near Śrem in the 15th century, a site where he believed “...pots grow in the soil of their own accord...” The second chapter,

by Stanisław Kurnatowski, discusses ten thousand years of history and its long chain of events leading to the emergence of the Polish state.

The following seven chapters discuss the cultural and social development of prehistoric societies dwelling in the lands now known as the historical region of Greater Poland. The problems discussed include subsistence, settlement patterns, social differentiation, beliefs and external contacts, and the organization of the modern state and church. The prehistory of the region under consideration begins in the Old Stone Age, some twelve thousand years ago. The third chapter, written by Michał Kobusiewicz, recounts the appearance, from the west, of the first settlers, reindeer hunters, and nomads inhabiting the tundra that prevailed in the region after the glacial retreat. The fourth chapter, written by Jacek Kabaciński, tells the story of the Mesolithic (Middle Stone Age) hunter-gatherers and fishermen dwelling



Fig. 1. Treasure comprised of objects of Scythian origin, HaC period, Witaszkowo, Krosno District, copy. From a hoard of Scythian artifacts, likely the grave goods of a Scythian warlord killed during an expedition. Collections of the Poznań Archaeological Museum



Fig. 2. Wooden bucket with bronze metalwork, 3rd century BC, Szeląg, Poznań. Collections of the Poznań Archaeological Museum



Fig. 3. Impressive crozier plume from a bishop's grave, discovered in the main nave of the Poznań Cathedral. Made in the 13th century in Limoges, of bronze decorated with gouged enamel, engravings, and gold leaf. Collections of the Institute of Archaeology and Ethnology, Polish Academy of Sciences, Poznań

in the dense forests that covered what is now known as Greater Poland.

Next is the Neolithic or Late Stone Age described by Lech Czerniak, who depicts the almost total abandonment of hunting and gathering resulting from the introduction of agriculture and cattle-keeping by migrants from the south, which consequently brought about new patterns of subsistence, knowledge of pottery making, changes in behaviors and beliefs, and certainly a new mentality. These events contributed to the Bronze Age and the beginning of the Iron Age (Hallstatt), with its fortified villages, developed spiritual beliefs, advanced handicrafts, metallurgy, advancements in weaving methods, and rich ornamentation of pottery as described by Janusz Ostoję Zagórski. The next chapter, written by Henryk Mamzer, analyzes the period known as the time of Roman influence. One especially interesting part concerns antique sources that speak about the life of the people living in northern Europe, their customs, and their contacts with the ancient Roman civilization. The latest discoveries

of the Goths passing through are mentioned here, as are discussions about the origins of the Slavs.

The large chapter written by Zofia Kurnatowska deals with the beginning and development of the early Polish state through the so called period of migration of nations and the formation of tribal elites up to the birth of the state. This chapter makes reference to subsistence patterns as well as to the different types of everyday occupations, crafts, church and laic architecture, and political events, including those related to the organization and success of the Gniezno Meeting in the year 1000.

The last chapter, authored by Wojciech Dzeduszycki, sheds light on Kruszwica, an example of a typical feudal center during the medieval times of Greater Poland. It discusses the fortified castle and Romanesque cathedral church, but also the life of ordinary people, their occupations, crafts, commerce, all against the backdrop of neighboring agricultural villages – thus offering a better understanding of the conditions of life and development of such local medieval centers.

Overall, the volume's high-quality illustrations, three-dimensional reconstructions, and maps considerably enhance its value, which was further confirmed when the Klio cultural institution awarded the book first prize in the editorial category. The English captions to the illustrations and the large English summary make the book accessible to readers abroad.

References

- Kara M. (2009). *Najstarsze państwo Piastów – rezultat przełomu czy kontynuacji? Studium archeologiczne* [The Oldest State of the Piasts – Result of a Turning-Point or Continuation? An Archaeological Study]. Instytut Archeologii i Etnologii PAN.
- Szamałek K. (2009). *Procesy integracji kulturowej w młodszej epoce brązu i początkach epoki żelaza na Pojezierzu Wielkopolskim* [Processes of Cultural Integration in the Young Bronze Age and Early Iron Age in the Wielkopolskie Lake District]. Instytut Archeologii i Etnologii PAN.

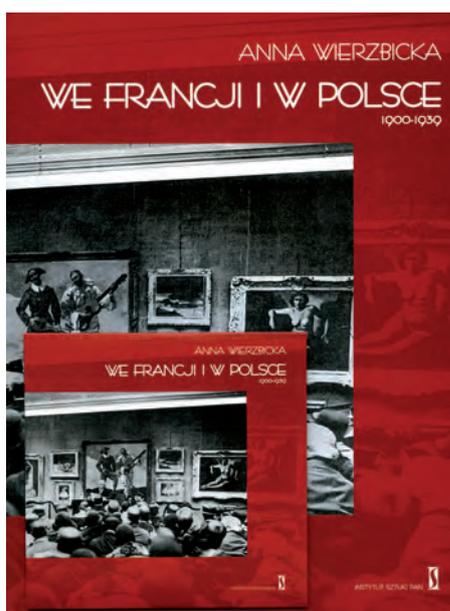
Institute of Archaeology and Ethnology
al. Solidarności 105, 00-140 Warszawa
phone: 48 (22) 620 28 81 to 87
fax: 48 (22) 624 01 00
e-mail: director@iaepan.edu.pl
www.iaepan.edu.pl

We Francji i w Polsce 1900-1939. Sztuka, jej historyczne uwarunkowania i odbiór w świetle krytyków polsko-francuskich

(In France and Poland 1900-1939 – Art, its historical background and reception by Polish-French art critics)

A. Wierzbicka | Institute of Art | Polish Academy of Sciences

This book represents the first extensive study of the views held by art critics of Polish descent active in France in 1900-1939: Chil Aronson, Adolf Basler, Waldemar George, Zygmunt Klingsland, Antoni Potocki, Jan Topass, Edward Woroniecki, and Zygmunt Lubicz Zaleski.



It concentrates on depicting the opinions of two outstanding art critics of Polish (or rather Polish-Jewish) descent: Adolf Basler and Waldemar George. Both theorists settled in Paris and both became well-known, although to a different extent. Adolf Basler (born in Tarnów) was on close terms with the two most prominent figures of the Polish and French milieu in Paris – the doctor and social activist Henryk Gierszyński and the philosopher and anarchist Mécislas Golberg (Mieczysław Goldberg). The socialist views of both these men and of Gierszyński's son Stanisław influenced the outlook and literary output of the young Basler. His first articles dating from the early 20th century were published in

La Revue blanche edited by the Natanson brothers and *Głos Wolny* edited by Stanisław Gierszyński. Basler's most important texts, however, were printed in the Polish rather than French press in 1903-1913 (*Sfinks*, *Krytyka*, *Museion*, *Przegląd Tygodniowy*, and the *Literatura i Sztuka* supplement to *Nowa Gazeta*). At that time Basler, who also worked as an art dealer, was a close associate and secretary of Guillaume Apollinaire (Fig. 1). His articles, written before 1918, were often inspired by the French poet's statements. When compared against the critical writings of Basler's contemporary Jan Topass (born in Warsaw), they reveal an art critic not only

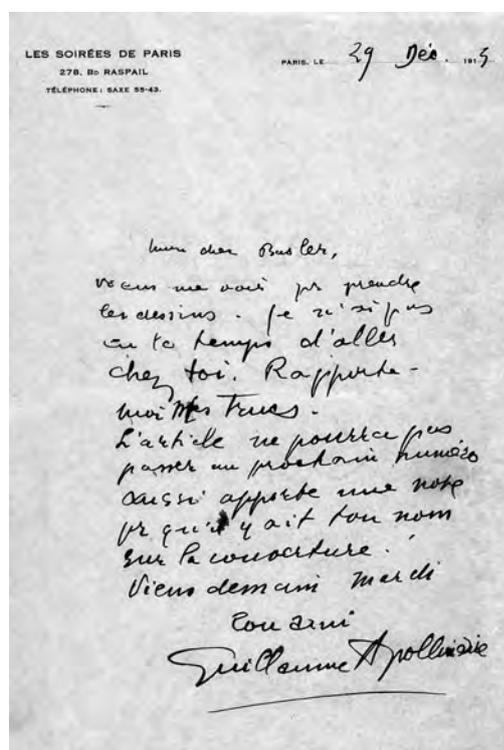


Fig. 1. Guillaume Apollinaire's letter to Adolf Basler from December 29, 1913, Los Angeles, Getty Research Library, Special Collections, 920031: *Adolf Basler, correspondence and newspaper clippings, 1912-1949*, folder 1

well-informed on the activity of the Parisian and European avant-garde but also acquainted with the artistic output of the Polish colony of artists in Paris. These texts surpassed both in style and content the articles written by other Polish correspondents. Basler's activity is presented in the first three chapters of the book.

Chapters five, six and seven are devoted to Waldemar George (Jerzy Waldemar Jarociński, born in Łódź). While Basler's most important articles were written before the First World War, George got his start in the 1920s as the secretary and later editor-in-chief of the art journal *L'Amour de l'art*. First a fervent supporter of the avant-garde, by the end of the 1920s he had changed his views. At that time his opinions on art were influenced by the literary output of Josef Strzygowski, Oswald Spengler, and Hermann Keyserling and the doctrines of German Nazism and Italian Fascism. George became the main spokesman in favor of the slogan '*retour à l'ordre*', a return to the classical, Latin tradition (Fig. 2). He supported, mainly in the art journal *Formes* of which he was editor-in-chief, the group of the so-called neo-humanists and Italian artists working in Paris. Waldemar George was the author of a vast number of articles, reviews and books and he was appreciated and recognized in the French

artistic milieu. George's articles reveal him to be not only a theorist of great knowledge but also an outstanding connoisseur of art of the first half of the last century.

Both Basler and George participated in the discussion concerning Jewish and national art; both also wrote articles on African art.

In the years 1918-1939 articles and books concerning the Polish colony of artists and reviews of the Parisian salons were written by Zygmunt Klingsland, Edward Woroniecki, Zygmunt Lubicz Zaleski, the last two active before 1918. All four presented very conservative opinions, stood against the avant-garde, and supported art inspired by the Great Tradition. They also contributed to the discussion concerning national art and the debate concerning the salons, judged negatively by most both Polish and French art critics.

Overall, articles written by these Polish art critics and published in the years 1900-1939 can serve as an excellent window on this turbulent epoch, which witnessed the appearance of new currents in art and fervent discussions dealing with national art and the role of art dealers. Their texts are also an excellent example of the literary output on art of that time, varying both in style and in their evaluation of the same artistic events and artists.

The main portion of the book consists of eight chapters plus a large bibliography at the end; the whole is supplemented by a CD containing biographical notes of the art critics, a bibliography of their articles and books (published until 1939), and archival material and literature dealing with them.

References

- Wierzbicka A. (2008). *Artyści polscy w Paryżu. Antologia tekstów o polskiej kolonii artystycznej czynnej w Paryżu w latach 1900-1939* [Polish Artists in Paris – Anthology of Texts on the Polish Artistic Colony in Paris in 1900-1939]. Warsaw, Neriton and Instytut Sztuki PAN.
- Wierzbicka A. (2009). *Polish Artists in France 1918-39 – The Discussion Concerning National Art*. In: *Crossing Cultures – Conflict, Migration and Convergence – The Proceedings of the 32nd Congress of the International Committee of the History of Art (CIHA)*, Jaynie Anderson (ed.), Melbourne, 633-638.



Fig. 2. Waldemar George's book *Picasso*, Rome 1924

Wierzbicka A. (2009). *Między dwiema ekspozycjami. Lata 1925-1937* [Between Two Expositions]. In: *Wystawa paryska 1937. Materiały z sesji naukowej Instytutu Sztuki PAN, 22-23 X 2007*, Joanna M. Sosnowska (ed.), Warsaw 2007, 11-27.

Institute of Art
ul. Długa 26/28, 00-950 Warszawa
phone: 48 (22) 504 82 00
fax: 48 (22) 831 31 49
e-mail: ispan@ispan.pl
www.ispan.pl

Culture and context differentiation of emotional expression

P. Szarota | Institute of Psychology | Polish Academy of Sciences

The International Display Rules Study began in 2004 and involved over 50 social scientists from over 30 countries ranging from Australia to Zimbabwe. The aim was to compare and analyze emotional display rules, and it was the first such comprehensive assessment of display rules around the world. The results were published in a series of articles in the most prestigious international journals in the field of psychology (*Journal of Personality and Social Psychology*, *Journal of Cross-Cultural Psychology* and *European Journal of Personality*).

We assumed that each culture has specific display rules of emotional expression, which operate in different social contexts (home, restaurants, workplace) and relationships (family, friends, co-workers). Display rules presumably refer to social conventions and cultural norms associated with social appropriateness that dictate the modification of expression. As such they are learned, and presumably stored neurologically. One of our achievements was to relate the cross-cultural differences in emotional expression to various universal dimensions of culture.

One such dimension is “Individualism-Collectivism.” On one hand, individualistic cultures (e.g. the US, Western Europe) favor personal goals over collective goals and place more importance on attitudes as relatively important determinants of behavior. On the other hand, collectivistic cultures (the Far East) encourage relatedness and communal relationships, and place relatively more importance on norms as determinants of behavior. In our paper “Mapping expressive differences around the world: The relationship between display rules and individualism versus collectivism” (Matsumoto, Yoo, Fontaine, Anguas-Wong, Szarota et al., 2008) we analyzed how individualistic and collectivistic cul-

tures differ in regard to emotional expressivity. The results confirmed our predictions that individualistic cultures are associated with norms endorsing greater overall expressivity.

In our most recent article, “Hypocrisy or maturity? Culture and context differentiation” (Matsumoto, Yoo, Fontaine, Szarota, et al., 2009), we introduce a new construct called Context Differentiation (CD) and describe how it functions on both the individual and cultural levels. On the cultural level, high context differentiating (CD) cultures encourage the differentiation of behavior in different contexts; in these cultures, inconsistency in behavior across contexts may be a norm. Other cultures, however, influence their members to differentiate their behaviors relatively less across contexts; in these cultures, consistency would be the norm, and they may be called low CD cultures. Findings indicated that cultures were reliably associated with measures of CD. Chameleons in one culture may be mature adults in another. The framework and findings provide a platform for new research in the future, examining how individuals differentiate their behaviors across contexts and how cultures facilitate that differentiation.

References

- Matsumoto D., Yoo S.H., Fontaine J., Szarota P. et al. (2009) Hypocrisy or maturity? Culture and context differentiation. *European Journal of Personality*, 23, 1-14.
- Matsumoto D., Yoo S.H., Nakagawa S., Alexandre J., Altarriba J., Szarota P. et al. (2008). Culture, emotion regulation, and adjustment. *Journal of Personality and Social Psychology*, 94, 925-937.

Matsumoto D., Yoo S.H., Fontaine J., Anguas-Wong A.M., Szarota P. et al. (2008). Mapping expressive differences around the world: The relationship between display rules and individualism versus collectivism. *Journal of Cross-Cultural Psychology*, 39, 55-75.

Institute of Psychology
ul. Chodakowska 19/31, 03-815 Warszawa
phone/fax: 48 (22) 517 99 16
e-mail: sekretariat@psychpan.waw.pl
www.psychpan.waw.pl

Young Generation of Poles and the New System

K. Szafranec | Institute of Rural and Agricultural Development | Polish Academy of Sciences

Poland has gone through 20 years of systemic transformation of historic importance. The identity of the system, defined clearly at the start of these changes as a *transition to democracy and a free market*, has been subjected to various kinds of pressure and it did not enjoy complete social support even at the outset. Does it have such support today?

One especially interesting aspect is the legitimization of the social system in the eyes of young people. Here we present the findings of sociological research focusing on young people aged 19 and 30. Theirs is the first generation that grew up under democracy and a free market economy, and it is moreover a baby-boom generation. Well educated, ambitious, and with high consumption aspirations, they offer hope for Poland's transformation but for the same reason may pose a threat to the stability of the system if their aspirations are blocked.

Our surveys were conducted in 2008 among 30-year-old young adults (N=809) and students aged 19 (N=1096). The data acquired in 2008 are compared against the findings of earlier surveys conducted in 1995 and 2000, under the direction of W. Adamski as a project entitled "Poles." In each case, the researchers used the same set of tools – a series of scales examining opinions about key elements of the new system. They concerned the respondents' views on the general direction of change which had taken place in Poland after 1989, privatization, further tightening of relations between Poland and the West, and their preference for socialism versus capitalism and for authoritarian versus democratic solutions.

Regarding almost all of these issues, negative views are definitely in the minority. However, the prevalent attitudes are ambivalent and moderate, rather than outright positive. One can definitely say that young Poles support the continuation of the

direction of the transformation initiated in 1989 and reject socialism – which they usually associate with communist Poland – and authoritarian political solutions. They strongly support democracy and capitalism and this tendency is gaining in strength as Poland's transformation proceeds.

But there is another tendency which is also becoming prominent – a rise in ambivalent and moderate attitudes. This may mean not only increased interest in hybrid systemic solutions but also a kind of transformation fatigue resulting from a lack of spectacular success, at least from the standpoint of these young people.

Privatization is one domain of the transformation which is not fully supported by young people. Ambivalent and mixed views are still prevalent, although the percentage of privatization opponents is slowly but steadily diminishing. A different logic is evident in young people's attitudes towards Poland's opening up to cooperation with the West. Their attitudes have evolved slowly from almost euphoric attitudes prevalent at the start of transition through very critical ones in 2000 to moderate and balanced ones in the latest data. One reason for this is the migration experience of a large number of young Polish people, who are no longer enchanted with the West. Another reason is their maturity as citizens, which leads to moderation and pride in their nation's achievements.

Generally, Poland's system enjoys quite a strong legitimization in the eyes of young people, considering that negative views are definitely in the minority. But considering that these attitudes tend to be ambivalent and rather positive, the legitimization of the system is moderate. It is not good that progress in legitimization is uneven across spheres of the social system (note the contrast: capitalism – "yes", private property – "rather not"). This may

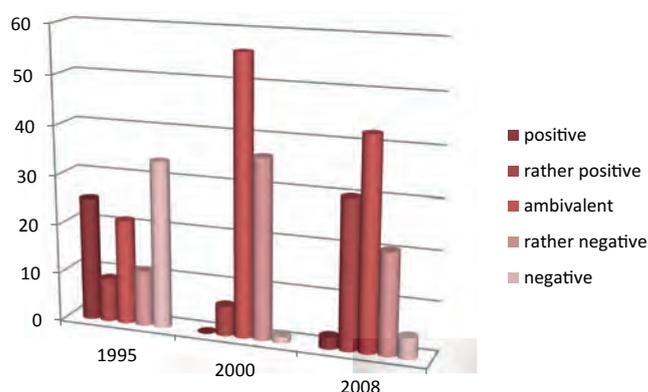


Fig. 1. Attitudes towards aspects of Poland's transformation

result from political inexperience due to the respondents' young age, or represent the mental legacy of the past. Neither is it good that there are two different types of attitude towards systemic transformation emerging within the same young generation. The social areas of legitimization are associated with young people from advantageous social backgrounds, having acquired or acquiring a high quality of education, with biographies marked by success in life, strong self-confidence and a sense of having good prospects in life. The social areas of de-legitimization, in turn, are associated with those groups of young people who have not achieved, or are not very likely to achieve, success in life even in the most conventional sense of his word – they will not graduate from good schools, will not get a sat-

isfying job, will not be able to become fully independent in life.

The system may encounter head-on resistance from young people if the high aspirations of the whole generation are blocked. Less active and less ambitious young people may pose a particular problem to the system. The risk of such a tension is much higher in the case of the teenagers because they are much more consumption-minded and – due to the global crisis – will be entering adulthood in less favorable conditions.

References

- Szafraniec K., ed. (2006). *Kapitał ludzki i zasoby społeczne wsi. Ludzie – społeczność lokalna – edukacja* [Human Capital and Social Resources of the Countryside]. Seria Problemy Rozwoju Wsi i Rolnictwa, Instytut Rozwoju Wsi i Rolnictwa PAN.
- Szafraniec K., ed. (2006). *Jednostkowe i społeczne zasoby wsi* [Individual and Social Resources of the Countryside]. Seria Problemy Rozwoju Wsi i Rolnictwa, Instytut Rozwoju Wsi i Rolnictwa PAN.

Institute of Rural and Agricultural Development
ul. Nowy Świat 72, 00-330 Warszawa
phone: 48 (22) 826 94 36, 48 (22) 826 63 71
fax: 48 (22) 657 27 50
e-mail: irwir@irwirpan.waw.pl
www.irwirpan.waw.pl

Aspects of Cognitive Ethnolinguistics

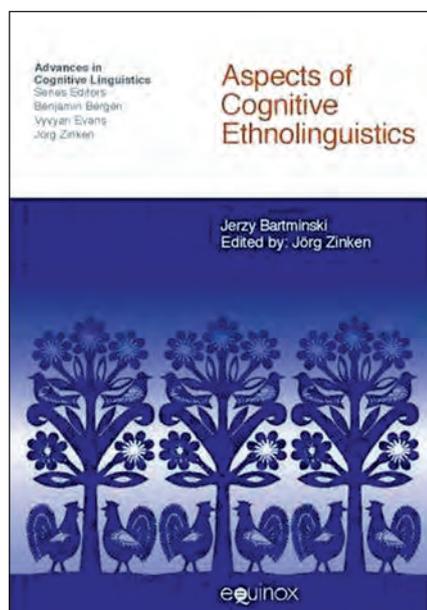
J. Bartmiński | Institute of Slavic Studies | Polish Academy of Sciences

This book is a synthetic presentation of ethnolinguistics (anthropological, cultural, and cognitive linguistics) proposed by the author and his colleagues associated with the work on *Słownik stereotypów i symboli ludowych* (Dictionary of Folk Stereotypes and Symbols) and the annual *Etnolingwistyka* (vols. 1-21, Lublin 1988-2009).

The book has been published in the "Advances in Cognitive Linguistics" series, which series editors Benjamin K. Bergen, Vyvyan Evans, and Jörg Zinken claim provides "a central outlet for the best new work by both established and younger scholars

in this rapidly moving field. [...] The series publishes work that promotes innovative approaches to Cognitive Linguistics" (www.equinox.pub).

The book is composed of eight theoretical and eight analytical chapters, an afterward, plus an introductory chapter by the volume's editor, Jörg Zinken. In that chapter, entitled "The Ethnolinguistic School of Lublin and Anglo-American cognitive linguistics," Dr. Zinken underscores the major points of convergence between the two lines of research, adding that "the 'advance' to which the Ethnolinguistic School of Lublin can contribute



concerns the systematic consideration of speakers' socio-cultural situatedness in the linguistic analysis of meaning and understanding.”

Some of the chapters are modified fragments of work previously published in Polish, in the books *Językowe podstawy obrazu świata* (Linguistic Foundations of Worldview, 2006, 3rd ed. 2009, Lublin, UMCS) and *Stereotypy mieszkają w języku* (Linguistic Stereotypes, 2007, 2nd ed. 2009, Lublin, UMCS), whereas others have been written especially for this volume.

The first part of the book addresses the following questions:

- What is cognitive ethnolinguistics?
- What is linguistic worldview?
- How can one reconstruct worldview?
- What is the position of values in linguistic worldview?

Attention is paid to basic notions such as stereotype, cognitive definition, viewpoint, perspective, the observing and conceptualizing subject, and the subject-induced profiling of concepts, notions the author maintains can be used in analyses and descriptions of linguistic worldview and its functioning in various types of discourse (especially ideological ones).

In the analytical part, the author reconstructs selected portions of the Polish linguistic worldview: the concepts of sun, mother, home, homeland, a German, the political left and right wing, and the Polish concepts of *los* and *dola* 'fate' (contrasted with the Russian *sud'ba*). The last chapter is devoted to the question of

how the linguistic worldview concept can serve as the basis for comparative Slavic research.

It is hoped that the theory and methodology presented in the book will be used by the international project EUROJOS, launched in 2008 and affiliated with the Institute of Slavic Studies of the Polish Academy of Sciences in 2009, which aims to reconstruct, in a comparative manner, the linguistic worldview of Slavs and their neighbors.

In the *Afterword*, the author writes: “The approach to ethnolinguistics presented in this book can be considered an integral theory of language, with the human speaking subject (*homo loquens*) at the center. Because the basic communicative function of language is strongly linked to its cognitive function, i.e. the perception and conceptualization of reality along with an underlying system of values, the efficiency of communication largely depends on the compatibility of the values and worldviews that are entrenched in language and thus readily available to the speaker. This does not mean, however, that the speaker cannot overcome the pressure of language; indeed, through language we are able to actually *create* situations.”

The author then observes that mental barriers in international communication “result from the semantics of seemingly ‘the same,’ international, transnational or pan-European concepts, such as *justice*, *equality*, *democracy* and their non-English ‘equivalents.’ But Eastern and Western Europe are very different [...]. These differences infiltrate the consciousness of Central European nations, which lie ‘between’ East and West also in the mental sense and which seek new ways of coexistence and communication in the international community not only within the European Union but also in a wider, global context. Linguists face important tasks of describing these discrepancies and diagnosing the sources of misunderstandings, as well as identifying common denominators. Ethnolinguistics, especially in its cognitivist version with the conceptual apparatus discussed in the first part of this book, has much to offer in this respect.”

References

- Bartmiński J. (2005). *Языковой образ мира: очерки по этнолингвистике*. Moscow, Indrik.
- Bartmiński J. (2006). *Językowe podstawy obrazu świata* [The Linguistic Basis of Worldview]. Lublin, Wydawnictwo UMCS (3rd ed. 2009).

Bartmiński J. (2007). *Stereotypy mieszkają w języku. Studia etnolingwistyczne* [Stereotypes Live in Language]. Lublin, Wydawnictwo UMCS (2nd ed. 2009).

Bartmiński J. (2009). *Europa und seine Werte. Akten der internationalen Arbeitstagung „Normen und Wertbegriffen in der Verständigung zwischen Ost- und Westeuropa,”* 3/4 April 2008 in Lublin, Poland, Jerzy Bartmiński and Rosemarie Lühr (eds.). Frankfurt am Main, Peter Lang.

Institute of Slavic Studies
ul. Bartoszewicza 1b/17, 00-337 Warszawa
phone: 48 (22) 828 44 75
fax: 48 (22) 826 76 88
e-mail: ispan@ispan.waw.pl
www.ispan.waw.pl

Juliusz Zborowski, *Słownik gwary Zakopanego i okolic*

(*Dictionary of the Dialect of Zakopane and Surrounding Areas*)

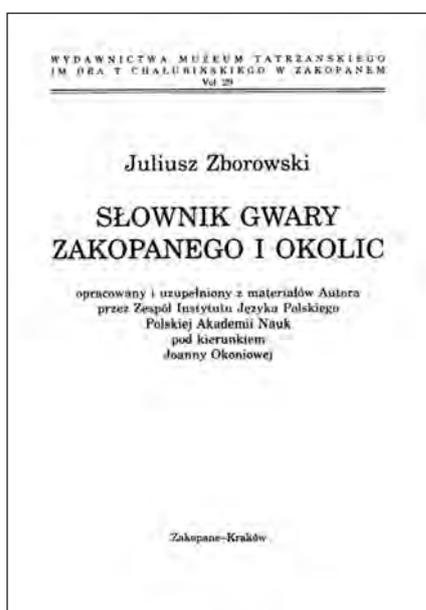
prepared and supplemented from the author's materials

by a team from the Institute of the Polish Language headed by Joanna Okoniowa; preface by Joanna Okoniowa

J. Okoniowa | Institute of the Polish Language | Polish Academy of Sciences

The Dictionary of the Dialect of Zakopane and Surrounding Areas was based on the handwritten materials of Juliusz Zborowski (1888-1965), a scholar of Podhale-region culture and for many years the director of the Tatra Museum in Zakopane. The materials encompass a dossier, notebooks, loose pieces of paper and files with notes and transcripts made between 1912 and 1964, all of which have been stored at the Tatra Museum since 1967. Between 2007 and 2008 a team of staff members from the

Department of Polish Dialectology (Institute of the Polish Language, Polish Academy of Sciences, Kraków), headed by Professor Joanna Okoniowa, laid out the conceptual framework for the *Dictionary*, drafted it in keeping with lexicographic principles, and compiled the linguistic material and illustrations for publication. The volume was published in 2010 (bearing a date of 2009), as a part of a publication series of the Tatra Museum, which loaned the materials to the Institute of the Polish Language and procured funds for publication. The *Dictionary* contains approx. 8,500 entries and is richly illustrated. It compiles and gives references for words and idioms used by the inhabitants of Zakopane and neighboring villages in the first half of the 20th century, thus documenting the life of highlanders in that period and their material and spiritual culture. In this area directly adjoining the Tatra Mountains, the Podhale dialect has been preserved in its classic form. The *Dictionary* also presents the constant changes and influences of the general language to which the dialect has been subject and which varied across the area and across time. The verbal material itself was preceded by an extensive preface, devoted to Podhale lexicography, Juliusz Zborowski, and the fate of his heritage, also offering information about the principles by which the *Dictionary* is constructed and a bibliography.



The Dictionary of the Dialect of Zakopane and Surrounding Areas represents the first such extensive, easy-to-use, and at the same time scholarly lexicon of the region, which had previously only been dealt with by studies of modest volume and imperfect content – the most complete earlier study being a 19th-century dictionary prepared by Bronisław Dembowski.

Institute of the Polish Language
al. Mickiewicza 31, 31-120 Kraków
phone: 48 (12) 632 56 92
phone/fax: 48 (12) 632 87 13
e-mail: spilarz@poczta.ijp-pan.krakow.pl
www.ijp-pan.krakow.pl

Excavations at Marea in Egypt

H. Szymańska | Research Center for Mediterranean Archaeology¹ | Polish Academy of Sciences

In the fall of 2000 a Polish expedition opened archaeological excavation work at the site of Marea on the southern shores of Lake Maryut (ancient Mareotis) about 45 km southwest of Alexandria. The project, which is being carried out under the auspices of the Polish Center of Archaeology of Warsaw University, Poland, has been planned for several seasons. The archaeological site of Marea with its Late Antique agglomeration remains a puzzle, generating considerable controversy as to its chronology and even its very name. In Graeco-Roman times Marea served as a reloading port for goods brought down the Nile from far inland to be shipped out from Alexandria to the lands around the Mediterranean. Reports by ancient authors speak of Marea's significance as a port and center for production of

an excellent wine. The ruins of the Byzantine town, on which our investigations are focused, were first identified as the ancient Marea in the 19th century, but modern scholarly debate has put this identification into doubt. The architectural remains on the surface are undoubtedly Byzantine in date (5th-7th century AD), as confirmed by ceramic finds. Consequently, it is possible that the ruins under exploration may indeed be the remains of a completely different town – Philoxenité erected in the 6th century for pilgrims stopping on their way to the nearby sanctuary of the greatest Coptic martyr, St. Menas. Solving this problem, which has proved impossible for previous researches, constitutes the justification for this project and an indubitable challenge for the expedition.

In spite of the fact that this large port had operated in Roman and Byzantine times and perhaps also in Ptolemaic ones, the team has concentrated on the extant ruins, investigating the role and importance of this Byzantine town as a religious center built around a huge basilica, second in size in all of Egypt. Surprisingly, there is not a single mention of this monument in the known ancient written sources.

During ten seasons of excavation the Polish Mission cleared two independent architectural complexes: the Byzantine baths (Fig. 1) and a funerary chapel (Fig. 2). Both structures have been dated to the 6th through early 8th century.

The present focus is on the exploration of a basilica standing on the promontory above the port,



Fig. 1. Marea. Byzantine baths

¹ The Research Center for Mediterranean Archaeology and the Center for Studies on Non-European Countries of the Polish Academy of Sciences were dissolved on August 31, 2010. The two centers formed the basis for establishing the new Institute of Mediterranean and Oriental Cultures, which began operations on September 1, 2010.

which was obviously a dominant element in the urban fabric. It defined the character of the town and it must have constituted an important cult center for the local Christian community, being an important pilgrimage stage. The building had three aisles and a wide, also three-aisled transept with rounded end. The shallow eastern apse is only slightly marked in the outer wall outline. The liturgical rooms were incorporated into the body of the building on either side of the apse. Two burial chambers were discovered under the floor of the apse. Multiple burials had been made in the chambers. Anthropological examination identified over 100 individuals: men, women, children and even unborn children. They appear to have been buried there during the invasion of Chosroes II in AD 619 when Persian troops torched Alexandria and ravaged the region (Fig. 3).

The rich interior decoration of the basilica included several fragmentary column shafts and splendid Corinthian capital decorated columns of various sizes. All of them in marble of excellent quality, probably imported from Alexandrian buildings. The interior decoration of the basilica also included pavement and wall mosaics, of which small marble cubes of different colors found in the building are the only surviving evidence.

A total surprise awaited archaeologists digging under the church apse, where a grate belonging to a large amphora kiln was discovered. The part of the church intended for liturgical practices used it as a foundation. The kiln had a diameter of 8 m, the thickness of the grate being 0.5 m. One of only a few discovered in the Nile Delta, it still contained upon discovery the last batch of amphorae dated to the 2nd-3rd century AD.

The size of the pottery kiln under the apse of the basilica is unmistakable proof of a flourishing center existing on the spot (possibly Marea) prior to the Byzantine foundations, perhaps producing the wine that Mareotis was famous for and expediting it to other towns of the Greco-Roman world in amphorae produced on the spot.

Seven small shops were uncovered behind the southwestern corner of the church. They contribute nicely to a study of the economy of Byzantine churches in Egypt. Two of them could have served as money-exchange counters for foreign pilgrims arriving at the harbor of Marea to continue their journey to the pilgrimage center in Abu Mena. This suggestion is based on a find of more than 300



Fig. 2. Marea. Funerary chapel



Fig. 3. Marea. Kiln for firing amphoras under the basilica

coins and a unique find of weights in bronze for weighting coins.

This research demonstrates that the Graeco-Roman port of Marea is indeed, as commonly assumed, to be found under the Byzantine remains of the town of Philoxenité existing in the same location.

References

- Szymańska H., Babraj K. (2008). *Byzantine Marea – Excavations in 2000-2003 and 2006*. Biblioteka Muzeum Archeologicznego w Krakowie, vol. IV, Kraków 2008.
- Babraj K., Szymańska H. (2009). Excavations in Marea in Egypt – July-August 2008. *Materiały Archeologiczne*, 119-123.

Szymańska H., Babraj K. (2009). Marea: Report of the Excavations of the Polish Archaeological Mission in 2006. *Polish Archaeology in Mediterranean*, XVIII, 51-62.

Institute of Mediterranean
and Oriental Cultures
ul. Nowy Swiat 72, 00-330 Warszawa
phone: 48 (22) 826 81 30
e-mail: zaspan@zaspan.waw.pl
www.zaspan.waw.pl

Szowinizm po polsku. Przypadek Romana Dmowskiego (1886-1905)

(Chauvinism in the Polish Way – The Case of Roman Dmowski, 1886-1905)

G. Krzywiec | Tadeusz Manteuffel Institute of History | Polish Academy of Sciences

The principal subject of this book is the rise of world-view radicalism in the late 19th and early 20th century, especially the birth of one of its particular instantiations – the rightwing radicalism professed by Roman Dmowski, cofounder and leader of the National Democracy movement in Poland. The author's basic aim was to reconstruct its ideology and depict the sociopolitical beginnings of the Polish nationalistic Right. The book is also a biography of the early political activities of Dmowski, the most important ideologue and leader of the Polish nationalistic movement at the turn of the century.

The work covers the period from 1886 to the outbreak of the 1905 revolution, a period usually regarded as the time when mass political parties and

modern world-views came into being. Although one of the aims of the book was to show the common dilemmas faced by the Polish intelligentsia in all three parts of Poland then under foreign rule, the author focuses on the role and developments connected with the Russian part of Poland.

The text is preceded by a discussion on radicalism in outlook and the difficulties of applying a radical concept to the Polish conditions. The most promising approach to this question seems to be seeking its ideological sources in the tensions and antinomies which prevailed in the liberal society of those days, in the crisis which was visible not so much on the institutional-political level as on the level of concepts, ideas, and a specific post-Enlightenment mentality. Such a cultural, mental approach to researching turn-of-the-century radicalism seems to have several advantages. First, it situates the political movements and world-views into a broader context by showing both their universal aspirations and their dynamism in combating the old order. Secondly, such an approach makes it possible to take a look at the burgeoning mass political movements but preserves all the categories that have been used and are still useful in such research. Thirdly, it provides an opportunity for comparative studies, for looking at the Polish ideological dilemmas against a wider European, or a narrower Central European, background.

The author starts by pointing out that the Polish philosophy-of-life proposals put forward at the turn of the century were a local transfiguration of the ideological tensions and contradictions then being experienced by the European intellectual classes at



that time, a local translation in the sense of a translation enriched by the native historical and social context.

The work is polemical, offering discussion on the approaches predominantly used in researching the emergence of mass Polish social movements. The initial chapters present a wide socio-cultural context and the intellectual climate of the epoch that gave birth to the radicalism of the intelligentsia. It can be assumed that the real hero here is the radical fin-de-siècle Polish youth.

From the second chapter of the book onward the principal hero is Roman Dmowski, seen through his political activity and through his early essays as a commentator, mainly in the Warsaw weekly *Głos* [Voice], where he addressed the most important political disputes. While the second, third, and fourth chapters trace the dynamic creation of a new proposal for life philosophy, the remaining chapters describe how this proposal was implemented by the Polish nationalistic movement. This part of the book discusses the crucial elements of the political ideas and rhetoric of the National Democratic Party at the turn of the century (including the question of political realism, political work, the National Democratic concept of “active policy,” its vision of “modern patriotism,” and the category of “national interest”). This part also contains an analysis of a question which occupied a central position in Dmowski’s thoughts: his attitude towards the Jews and the Jewish question and his vision of an integral political order.

The book ends with a discussion of the main programmatic work of its hero, entitled *Mysli nowoczesnego Polaka* (Thoughts of a Modern Pole). This chapter consists of two parts. The first is an analysis of the National Democratic party’s entry into the world of politics at the turn of the century in all three parts of Poland, with stress being laid on Galicia. The second part proposes a new interpretation of Dmowski’s book and its reception by his supporters and by the public at large. The Polish nationalistic movement is shown here against the background of other rightwing radicalisms of the

epoch, the author indicating not only their similarities but also their specific characteristics.

In this part of the book the author puts forward a theory that although *The Thoughts of a Modern Pole* was very valuable for the native nationalistic movement, the nationalistic camp nevertheless did not fully adopt the credo of the book or of Dmowski’s whole program (for instance, such elements as its confrontation-prone vision of the world, its expanded political mythology, its anti-Semitic racialism, the idea of a homogeneous national identity which excluded other forms of belonging to a nation, the insistence that this homogeneous identity should be shaped by an incessant fight against the community’s enemies, the integral link between politics and a regenerating ethical message, and the placing of the political sphere within the framework of “organized public opinion”).

References

- Krzywiec G. (2009). Polish Intelligentsia in the face of the Jewish Question 1905-1914. *Acta Poloniae Historica*, 100, 129-167.
- Krzywiec G. (2008). “Idea w poniewierce.” Pierwszy artykuł polityczny Romana Dmowskiego [„An Idea Mistreated” – Roman Dmowski’s First Political Article]. *Archiwum Historii Filozofii i Myśli Społecznej*, 53, 147-166.
- Krzywiec G. (2007). Wokół genezy polskiego nacjonalizmu integralnego. Przypadek Romana Dmowskiego (1886-1904) [On the Genesis of Polish Integral Nationalism – The Case of Roman Dmowski, 1886-1904]. *Roczniki Dziejów Społecznych i Gospodarczych*, 58 (3), 45-71.

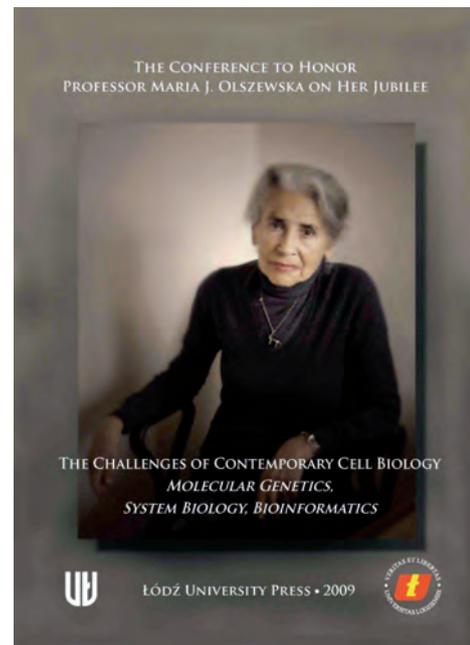
Tadeusz Manteuffel Institute of History
ul. Rynek Starego Miasta 29/31,
00-272 Warszawa
phone: 48 (22) 831 02 61 to 62
fax: 48 (22) 831 36 42
e-mail: ihpan@ihpan.edu.pl
www.ihpan.edu.pl

Biological Sciences

Division II – Biological Sciences is responsible for the Academy's various biological institutions and activities. It now embraces 17 institutes (including two international units), employing over 600 scientists altogether. The Division covers scientific activities in virtually all fields of biological research, including anthropology, biochemistry, biophysics, botany, cellular and molecular biology, ecology, evolutionary biology, microbiology, neurobiology, palaeobiology, parasitology, virology, and zoology. Eleven scientific committees are affiliated with the Division, covering a similarly wide spectrum of the life-sciences disciplines. At the end of 2009, the Division encompassed 35 national members of the Academy (17 full and 18 corresponding) and 27 foreign members. In 2009 two members of the Division, Prof. Piotr Słonimski and Prof. Kazimierz Browicz, passed away.

Two plenary sessions of the Division took place in 2009. The spring session, held on 20 April, was hosted by the Łódź Branch of the Academy. This session was of a special nature because it was connected with a scientific conference dedicated to Prof. Maria Joanna Olszewska, full member of the Division, to commemorate her 80th anniversary. The subject of the conference was "Challenges of modern cell biology: molecular genetics, systems biology, bioinformatics." At the same session, the

research caliber and organizational activity of three institutes of the Division were given a positive evaluation: the Nencki Institute of Experimental Biology, the Institute of Botany, and the Mammal Research Institute.



The autumn session, held on 5 November in Warsaw, gave a positive evaluation of the activities of the remaining 14 institutes of the Division over the 2007-2010 period. During the session, the Division's Annual Awards were also presented. A team from the Nencki Institute of Experimental Biology including Prof. Leszek Kaczmarek (head), Dr. Grzegorz M. Wilczyński, Dr. Marcin Rylski, Dr. Filip A. Konopacki, Piotr Michaluk, Dr. Paweł Okulski, Renata Amborska, Dr. Jacek Jaworski, Dr. Joanna Dzwonek, and Maciej Gawlak was recognized for a number of papers devoted to "The role and regulation of matrix metalloproteinase, MMP-9, in physiological and aberrant synaptic plasticity." The Division's Award for Best Monograph went to Prof. Ryszard Ochyra and Assoc. Prof. Halina Bednarek-Ochyra from the Institute of Botany for *The Illustrated Moss Flora of Antarctica*, published by Cambridge University Press.

Throughout 2009, members of the Division and its scientific committees participated in and



Plenary session of Division II held in Łódź on 20 April 2009



From left: Professor Ryszard Ochyra and Assistant Professor Halina Bednarek-Ochyra from the Władysław Szafer Institute of Botany, Polish Academy of Sciences, presenting their award-winning publication *The Illustrated Moss Flora of Antarctica*, to Professor Andrzej B. Legocki, chairman of Division II (A. Jaskot)

contributed to numerous discussions and meetings devoted to the preparation of new state regulations on higher education and environmental protection.

A number of scientific meetings, workshops, and research seminars were organized or jointly organized by the scientific committees affiliated to the Division – some concrete examples worth mentioning are “Natural and synthetic antioxidants” (by the Committee on Biochemistry and Biophysics), “Molecular biology in diagnostics of contagious diseases and biotechnology” (the Committee on Microbiology), “Molecular view of the synapse and its proteolytic remodeling in neuronal plasticity” (the Committee on Neurobiology), “4th Biogerontological Meeting at the Nencki Institute – From Development to the Ageing of the Organism” (the



48th Workshop on Evolutionary Biology entitled “The Year of Darwin;” the speakers included Prof. Francisco Ayala from the University of California, Irvine (W. Pojda)

Committee on Cytobiology), “Consequences of climate change in Polish national parks” (the Committee on Ecology and the Committee on Nature Conservation), and “Parasitoses of free-living animals: the awareness of growing problem” (Committee on Parasitology).

During one of the above workshops organized by the Committee on Evolutionary and Theoretical Biology, the distinguished evolutionist Prof. Francisco Ayala presented two lectures on “Darwin’s evolution: from natural theology to natural selection” and “Evolutionary origin of malaria.” The Committee on Zoology participated in organizing an exhibition on “Vanishing animals in Europe” at the Museum of Hunting and Horsemanship, and patronized another popular-science event entitled “Who gave me legs? How the vertebrates conquered land,” which took place in the Museum of Evolution in Warsaw. In terms of international cooperation, the Division also supported the Polish-Russian Summer School of Young Researchers entitled “Molecular biotechnology of plants,” which took place in July 2009 in Gdańsk.

In 2009 the Division published three issues of its electronically distributed bulletin *Biuletyn Wydziału II Nauk Biologicznych PAN*. In the same year the International Institute of Molecular and Cell Biology celebrated its 10th anniversary.

Circulating oestradiol and heart failure in men

E.A. Jankowska | Institute of Anthropology | Polish Academy of Sciences |
Wrocław Medical University | 4th Clinical Military Hospital

W. Banasiak | 4th Clinical Military Hospital

P. Ponikowski | Wrocław Medical University | 4th Clinical Military Hospital

Heart failure (HF) is a crucial problem facing modern medicine, remaining the only cardiovascular disease whose incidence and prevalence are steadily on the rise. Despite the vast progress made in recent years regarding the management of patients with HF, the prognosis is still fatal. Therefore, the complex pathophysiological pathways involved are a subject of intensive study with the aim of developing novel therapeutic approaches that could at least partially reverse the abnormal processes seen during the natural history of HF. Nowadays, HF is considered a disease of the whole human body, involving dysfunction of the heart as a mechanical pump with haemodynamic derangements and numerous pathologies occurring in almost all body organs and systems (including neurohormonal abnormalities) that independently aggravate the progression of HF and increase the risk of death.

Men with chronic HF commonly demonstrate deficiencies in circulating gonadal and adrenal an-

drogens (deficiencies of approximately 25% and 60% for testosterone and dehydroepiandrosterone sulphate, respectively). These hormone derangements have serious clinical and prognostic consequences. Namely, they are related to impaired exercise capacity, to altered body composition (e.g. reduced bone mass), to more intense depressive symptoms, and most importantly to increased 3-year mortality in men with systolic chronic HF.

In recent years, it has been suggested that oestrogens play a role in the physiology and pathophysiology of male subjects, also in the context of cardiovascular disease. Oestrogens (e.g. oestradiol) are formed by the aromatization of androgens (e.g. testosterone) in men mainly in adipose tissue. Taking into consideration the observed androgen deficiencies in men with systolic chronic HF, abnormal oestrogen metabolism would also be anticipated.

We measured serum oestradiol in a cohort of 501 men with systolic chronic HF (mean age: 58 ± 12 years, LVEF: $28 \pm 8\%$, NYHA class I/II/III/IV: 52/231/181/37), and during the 3-year follow-up 171 (34%) deaths occurred. We demonstrated a U-shaped relationship between circulating oestradiol and 3-year mortality in men with systolic chronic HF, independently of clinical prognosticators and circulating androgens. Namely, compared to men with serum oestradiol within the middle quintile, those with serum oestradiol within the lowest and highest quintiles exhibited the greatest mortality. For increasing oestradiol quintiles, there were the following 3-year survival rates adjusted for clinical variables and circulating androgens in men with systolic chronic HF: 45% (95% CI, 24%-63%), 66% (95% CI, 47%-79%), 82% (95% CI, 69%-90%), 79% (95% CI, 66%-88%), and 64% (95% CI, 47%-77%).

These 2 groups of men with the lowest and the highest serum oestradiol levels had different clinical characteristics. Men with reduced serum oestradiol had increased serum total testosterone, decreased serum dehydroepiandrosterone sulphate, more ad-



Does a man's heart need a woman's hand?

vanced NYHA class, impaired renal function, reduced haemoglobin level, and decreased total fat tissue mass. Men with increased serum oestradiol had high serum bilirubin and liver enzymes, and decreased serum sodium.

The analyses performed indicate that the abnormal metabolism of both androgens and oestrogens constitutes a crucial element of the complex pathophysiology of HF. Most importantly, the aforementioned hormone derangements predict the unfavorable outcome in men with systolic chronic HF. It should be emphasized that decreased circulating oestradiol levels are also related to increased mortality, which suggests that oestrogens may have beneficial (protective) properties in the context of diseased male myocardium. Our results lay the groundwork for investigating pharmacological interventions, timing the normalization of androgen and oestrogen levels in peripheral blood (and also in target tissues) in these patients.

References

- Jankowska E.A., Ponikowski P., Piepoli M.F., Banasiak W., Anker S.D., Poole-Wilson P.A. (2006). Autonomic imbalance and immune activation in chronic heart failure – pathophysiological links. *Cardiovascular Research*, 70(3), 434-45.
- Jankowska E.A., Biel B., Majda J., Szklarska A., Lopuszanska M., Medras M., Anker S.D., Banasiak W., Poole-Wilson P.A., Ponikowski P. (2006). Anabolic deficiency in men with chronic heart failure: prevalence and detrimental impact on survival. *Circulation*, 114(17), 1829-37.
- Jankowska E.A., Ponikowski P. (2009). Sex hormone-binding globulin and heart failure: a passive carrier of steroid hormones or an active hormone itself? *Rev Esp Cardiol*, 62(12), 1353-5.
- Jankowska E.A., Filippatos G., Ponikowska B., Borodulin-Nadzieja L., Anker S.D., Banasiak W., Poole-Wilson P.A., Ponikowski P. (2009). Reduction in circulating testosterone relates to exercise capacity in men with chronic heart failure. *Journal of Cardiac Failure*, 15(5), 442-50.
- Jankowska E.A., Jakubaszko J., Cwynar A., Majda J., Ponikowska B., Kustrzycka-Kratochwil D., Reczuch K., Borodulin-Nadzieja L., Banasiak W., Poole-Wilson P.A., Ponikowski P. (2009). Bone mineral status and bone loss over time in men with chronic systolic heart failure and their clinical and hormonal determinants. *European Journal of Heart Failure*, 11(1), 28-38.
- Jankowska E.A., Rozentryt P., Ponikowska B., Hartmann O., Kustrzycka-Kratochwil D., Reczuch K., Nowak J., Borodulin-Nadzieja L., Polonski L., Banasiak W., Poole-Wilson P.A., Anker S.D., Ponikowski P. (2009). Circulating estradiol and mortality in men with systolic chronic heart failure. *Journal of the American Medical Association*, 301(18), 1892-901.

Institute of Anthropology
ul. Kuźnicza 35, 50-951 Wrocław
phone: 48 (71) 343 86 75
phone/fax: 48 (71) 343 81 50
e-mail: zapan@antro.pan.wroc.pl
www.antro.pan.wroc.pl

When physiology meets ecology: Energy trade-offs in the least weasel *Mustela nivalis*

K. Zub | P.A. Szafrńska | Mammal Research Institute | Polish Academy of Sciences

M. Konarzewski | Mammal Research Institute | Polish Academy of Sciences | University of Białystok

P. Redman | J.R. Speakman | University of Aberdeen

Energy expenditures measured under natural conditions provide essential information about the most important aspects of animals' life influencing their survival and reproduction. Several authors have suggested that energy expenditures may be affected not only by environmental (extrinsic) factors such

as ambient temperature, but also by physiological (intrinsic) factors, for example the rate at which animals' gut can digest and assimilate food, or the rate at which muscles can convert assimilated energy to mechanical work. The notion that intrinsic factors may be an important constraint is related to

the simple observation that, for example, even when food is unlimited the capacity to harvest and expend energy cannot increase indefinitely. A possible interplay between extrinsic and intrinsic factors has been suggested to form a ‘metabolic niche’ defining the range of animals’ energy expenditures, and ultimately, the range of environmental conditions in which animals can thrive. If an upper bound of energy expenditures is driven by intrinsic factors, one can expect this bound to be invariant across environmental conditions (i.e., independent of chief extrinsic factors, such as ambient temperature). Conversely, the lowest boundary of energy expenditures should be much more sensitive to extrinsic factors, particularly temperature, because low temperatures elevate thermoregulation costs. A metabolic niche can be therefore visualized as the space set between upper and lower energy expenditure boundaries defined with respect to ambient temperature (Fig. 1).

Although the concept of ‘metabolic niche’ is appealing, to date its very existence has not been demonstrated for any species. This is mainly because data on energy expenditures are difficult to obtain under natural conditions. The goal of our study was therefore to test the concept of ‘metabolic niche’ in the least weasel, the smallest member of the order Carnivora, characterized by extremely high metabolic rates and high levels of locomotor activity. The study was carried out in the central part of the Białowieża Forest. We analyzed daily energy expenditures (thereafter DEE) through the use of the doubly-labeled water (DLW) technique. This tech-

nique involves the isotopic labeling of an animal’s body fluid, providing a direct measurement of carbon dioxide (CO_2) production and thus, indirectly, of energy expenditure. We also fitted the animals with radio transmitters, which allowed us to gather data on their locomotor activity (Fig. 2).

Our results demonstrated that the DEE of male weasels formed a triangular pattern, with an upper boundary that was invariant with ambient temperature, but with a lower boundary that increased



Fig. 2. Male weasel fitted with radio transmitter

with decreasing temperature (Fig. 1a). An inverse but again triangular pattern was found for the relationship between ambient temperature and activity time (Fig. 1b). This means that during warm days

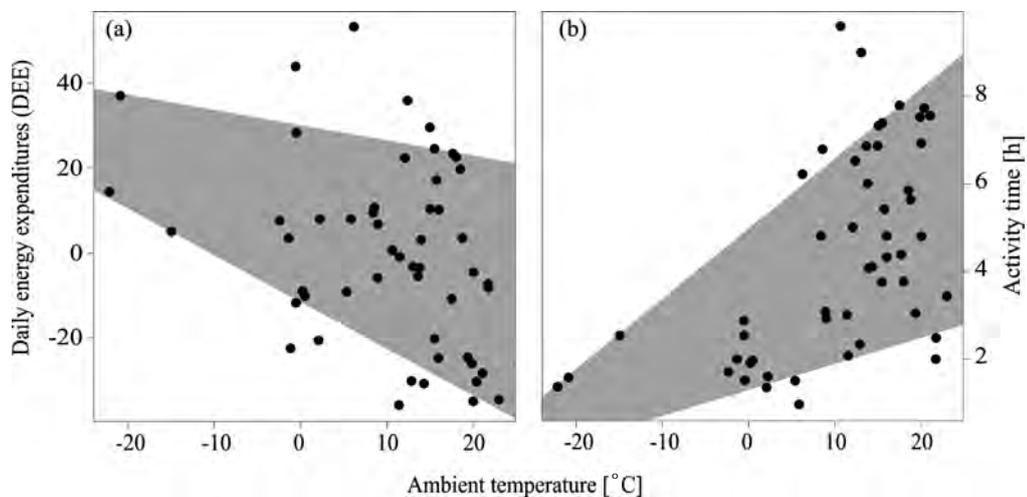


Fig. 1. Ambient temperature vs. daily energy expenditures DEE (a), and activity time (b). Shaded areas include 90% of data points



weasels can be active between 1 and 8 hours, but in winter not longer than 2 hours. The invariance of the upper boundary of the DEE space remains a striking contrast to the strong, positive relationship between temperature and maximum values of locomotor activity. This discrepancy is probably caused by high winter costs of thermoregulation during activity, contributing to high DEE. This pattern indicates the importance of the combined costs of activity and thermoregulation.

The significance of physiological limits to DEE in free-living endotherms is a matter of debate. In our study less than 10 per cent of measurements approached the upper bound of observed weasels'

DEE. One can expect, however, that under most environmental conditions animals are unwilling to operate at the maximal rates, most likely because it entails physiological costs, for example, an increased rate of reactive oxygen species (ROS) production or impairment of the function of an immune system. These effects may ultimately lead to reduced survival. Thus, weasels' "laziness" seems to be reasonable after all. In short, we demonstrated, for the first time, the usefulness of the concept of 'metabolic niche' for energy expenditure studies on free-ranging animals.

References

- Zub K., Sönnichsen L., Szafrńska P.A. (2008). Habitat requirements of weasels *Mustela nivalis* constrain their impact on prey populations in complex ecosystems of the temperate zone. *Oecologia*, 157, 571-582.
- Zub K., Szafrńska P.A., Konarzewski M., Redman P., Speakman J.R. (2009). Trade-offs between activity and thermoregulation in a small carnivore, the least weasel *Mustela nivalis*. *Proceedings of the Royal Society of London B*, 276, 1921-1927.

Mammal Research Institute
ul. Waszkiewicza 1c, 17-230 Białowieża
phone: 48 (85) 681 22 78
fax: 48 (85) 681 22 89
e-mail: mripas@zbs.bialowieza.pl
www.zbs.bialowieza.pl

Whence the Red Panda? A 190-year-old riddle solved by nuclear DNA

M. Wolsan | Museum and Institute of Zoology | Polish Academy of Sciences

J.J. Sato | Fukuyama University

The Red (or Lesser) Panda was first presented to Western naturalists in 1821. Four years later, the species received its scientific name, *Ailurus fulgens*, which means "shining cat." It was the only panda known to the Western world for half a century until the Giant Panda was discovered. Both species are confined in occurrence to high-altitude bamboo

forests in the south-central China and Himalaya region, subsist on bamboo, and exhibit several anatomical and behavioral similarities associated with the shared vegetarian lifestyle, a peculiar adaptation for members of the order *Carnivora* (meaning "flesh eating"). Primarily for these reasons, it was common in the past to treat both pandas as closely

related. Although the Red Panda was named after a cat, it soon became obvious that its ancestry lies within the suborder of dog-like carnivorans (dogs, bears, seals, raccoons, weasels, and their relatives) rather than the suborder of cat-like carnivorans (cats, hyenas, civets, mongooses, and their kin). As the Red Panda resembles raccoons in certain respects, whereas the Giant Panda is essentially a bear, there was a long-standing debate over whether the pandas should be included in the raccoon family (also containing ringtails, coatis, olingos, and kinkajous) or the bear family, or rather classified in their own family. Over the last 50 years, the bear nature of the Giant Panda has ultimately been demonstrated conclusively, and the perceiving of this species as the closest extant relative of the living bears has eventually become widespread. The Red Panda's affinities, however, have continued to be puzzling and have become even more controversial given an impressively wide range of phylogenetic relationships proposed for this species during the past two decades.

The most recent investigations based on large sets of data have at last convincingly revealed a basal position of the Red Panda and the skunk family (also comprising stink badgers) to the raccoon family and weasel family (also including otters, martens, badgers, and allies), but have nevertheless failed to clarify the mutual phylogenetic relation between the Red Panda and the skunk family. It is noteworthy that the skunks and stink badgers had long been regarded as distantly related within the weasel family, but recent research has uncovered evidence arguing persuasively for their close relatedness and a placement outside this family.

To shed more light on the Red Panda's relationship to other dog-like carnivorans, we explored among-species variation in a set of concatenated 5,497-nucleotide sequences from protein-coding exons of five nuclear genes, representing the largest nuclear DNA data set undertaken for this purpose so far. Our diverse analyses (parsimony, maximum likelihood, and Bayesian) resulted in

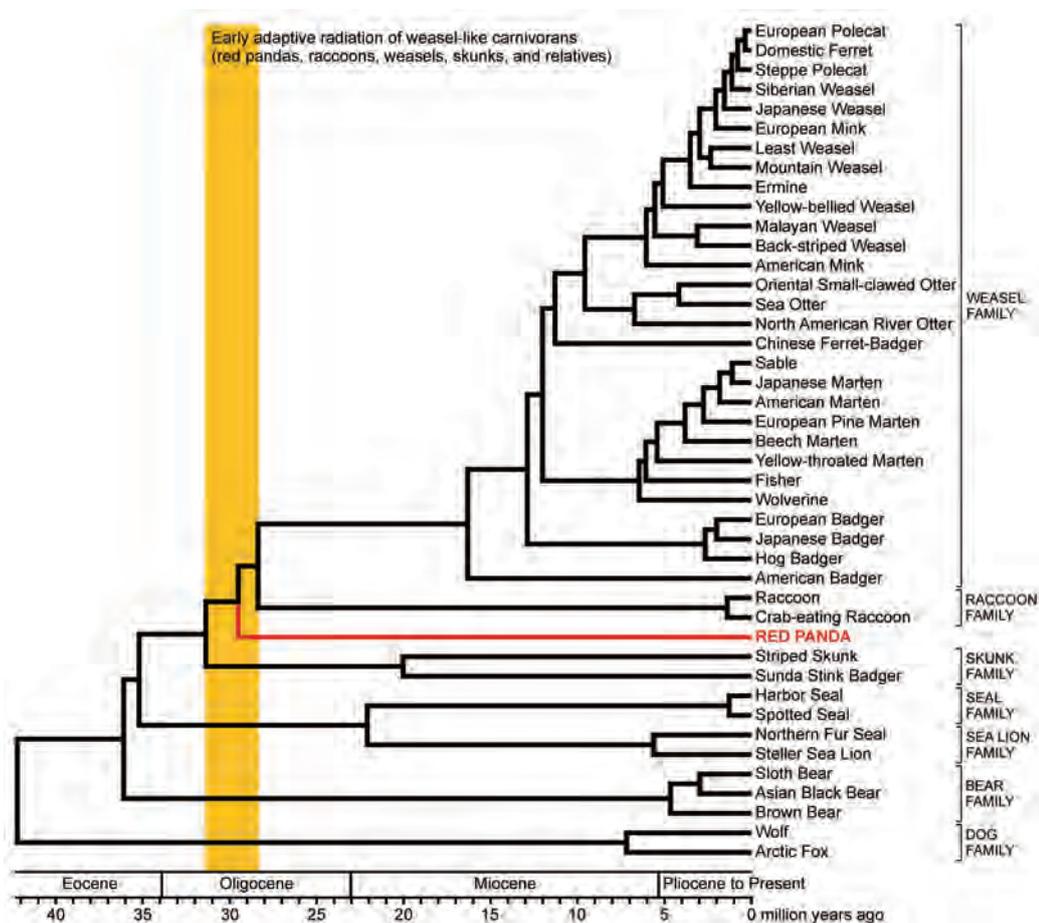


Fig. 1. A timetree of the Red Panda and other dog-like carnivorans inferred from parsimony, maximum likelihood, and Bayesian phylogenetic analyses and Bayesian dating analysis based on a set of 5,497-nucleotide sequences of nuclear DNA

almost identical and well-supported phylogenetic reconstructions. Most of the interrelationships of dog-like carnivorans hypothesized increasingly in comprehensive studies have been corroborated and extended. In particular, our analyses reinforced the most recent molecular resolution of the long-lasting controversy regarding the affinities of “fin-footed” carnivorans (seal and sea lion families) by providing compelling evidence for their close relationship to a common clade of the Red Panda and the raccoon, weasel, and skunk families, rather than to the bear family (Fig. 1). More importantly, all our phylogenetic analyses strongly supported the Red Panda as the closest living relative of the raccoon and weasel families to the exclusion of the skunk family (Fig. 1). All theoretically possible alternative hypotheses about the relationships among these four taxa were consistently rejected by three different (approximately unbiased, Kishino-Hasegawa, and Templeton) statistical tests, which additionally strengthens confidence in the accurate reconstruction of the Red Panda’s relationships. Our finding is the first conclusive resolution of the Red Panda’s affinities, a long-awaited solution to an evolutionary riddle that had persisted unresolved for almost two centuries.

The deciphering of the phylogenetic relationships among the Red Panda and the raccoon, weasel, and skunk families allowed, for the first time, an efficacious estimation of the timing, tempo, and mode of the early adaptive radiation of a clade composed of these and related extinct taxa (superfamily of weasel-like carnivorans). To address this issue, we estimated the divergence times of the Red Panda’s lineage and those of other dog-like carnivorans un-

der a relaxed molecular clock using a multigene Bayesian approach with temporal constraints based on well-documented fossil data. The dating analysis yielded a 42-million-year time scale to the evolution of dog-like carnivorans and also provided evidence of several bursts of diversification. One of these, occurring around 30 million years ago in the Oligocene, involved the origin of the Red Panda’s lineage and those of the raccoon, weasel, and skunk families, which all appear to have separated from each other during a relatively short 3-million-year interval (Fig. 1).

References

- Sato J.J., Wolsan M., Minami S., Hosoda T., Sinaga M.H., Hiyama K., Yamaguchi Y., Suzuki H. (2009). Deciphering and dating the red panda’s ancestry and early adaptive radiation of Musteloidea. *Molecular Phylogenetics and Evolution*, 53, 907-922.
- Sato J.J., Wolsan M., Suzuki H., Hosoda T., Yamaguchi Y., Hiyama K., Kobayashi M., Minami S. (2006). Evidence from nuclear DNA sequences sheds light on the phylogenetic relationships of Pinnipedia: single origin with affinity to Musteloidea. *Zoological Science*, 23, 125-146.

Museum and Institute of Zoology
ul. Wilcza 64, 00-679 Warszawa
phone: 48 (22) 629 32 21
phone/fax: 48 (22) 629 63 02
e-mail: sekretariat@miiz.waw.pl
www.miiz.waw.pl

Mitotic kinesin Ncd: Subunit interactions and directional microtubule-microtubule sliding

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

Molecular motors are systems of one or several molecules, which are capable of cyclically converting chemical energy derived from adenosine triphosphate (ATP) hydrolysis into mechanical work. The motor protein Ncd, a member of the kinesin-14 subfamily, is a homodimer of about 180 kDa molecular weight which specifically binds to microtu-

bules. By hydrolyzing one ATP molecule, Ncd generates a force of up to 7 pN and makes an 8-nm step towards the minus end of the microtubule. Unlike the ‘walking’ kinesins belonging to subfamily 1, in Ncd only one of the two motor domains is involved in the interaction with the microtubule (Skowronek et al., 2007). The other head is tethered

to the bound one and is believed to remain completely passive. In order to study interactions between subunits in this motor, we designed mutated Ncd molecules carrying point mutations in one of the heads, thus producing heterodimeric motors. These proteins were expressed in bacteria and then isolated by two sequential affinity chromatography steps, followed by measurements of their affinities to microtubules, enzymatic properties, and the velocity in the microtubule gliding test *in vitro* (Kocik et al., 2009). Although the heterodimers had one fully active and one inactive head, their enzymatic properties and motility varied dramatically, demonstrating that Ncd motor domains do not function independently. While it is clear that the Ncd heads are enzymatically and mechanically interactive, the interpretation of these results at the atomic level is not yet possible because the available crystallographically-derived Ncd structures do not provide a clue

as to the pathway of communication between the motor domains.

In the cell, the Ncd motor plays a pivotal role in the maintenance and organization of the mitotic spindle. Chromosome segregation in eukaryotes is carried out by an elaborated protein machine called the mitotic spindle, composed of microtubules and microtubule bundles, molecular motors and other proteins. Balanced antagonistic forces by two groups of kinesins, the plus-end-directed kinesins-5 and minus end-directed kinesins-14, regulate spindle assembly and dynamics. Evidence suggests that kinesins-14, such as Ncd, act by driving the sliding of parallel or anti-parallel microtubules bundles in different areas of the spindle. These motors have two microtubule binding sites, an ATP-dependent site in the motor domain and an ATP-independent site in the tail (see Fig. 1). To elucidate the interaction of Ncd with microtubules on the single molecule

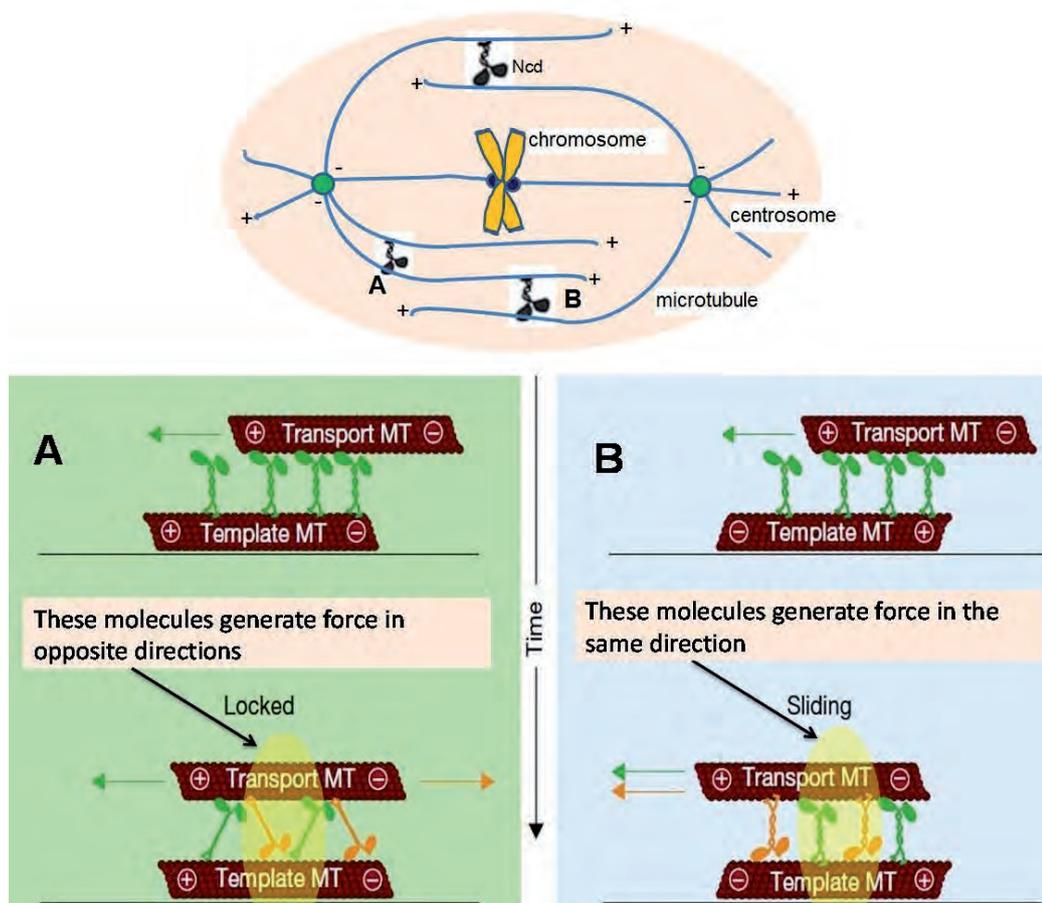


Fig. 1. (top) Schematic view of microtubule cytoskeleton during mitosis. (bottom) Models for static cross-linking (A) and directional sliding (B) of microtubules by Ncd. Initially movement of the transport microtubule is generated in either orientation. With time, however, as the motors switch filaments to which they are attached, the transport stops in A but still continues in B. Both microtubule arrangements exist in the cell during mitosis; see Fink et al., 2009 for details

level we developed a novel *in vitro* motility assay (Reuther et al., 2006), in which we measured the velocity of microtubule sliding powered by molecular motors over one another. Next, we prepared a series of truncated, dimeric Ncd motors, which lacked either the second microtubule binding site or the motor domain (tailless or headless motors). Using the sliding assay and either full-length Ncd or the constructs, we observed a strikingly different behavior for microtubules oriented in the parallel and anti-parallel fashion (Fink et al., 2009). When ATP was added to initiate sliding, in both cases the microtubules began to move. However, when the two microtubules had the parallel orientation, the movement stopped rapidly and the microtubules became statically locked (cross-linked) by the motors (Fig. 1). In contrast, robust sliding continued when the microtubules were oriented in the anti-parallel fashion. We suggest that the ability to distinguish the orientation of sliding microtubules is conferred by the directional force generation by molecular motors, which in conjunction with the mass-action law and the switching of Ncd molecules between microtubules (Fig. 1) leads to the observed phenomenon. An intriguing and still unanswered question is whether the interactions between subunits in this

motor (Kocik et al., 2009) are indispensable for such a mechanism.

References

- Fink G., Hajdo Ł., Skowronek K.J., Reuther C., Kasprzak A.A., Diez S. (2009). The mitotic kinesin-14 Ncd drives directional microtubule-microtubule sliding. *Nat. Cell Biol.*, 11:717-723.
- Kocik E., Skowronek K.J., Kasprzak A.A. (2009). Interactions between subunits in heterodimeric Ncd molecules. *J. Biol. Chem.* 284:35735-35745.
- Reuther C., Hajdo Ł., Tucker R., Kasprzak A.A., Diez, S. (2006). Biotemplated nanopatterning of planar surfaces with molecular motors. *Nano Lett.* 6:2177-2183.
- Skowronek K.J., Kocik E., Kasprzak A.A. (2007). Subunits interactions in dimeric kinesins. *Eur. J. Cell Biol.*, 86:559-568.

Nencki Institute of Experimental Biology
ul. Pasteura 3, 02-093 Warszawa
phone: 48 (22) 589 22 07
fax: 48 (22) 822 53 42
e-mail: dyrekcja@nencki.gov.pl
www.nencki.gov.pl

A tree-ring reconstruction of wind disturbances in a Carpathian Mountain forest

T. Zielonka | Władysław Szafer Institute of Botany | Polish Academy of Sciences

Natural disturbances are among the most important phenomena which influence the dynamics of whole ecosystems. On the level of forest stands, the disturbance regime shapes the species composition and structure of the forest. European forests are affected by large-scale disturbances by fire, windstorms, and insects. On 19 November 2004, an unusually strong “bora” wind heavily damaged 12 000 ha of forests located on the southern slopes of the Tatra Mountains in Slovakia. This unprecedented event was publicly treated as a natural disaster, which consumed over 2.5 million m³ of timber including valuable natural and semi-natural stands protected within the Tatra National Park. Abrupt deforestation over a large area triggered a cascade of environmental changes and the

windthrow immediately became the target of great interest for specialists in many disciplines. One of the objectives set was to deepen our knowledge of the history of the mixed forest composed of Norway spruce (*Picea abies*) and European larch (*Larix decidua*) affected by the windstorm. Reconstruction of its history focused on the detection of possible disturbances in this region in the past. We obtained long-term information from the tree-ring series of uprooted and broken trees. Over 700 cross-sections were collected from stumps; tree-ring widths were measured and cross-dated according to the standard procedure used in dendrochronology. Tree-ring series were analyzed to detect growth releases associated with past disturbances. An abrupt increase in tree-ring width is often caused by improved growth

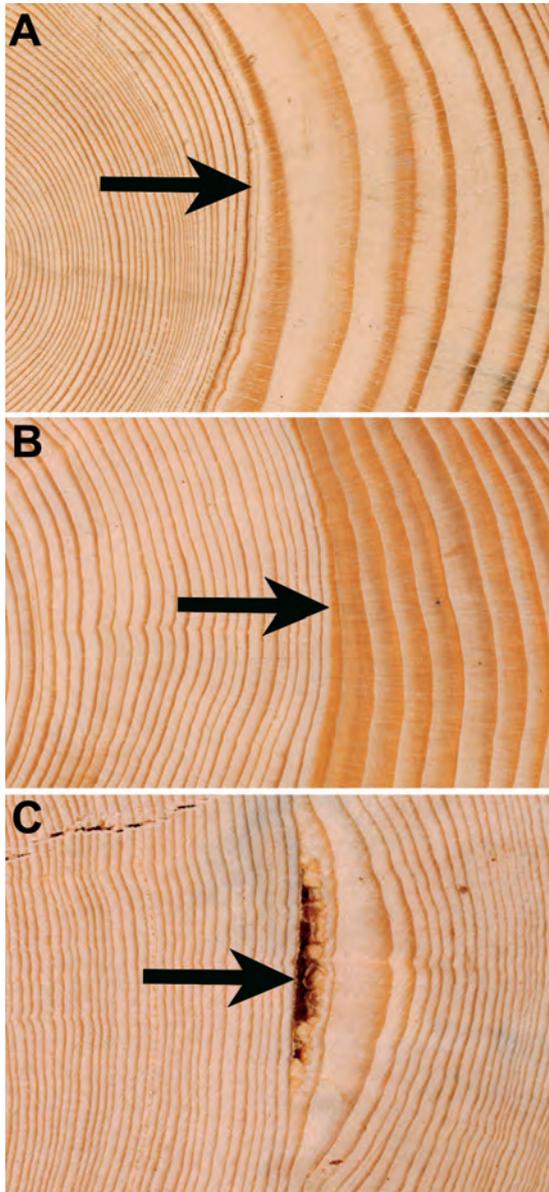


Fig. 1. Modifications in wood anatomy which may indicate a disturbance event (arrows). Dendrochronological cross-dating of such changes in tree-rings enables a precise determination of the year of the disturbance. A) a growth release – an increase of growth due to death of neighbor trees eliminated by the disturbance. B) abrupt production of compression wood may be evidence of tilting in surviving trees because of the impact of the windstorm. C) resin pockets are formed in conifer stems due to bending by strong wind

conditions related to the death of neighboring trees due to a disturbance event. Percentage change in growth rate (%GC – percent growth change) was calculated and scaled according to a boundary-line release criterion (Zielonka et al. 2009; Zielonka et al. 2010). As an additional indicator of past distur-

bances we used the presence of compression wood and resin pockets (Zielonka and Malcher 2009). These modifications in wood anatomy are often caused by partial stem damage due to the impact of windstorms.

During the period of the reconstruction – covering the two last centuries – the southern slopes of the Slovak Tatras were affected by several windstorms. Synchronized release signal in tree-ring series indicated a severe and most likely large-scale disturbance event in the late 18th century and another in the late 1860s. These dates correspond with the bimodal age structure of larch; both of these events initiated the recruitment of this species. The larch, a light-demanding tree, needs larger openings for successful regeneration and growth, whereas the shade-tolerant spruce regenerates in weaker light conditions and thus may displace other light-demanding species from the forest if cyclic large-scale disturbances are lacking. Other disturbances detected in tree-ring signals in the 20th century overlap with historical data about intensive windthrows in this area. Release pulses correspond with synchronized and abrupt production of compression wood and resin pockets in survival trees (Fig. 1, Fig. 2).

These results show that at least some regions of the Carpathian Mountains have been shaped by the long-term influence of occasional large-scale wind disturbances. Such infrequent and severe events may counter tendencies resulting from local gap-phase processes, leading to a non-equilibrium transient state that promotes coexistence of tree species with different ecological requirements. The role of infrequent large-scale windthrows might be more important for forest dynamics in Central Europe than

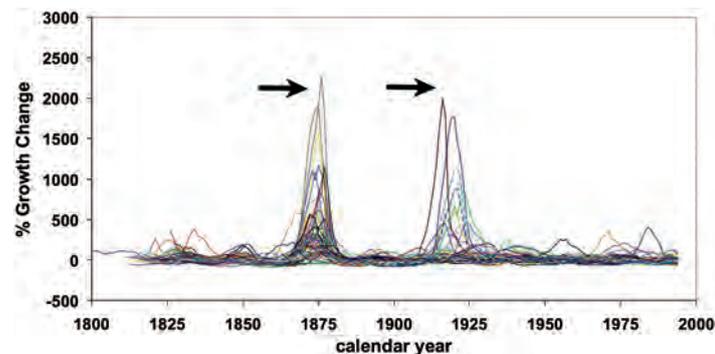


Fig. 2. Strong and synchronized growth releases in the high number of tree-ring series indicate severe disturbance events (arrows)

previously reported. Studies of the influence of disturbances on forest dynamics are still scarce in Central Europe; forest ecology in this region has traditionally used conceptual models based on the description of development phases and stages developed by Leibundgut and Korpel. This conceptual framework has assumed relatively stable conditions in forest structure. Much of our understanding of forest dynamics was based on relatively short-term observations, which precluded the detection of infrequent disturbances. Such events, although they may occur once per century or less often, have a great influence on forest structure and composition. Knowledge of disturbance history seems to be of high importance for the proper management, conservation, and restoration of forest stands. However it cannot be obtained without resorting to dendroecological analyses in most cases. Like in this study, information contained in tree-rings may significantly extend the disturbance history retroactively.

References

- Zielonka T., Holeksa J., Fleischer P., Kapusta P. (2010). A tree-ring reconstruction of wind disturbances in the mountain forest of the Slovakian Tatra Mts., Western Carpathians. *Journal of Vegetation Science*, 21, 31-42.
- Zielonka T., Malcher P. (2009). The dynamics of a mountain mixed forest under wind disturbances in the Tatra Mountains, central Europe – a dendroecological reconstruction. *Canadian Journal of Forest Research*, 39(11), 2215-2223.
- Zielonka T., Holeksa J., Malcher P. (2009). Disturbance events in a mixed spruce larch forest in the Tatra Mts., Western Carpathians – a tentative reconstruction. *Baltic Forestry*, 15(2), 161-167.

Władysław Szafer Institute of Botany
ul. Lubicz 46, 31-512 Kraków
phone: 48 (12) 421 51 44
fax: 48 (12) 421 97 90
e-mail: iboffice@ib-pan.krakow.pl
www.ib-pan.krakow.pl/show

Mathematical, Physical, and Chemical Sciences

Division III – Mathematical, Physical, and Chemical Sciences covers scientific activity in astronomy, physics, mathematics, and chemistry. The Division consists of 70 members of the Academy (41 full members and 29 corresponding members) plus 49 foreign members. It is with deep sorrow that we note that Prof. Jan Stankowski, full member of the Division, passed away in 2009.

Division III coordinates the activity of 14 research institutes, with 991 researchers (1012 in 2008) pursuing fundamental research in domains represented in the Division as well as in various applied research fields. In 2009 the institutes carried out 942 (955 in 2008) research projects, 160 (167) of which were foreign. Over the past year, researchers from the Division's institutes published 1997 (2017) papers in refereed journals of international circulation, and the institutes were engaged in editing 14 (14) scientific journals.

Twelve of the institutes affiliated with the Division are authorized to confer doctorate (PhD) degrees, while 11 may confer *habilitation* (DSc) degrees. The institutes run their own four-year post-graduate studies leading to PhD degrees, or par-

ticipate 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.

Six scientific committees encompassing 281 members are affiliated with the Division. Four of them deal with the branches of knowledge represented within the Division – astronomy, chemistry, mathematics, and physics – and function on a permanent basis. The other two – the Committee on Analytical Chemistry and the Committee on Crystallography – are appointed for the term of the Academy's Presidium. As bodies representing the entire scientific community, the committees express scientific opinions, discuss research directions, and are engaged in organizing scientific events and publishing journals. 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 – Plan-*



Award ceremony. From left: Assoc. Prof. Yuriy Tomilov, Prof. Michał Kleiber (president of the Polish Academy of Sciences), Prof. Andrzej M. Oleś, Prof. Janusz Jurczak (chairman of Division III), Dr. Robert Gryboś, Dr. Paweł Wajer (M. Mlekicki)

etary Geodesy, and *Molecular Physics Report* in the domain of astronomy and physics, *Polish Journal of Chemistry*, *Biotechnologia* (Biotechnology), *Chemia Analityczna* (Analytical Chemistry), 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.

In 2009 the Division remained engaged, directly or via its Committees, in the promotion of gifted high school and university students. The International PhD Studies program established at Division III in 2000 continued this program. The Division's institutes participate in International EU Programs, and specific attention is paid to activities pursued through Centers of Excellence. The Division coordinates the Polish part of the EU – Republic of Korea scientific cooperation Program (KORANET). Close collaboration with scientific societies active in the domains represented in the Division has been continued.

During the present term of office of the Academy authorities, Division III is headed by Prof. Janusz Jurczak as chairman and Prof. Jacek Kossut and Prof. Jerzy Zabczyk as deputy chairmen.

Two plenary sessions of the Division were held in 2009. At its spring session the Division analyzed the current status of the discussion on proposed new regulations concerning Polish scientific institutions, in particular the Polish Academy of Sciences. The second important point was a preliminary evaluation of the condition of institutes belonging to Division III. The fall session was devoted to the election

of new foreign members of the Polish Academy of Sciences and to the evaluation of the Division III institutes. Four foreign members of the Academy were elected: Gerhard Ertl (Germany, chemistry), Robert H. Grubbs (USA, chemistry), Jakov Sinai (Russia, USA, mathematics), and Frank Steglich (Germany, physics). In the second point, the Division analyzed the research conditions of the institutes and centers, and concluded that all the scientific units are in good shape in relation to their funding situation.

As is traditional, the Division granted its annual prizes. In 2009, the prestigious M. Skłodowska-Curie Award was bestowed upon Prof. Andrzej M. Oleś from Jagiellonian University in Kraków and the Institute of Nuclear Physics, Polish Academy of Sciences, for his research on spin-orbital entanglement in transition metal oxides. The Division III research awards, in turn, were given as follows: the W. Sierpiński Award in mathematics to Assoc. Prof. Yuriy Tomilov from the Nicolaus Copernicus University in Toruń and the Institute of Mathematics, Polish Academy of Sciences, for a series of papers relating to asymptotics of operator series in Hilbert and Banach spaces as well as the stability of operator semigroups, the S. Pieńkowski Award in physics and astronomy to Dr. Paweł Wajer from the Space Research Center, Polish Academy of Sciences, for his paper entitled “2002 AA₂₉: Earth's recurrent quasi-satellite?” and the Kołos Award in chemistry to Dr. Robert Gryboś from the Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences, for a paper on the mechanism of reduction of nitrogen oxides in the presence of zeolite catalysts.

Spin-orbital entanglement in transition metal oxides

A.M. Oleś | Henryk Niewodniczański Institute of Nuclear Physics | Polish Academy of Sciences

Magnetic properties of materials with strongly correlated electrons are usually described by exchange interactions between neighboring spins, while the occupied electronic orbital states contribute only to chemical bonds. A qualitatively different situation occurs, however, in a class of transition metal oxides with partly filled degenerate 3d orbital states. In this case exchange interactions con-

cern spins and orbitals on equal footing, and both these degrees of freedom are dynamical and strongly coupled with each other. When in addition the coupling between orbitals and the lattice is strong, as in the colossal magnetoresistance manganites, the orbitals are frozen. In a general case both spins and orbitals may fluctuate simultaneously and determine the quantum states which decide about the mag-

netic order and phase transitions. Such states cannot in general be factorized into a spin and orbital part, implying that these states are entangled. Recent research has shown that vanadate perovskites provide a good example of this behavior and a number of their rather exotic properties can be understood only after the concept of spin-orbital entanglement is introduced.

Impressive experimental work has produced exceptionally detailed information on the phase diagrams of the RVO_3 perovskites, with $R=La, Pr, \dots, Yb, Lu$, thus providing a unique challenge to the theory and an opportunity to resolve the interplay between the underlying interactions. In all these compounds an orbital transition takes place at T_{OO} , and the C-type antiferromagnetic (C-AF) order appears below the Neel temperature T_{N1} (see Fig. 1). A rather exotic feature here is that these temperatures are nearly the same in $LaVO_3$, and next exhibit a characteristic dependence on the ionic radius r_R of rare earth ions along the RVO_3 series. The nonmonotonic dependence of T_{OO} on r_R indicates a competing mechanism, while the decrease of T_{N1} with decreasing r_R is surprising as the parameters which describe 3d electrons on V ions do not change.

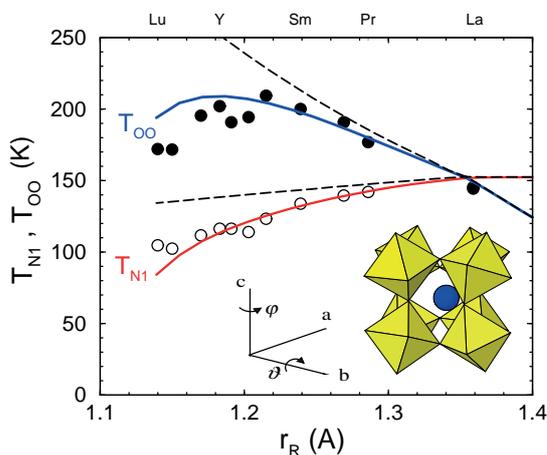


Fig. 1. The orbital T_{OO} and Neel T_{N1} transition temperatures in RVO_3 for varying ionic radius r_R ; points and lines stand for experiment and theory. The inset shows the lattice distortion described by two angles $\{\theta, \phi\}$ which increases with decreasing r_R (Horsch et al. 2008)

The microscopic model for the RVO_3 perovskites includes spin-orbital superexchange in entangled states, arising from charge excitations between two neighboring V^{3+} ions, with $S=1$ spin and $xy^1(yz/zx)^1$ ionic configuration, and the coupling between the

orbitals and the lattice. The tilting of rigid VO_6 octahedra increases with decreasing r_R and leads to an orthorhombic distortion of the lattice. The orbital-lattice coupling is twofold: (i) the Jahn-Teller coupling increases for decreasing r_R , while (ii) the coupling to the above distortion increases faster and gradually suppresses orbital fluctuations. As these two terms compete with each other and the orbital correlations change, one finds that the experimental phase diagram of Fig. 1 is reproduced by the theoretical model. We emphasize that the entire dependence of T_{N1} on r_R follows from the changes in the orbital fluctuations which influence the magnetic couplings.

Spin-orbital entanglement leads also to an unexpected second magnetic transition in YVO_3 , and to a new intermediate C-AF phase with dimerized ferromagnetic interactions. This dimerization becomes possible when the states with spin-orbital entanglement are excited by thermal fluctuations and enable dimerization without any lattice distortions. Also the distinct anisotropy and temperature dependence of the optical spectral weights in $LaVO_3$ have been quantitatively explained using the entangled spin-orbital states.

Coexisting antiferromagnetic (AF) and alternating orbital (AO) order of occupied yz/zx orbitals in ab planes of RVO_3 perovskites provides an example of the ground state which arises due to entangled states. Recently the issue of a hole moving in such an entangled AF/AO background (see Fig. 2) was

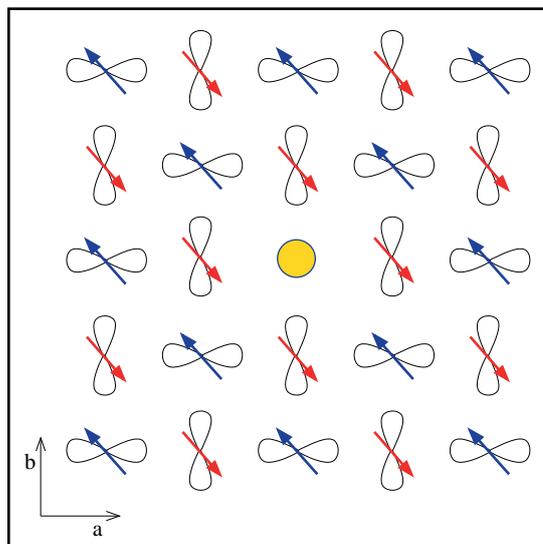


Fig. 2. Artist's view of a single hole doped in a Mott insulator with entangled AF/AO order. This state is realized in ab planes of RVO_3 perovskites (K. Wohlfeld et al. 2009)

investigated by reducing this problem to being polaronlike. The hole delocalizes by its coupling to simultaneous spin and orbital excitations, and dresses by them along its path. The spin-orbital entanglement here provides topological constraints on the hole motion which, unlike a hole in superconducting cuprates, cannot benefit from quantum fluctuations in the spin system. The predicted hole spectral properties in such challenging background as the AF/AO planes of the vanadates should help us to understand future photoemission experiments as well as the phase diagrams of doped vanadates and other materials with similarly complex ordered states. A comment on this paper has appeared in *Physics*.

Summarizing, spin-orbital entanglement allows one to understand certain qualitatively new properties of transition metal oxides and may be further tested in future experiments. A better understanding of spin-orbital entanglement could lead to future applications and is of interest both for strongly correlated electrons and in quantum information theory.

References

- Horsch P., Oleś A.M., Feiner L.F., Khaliullin G. (2008). Evolution of spin-orbital-lattice coupling in the RVO_3 perovskites. *Physical Review Letters*, 100, 167205.
- Oleś A.M., Horsch P. (2009). Orbital fluctuations in RVO_3 perovskites. *Properties and Applications of Thermoelectric Materials*. V. Zlatic, A.C. Hewson (eds.), NATO Science for Peace and Security Series B: Physics and Biophysics, vol. 299 (New York, Springer), 299-324.
- Wohlfeld K., Oleś A.M., Horsch P. (2009). Orbital induced string formation in the spin-orbital polarons. *Physical Review B*, 79, 224433 [Editor's choice, Viewpoint, Berciu M. (2009). *Physics*, 2, 55].

Henryk Niewodniczański Institute
 of Nuclear Physics
 ul. Radzikowskiego 152, 31-342 Kraków
 phone: 48 (12) 662 80 00
 fax: 48 (12) 662 84 58
 e-mail: dyrektor@ifj.edu.pl
 www.ifj.edu.pl

Quantum chemistry in designing car exhaust catalysts

R. Gryboś | Institute of Catalysis and Surface Chemistry | Polish Academy of Sciences

In a series of papers, we have managed to demonstrate how quantum chemistry methods can serve as useful techniques, fully complementary to experimental methods. Theory can be a great aid in interpreting experimental results and in understanding phenomena that occur even in such “technological” systems as car exhaust catalysts. The scientific achievement described in our papers is a precise description of the interaction between nitrogen oxide molecules and palladium clusters embedded in mordenite. Our model permits us to compare the properties of metallic palladium and palladium in mordenite.

One of the major problems in environmental catalysis is the removal of dangerous nitrogen oxides (NO_x) from car engine exhausts by its reduction to safe molecular nitrogen – N_2 . From the chemical point of view this is a very demanding reaction because it requires nitrogen oxides to be reduced in

the presence of oxygen. One of the most promising catalysts for this reaction are zeolites ion-exchanged with noble metals. Such systems exhibit very high activity but are sensitive to water vapor, which, at elevated temperatures, can cause the collapse of the zeolite structure. The most stable, and at the same time one of the most active systems is palladium ion-exchanged into mordenite.

Zeolites, such as mordenite for instance, are very interesting materials with a unique, nanoporous structure. The whole volume of zeolite is pierced with channels of very specific dimensions, comparable to the dimensions of chemical molecules. Zeolites are sometimes called “molecular sieves” because they are able to separate molecules based on their size or even shape. This is not the only fascinating property of zeolites. In addition, small structure modifications (i.e. the substitution of aluminum in place of some silicon atoms) give

rise to very strong acid sites. Such substances are dubbed “superacids” because they are stronger than concentrated sulfuric acid, and are sometimes also called “solid acids” because they take the form of a powder. Moreover, acid sites can be substituted with a variety of other species, metal cations for example, resulting in materials with completely new properties.

The development of quantum chemical methods together with computational techniques allows for more and more precise computer simulations of reactions and processes. Quantum chemistry is becoming an established technique, which in conjunction with experimentation allows for a full understanding of phenomena occurring during a catalytic reaction. Employing a quantum chemistry method known as DFT (Density Functional Theory) enabled us to propose a very detailed and concise model of the state and function of the Pd-MOR (palladium doped mordenite) catalyst used for reduction of nitrogen oxide NO.

In zeolite science, one of the crucial parameters is the distribution of aluminum sites within the crystalline structure of the zeolite. Because standard X-ray techniques for structure determination cannot differentiate between aluminum and silicon, other, more complex methods must be used, such as NMR (Nuclear Magnetic Resonance) or probe molecules. However, interpretation of the results is usually difficult and not always unambiguous. Theoretical methods have the advantage of offering

complete control over the structure being investigated. Using combinatorics, I have created approx. 30 different distributions of aluminum sites in the mordenite framework and compared their stabilities, or in other words, their probabilities of existence. The results have shown that aluminum distribution is almost completely random. Conversely, a similar procedure applied to palladium ion-exchanged into mordenite showed a clear preference of Pd cations for some specific sites. Additionally, the location of palladium has a profound impact on its catalytic activity, for example in reaction with nitrogen oxide. Because data on infrared spectra for NO adsorbed in Pd-MOR were available in the literature, it was only natural to compare the results. Quantum chemistry methods allow for the calculation of molecule vibration frequencies (measured by infrared spectroscopy) for very well defined systems or even for a single, chosen vibration mode, which allows us to revise the spectra interpretation given by experimentalists. Some bands in the spectra which were originally assigned to adsorption of more than one NO molecule on a single palladium center were shown to originate from monoadsorption, albeit on palladium located in different positions in the zeolite – Pd properties dependent on the cation location had a large effect on the vibration of adsorbed NO.

Experiments have shown that under elevated temperatures, palladium cations migrate and come into contact with each other, forming small clusters and subsequently large metallic particles. Quantum chemical calculations for palladium clusters in mordenite confirmed this tendency to agglomerate and allowed for a detailed analysis of the clusters’ interaction with zeolite and with the NO molecules. Projections of electron density have shown how the hybridization of palladium orbitals changes due to interaction of the cluster with the zeolite. Hybridization defines the strength of palladium-palladium bonds and, as a consequence, the reactivity of the whole cluster. On the other hand, differential maps visualized the electron flow between the cluster and the NO molecule upon adsorption. For details, please consult the papers listed below.

The results obtained are an excellent example of very close cooperation between the Institute of Catalysis and Surface Chemistry in Kraków (the group of Prof. Małgorzata Witko) and the Institute of Physics of Vienna University (the group of Prof. Jürgen Hafner).

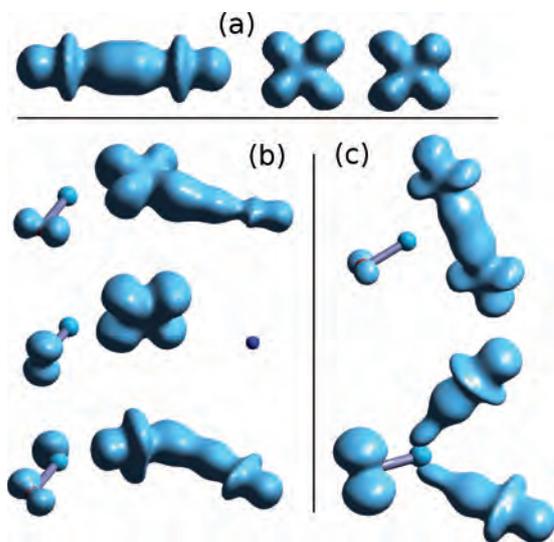


Fig. 1. Shapes of the bonding states for a Pd₂ cluster and interaction with NO. (a) free cluster; (b) NO in contact with one Pd; (c) NO in contact with two Pd

References

- Grybos R., Benco L., Bucko T., Hafner J. (2009). Molecular adsorption and metal-support interaction for transition-metal clusters in zeolites: NO adsorption on Pd_n (n=1-6) in mordenite. *J. Chem. Phys.*, 130, 104503-1 – 104503-20.
- Grybos R., Benco L., Bucko T., Hafner J. (2009). Interaction of NO molecules with Pd clusters: Ab-initio density functional study. *J. Comput. Chem.*, 30, 1910-1922.

- Grybos R., Hafner J., Benco L., Raybaud P. (2008). Adsorption of NO on Pd exchanged mordenite: Ab-initio DFT modeling. *J. Phys. Chem. C*, 112, 12349-12362.

Institute of Catalysis and Surface Chemistry
ul. Niezapominajek 8, 30-239 Kraków
phone: 48 (12) 639 51 01
fax: 48 (12) 425 19 23
e-mail: ncikifp@cyf-kr.edu.pl
www.ik-pan.krakow.pl

On certain asymptotic problems in operator theory

Yu. Tomilov | Institute of Mathematics | Polish Academy of Sciences

Operator theory is one of the most abstract areas of mathematical analysis, connecting and unifying several, often quite distant, fields of analysis such as harmonic analysis, complex function theory, the geometry of Banach spaces, and the theory of differential equations, to mention a few. Giving rise to a synthetic approach to many analysis problems, operator theory methods form one of the basic tools of modern mathematics.

Our achievements concern a series of problems in operator theory whose common denominator is asymptotic behavior of operator families in various topologies.

Many approaches in operator theory are based on reducing the study of a given operator to the study of its model, which inherits basic properties of the operator and at the same time has a more accessible form. As such a model, one often uses an operator similar or quasi-similar to a given operator.

One of the most challenging problems in operator theory was to decide whether every polynomially bounded operator on a Hilbert space is similar to a contraction. The problem was posed by Halmos in 1970 as a refined version of a B. Sz.-Nagy question from 1959 on similarity to contractions of power bounded operators on Hilbert spaces. While the B. Sz.-Nagy question was answered in the negative quite soon by S.R. Foguel, the Halmos problem was solved by G. Pisier only in 1997.

However, certain less known versions of the Halmos problem remained open until very recently. Using a new method of constructing power bound-

ed operators and ideas from operator ergodic theory, in a joint paper Muller and I solved in the negative an old problem on quasi-similarity of power bounded operators on Hilbert spaces to contractions. Answering a well-known question by L. Kerchy and Cassier from 1989, we also found an example of a power bounded operator on a Hilbert space which is quasi-similar to a unitary operator but not similar to a contraction. Our results showed that the classes of power bounded operators on Hilbert spaces and contractions on Hilbert spaces are essentially 'disjoint.'

Semigroups of operators are one of the basic abstract tools in the study of partial differential equations. R. Chill and I in a joint paper solved a problem going back to the 1960s and concerning characterization of norm-continuity and differentiability of operator semigroups in terms of asymptotics of resolvents of their generators along vertical lines. In particular, we constructed a strongly continuous operator semigroup which is continuous in the uniform operator topology at no positive real, such that the resolvent of its generator has a decay along vertical lines arbitrarily close to a logarithmic one. Our examples rule out any possibility of characterizing norm-continuity of semigroups on arbitrary Banach spaces in terms of resolvent-norm decay on vertical lines.

For the solution of this problem we worked out a new method of constructing semigroups for which properties of the resolvent of the generator and continuity properties of the semigroup in the oper-

ator-norm topology are controlled simultaneously. The method relies on a blend of several techniques stemming from complex analysis, Banach algebras, and the geometry of Banach spaces. It helped us to deal with a number of related questions, and, it seems, it will be useful in the study of other problems in semigroup theory as well.

Asymptotic problems in operator semigroup theory were also the main motivation for joint research by A. Borichev, R. Chill and myself. As a result of our investigations, we found boundary uniqueness principles of a new type for harmonic and subharmonic functions defined on the unit disc or halfplane. The principles included well-known uniqueness principles and led to far-reaching generalizations of classical conditions for analytic continuation of functions across a linear boundary and of classical theorems of the Phragmen-Lindelöf type. Our function-theoretic results allowed us to obtain resolvent conditions for strong stability of operator semigroups on Banach spaces with non-trivial Fourier type. The resolvent stability theory which we developed essentially complements a classical spectral stability theory and has already found many

applications in studies of concrete differential equations of mathematical physics, e.g. equations of fluid dynamics.

References

- Borichev A., Chill R., Tomilov Yu. (2007). Uniqueness theorems for (sub-)harmonic functions with applications to operator theory. *Proceedings of the London Mathematical Society*, 95, 687-708.
- Chill R., Tomilov Yu. (2009). Operators $L_1(\mathbb{R}_+^+) \rightarrow X$ and the norm continuity problem for semigroups. *Journal of Functional Analysis*, 256, 352-384.
- Muller V., Tomilov Yu. (2007). Quasismilarity of power bounded operators and Blum-Hanson property, *Journal of Functional Analysis*, 246, 385-399.

Institute of Mathematics
ul. Śniadeckich 8, 00-956 Warszawa
phone: 48 (22) 522 81 00
fax: 48 (22) 629 39 97
e-mail: im@impan.gov.pl
www.impan.gov.pl

Technical Sciences

Division IV – Technical Sciences covers all the disciplines of technical sciences, including acoustics, automatics, biocybernetics, biomedical engineering, civil engineering, chemical and process engineering, computer science, laser technology, materials science, mechatronics, mechanical engineering, robotics, and the mechanics of fluids and solids. At the end of 2009 the Division had 64 national members (33 of them full members, 31 corresponding members) plus 33 foreign members. The Division supervises the work of 9 research institutes.

These institutes publish scientific journals. Seven of them publish journals in English: *Control and Cybernetics*, *Biocybernetics and Biomedical Engineering*, *Archives of Hydro-engineering and Environmental Mechanics*, *Theoretical and Applied Informatics*, *Transactions of the Institute of Fluid-Flow Machinery*, *Archives of Metallurgy and Materials*, *Machine Graphics and Vision*, *Archives of Acoustics*, *Archives of Civil Engineering*, *Archives of Mechanics*, *Computer Assisted Mechanics and Engineering Sciences*, *Engineering Transactions*, *Evolutionary Optimization (on-line)*, and *Journal of Technical Physics*.

There are 16 scientific committees affiliated with the Division, composed of 535 elected scientists involved in research in the field of technology. The activity of the committees concentrated on supporting research and the popularization of science by organizing conferences and scientific symposiums (the overall number of such meetings was 35) and maintaining contacts with foreign scientific centers, organizations and associations. The committees also continued their publishing activity in 2009 – editing 20 titles, including 16 quarterlies, 14 of them financially supported by the Polish Academy of Sciences.

A new task force committee – the of Committee on Production Engineering – was set up by Division IV in 2009. This committee developed an expert report entitled *The State and Prospects for Production Engineering Research in Poland*.

The Division continued editing of its own scientific quarterly – *Bulletin of the Polish Academy of Sciences: Technical Sciences*, covered by the Master Journal List (Thomson Reuters). In 2009 particular issues focused on the following themes: *Disasters*, *Micro and Nanomechanics*, *Modeling and Optimiza-*

tion of Manufacturing Systems, and *Power Electronics in Renewable Energy Systems*.

Two plenary sessions were held in 2009. During the first session held on 16 April at the Building Research Institute in Warsaw, three new corresponding members – Prof. Tadeusz Burczyński, Prof. Józef Modelski, and Prof. Henryk Krawczyk – presented their research achievements and areas of scientific interest. The participants of the assembly were informed about the research activity of the Building Research Institute, which is a research unit under the Ministry of Infrastructure. The director and scientific secretary of the Institute presented its laboratories and profiled its cooperation with the Polish Academy of Sciences.

The second plenary session was held in Gdańsk on 22-23 October. On the first day participants assembled for the meeting at the Robert Szewalski Institute of Fluid-Flow Machinery, where they visited selected laboratories. Prof. Jarosław Mikielewicz (director of the Institute) and Prof. Jan Kiciński (deputy director) gave short lectures about the research activities of the Institute. They also spoke about successful cooperation between the Institute and other research units or universities and presented the research programs coordinated by the Institute. Two new corresponding members – Prof. Andrzej



Fall session of Division IV held at the Robert Szewalski Institute of Fluid-Flow Machinery in Gdańsk. From left: Prof. Jacek Marecki, Prof. Władysław Włosiński, and Prof. Jarosław Mikielewicz



The ceremony of granting the Division IV scientific awards. From left: Assoc. Prof. Piotr Kowalczyk, Dr. Jacek Dybała, Prof. Władysław Włosiński (chairman of Division IV), Assoc. Prof. Celina Pezowicz, Assoc. Prof. Teofil Jesionowski, Prof. Kazimierz Thiel, Assoc. Prof. Paweł T. Wojciechowski, Assoc. Prof. Marek Florkowski, and Dr. Andrzej Kłosak

Nowicki and Prof. Tadeusz Chmielniak – presented their research achievements and areas of scientific interest. The continuation of the session on the next day took place in another institute in Gdańsk affiliated with Division IV: the Institute of Hydro-engineering. The participants visited its laboratories

and were informed about its main research areas and scientific plans for the future by Prof. Andrzej Sawicki (director of the Institute). The meeting was also devoted to the election of new foreign members of the Polish Academy of Sciences. Five new members were elected: Prof. Shun-ichi Amari from Japan, Prof. Dov Jaron from the USA, Prof. Witold Pedrycz from Canada, Prof. Bolesław Szymański from the USA, and Prof. Xu Binshi from China.

At the end of this meeting the winners of the annual academic awards were also announced. The awards were bestowed upon: Assoc. Prof. Piotr Kowalczyk from the Institute of Fundamental Technological Research in mechanics, Dr. Marek Florkowski from the ABB Research Center in electric engineering, Dr. Teofil Jesionowski from the Poznań University of Technology in chemical engineering, Assoc. Prof. Celina Pezowicz from the Wrocław University of Technology in biomedical engineering, Assoc. Prof. Paweł Tomasz Wojciechowski from the Poznań University of Technology in computer science, Dr. Andrzej Krzysztof Kłosak from the Kraków University of Technology in architecture, and Dr. Jacek Dybała from the War-



Prof. Adam Borkowski (deputy chair of Division IV) and Assoc. Prof. Celina Pezowicz (laureate of the Division IV scientific award)

saw University of Technology in machine building and exploitation.

In December 2009, Prof. Andrzej Nowicki was elected as the new director of the Institute of Fundamental Technological Research.

As a result of efforts by the chairman of Division IV – Prof. Władysław Włosiński – and a group of scientists cooperating with him, the project of the research center of the Polish Academy of Sciences in Jabłonna entitled *Conversion of Energy and Renewable Energy Sources* was put on the list of projects financed by the Marshal of the Mazovian Voivodeship using EU funds. The main beneficiary of this project is the Institute of Fundamental Technological Research.

Furthermore, in 2009 the members of the Division and employees of its institutes frequently received awards and commendations for their outstanding achievements in science. Honorary doctorates were granted to Prof. Tadeusz Kaczorek by the Opole University of Technology, Prof. Jarosław Mikielwicz by the Koszalin University of Technology, Prof. Jan Węglarz by the University of Zielona Góra, and Prof. Tadeusz Chmielniak by the Częstochowa University of Technology. Prof. Zenon Mróz became a foreign member of the Lithuanian Academy of Sciences. Prof. Romuald Będziński received the prize granted by the Ministry of Science and Higher Education.

Crystallographic orientation in the study of material microstructures

K. Sztwiertnia | Aleksander Krupkowski Institute of Metallurgy and Materials Science | Polish Academy of Sciences

The development of new materials is, to a considerable degree, linked to the development of methods used to study their microstructure. The introduction of the latest generation of computer-controlled electron microscopes into research use has made it possible to obtain nearly comprehensive characterizations of microstructure. Such characterizations may be based on the information included in the sets of crystallographic orientations measured in defined micro- or nano-areas in a sample of the examined material.

The development of measuring methods for local crystallographic orientations in the 1990s led to the emergence of a new field of electron microscopy, called OM (*Orientation Microscopy*) or OIM (*Orientation Imaging Microscopy*). OM techniques can be applied to the quantitative description of the microstructure of all polycrystalline materials, encompassing such microstructure orientation characteristics as: the functions of the orientation distribution (texture), the functions of the misorientation distribution (distributions characterizing grain boundaries), and also the so-called partial functions of the distribution, described on sets of orientations after an appropriate selection (e.g. the distribution of the orientation differences between

the grains whose sizes exceed a stated value and their environment). OM techniques can be used for a quick identification of phases. Knowledge of the orientation topography allows for an identification of the subgrains' boundaries and other heterogeneities, on the basis of a selection of orientation rela-



tionships of adjoining measurement points; thus it is possible to perform a stereological analysis with regard to the crystallographic orientation, as well as an imaging of the spatial distribution of the subgrains and their boundaries. Also used is the additional information included in the diffraction image, e.g. on the basis of the parameters describing “image quality,” areas of different dislocation densities can be distinguished in the material.

The OM automatic measuring technique was initially developed for scanning electron microscopes (SEM) in the late 1980s. For the measurement of sets of single orientations in SEM, Electron Back-Scatter Diffraction (EBSD) is used. Progress in the development of the diffraction technique in electron microscopy has popularized the application of EBSD/SEM in material studies and is currently a significant research tool in materials science, geology, and solid-state physics. The key parameter in the performance assessment of such a tool is its spatial resolution. In the case of the scanning electron microscope, this value ranges between tens and hundreds of nanometers (mainly depending on the type of electron gun applied and the sort of material examined). Spatial resolution of this order is not sufficient for the examination of the types of highly deformed and ultrafine-crystalline materials produced with state-of-the-art materials science methods. Responding to the need for microstructure analysis of such materials, OM

techniques for transmission electron microscopes (TEM) are being developed. The spatial resolution ability in TEM is usually better than 10 nm. In sum, orientation microscopy for TEM and for SEM represent two complimentary techniques, allowing for microstructure studies in the nano- and micrometric scale.

Still, as compared to the EBSD/SEM methods, automation of the measurements in TEM has turned out to pose a considerable challenge. Due to these difficulties, no fully-automated commercial systems for the measurement of large sets of local orientations in TEM have yet been developed. In several centers in the world, including the Institute of Metallurgy and Materials Science in Kraków, OM techniques in TEM are being developed through the construction of appropriate slotted lines and the development of software necessary both for the measurement stage and for the analysis of the obtained data. The present author’s monograph includes examples of practical applications of the OM technique in TEM for the analysis of such issues as: gradient and multiphase microstructure characteristics, grain and interfacial boundary characteristics, and local crystal lattice deformation characteristics.

The sample figure presented here shows the orientation topography of the new grains formed in a 6013 aluminum alloy sample, cold-rolled up to 75%, in the deformation area around a large precipitation, after heating in a calorimeter. It can be observed that the deformation area around a large precipitation was the first to recrystallize. The crystallites that are free from the inner substructure, up to several micrometers in size, and in the environment of the precipitation are here new grains which have formed as a result of nucleation and subsequent growth (high angle grain boundary migration). It is visible that the subgrain boundaries do not disappear in the matrix. The annihilation of these low angle grain boundaries takes place in slightly higher temperatures.

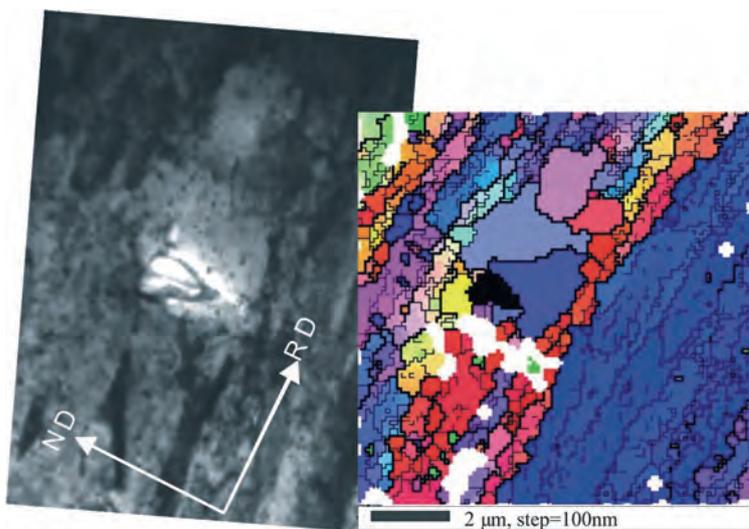


Fig. 1. The microstructure of 6013 aluminum alloy after cold-rolling up to 75% and heating in a calorimeter up to 330 °C – the deformation area around the precipitation (marked black) shown in longitudinal section, TEM. Thin lines indicate low angle grain boundaries, thick lines indicate high angle grain boundaries

References

- Sztwiertnia K. (2009). *Orientacja krystalograficzna w badaniach mikrostruktury materiałów* [Crystallographic orientation in studies of material microstructures]. Polska Akademia Nauk, Instytut Metalurgii i Inżynierii Materiałowej, Kraków.

Morawiec A., Fundenberger J.J., Bouzy E., Lecomte J.S. (2002). EP – a program for determination of crystallite orientations from TEM Kikuchi and CBED diffraction patterns. *J. Appl. Cryst.*, 35, 287.
Sztwiertnia K., Bieda M., Korneva A., Sawina G. (2007). Inhomogeneous microstructural evolution during the annealing of 6013 aluminum alloy. *Inżynieria Materiałowa*, Vol. 3 XXVIII, 476.

Aleksander Krupkowski Institute of Metallurgy and Materials Science
ul. Reymonta 25, 30-059 Kraków
phone: 48 (12) 637 45 80
fax: 48 (12) 637 21 92
e-mail: office@imim-pan.krakow.pl
www.imim.pl

Periodic operations – A method of process intensification in trickle-bed reactors

A. Gancarczyk | G. Bartelmus | Institute of Chemical Engineering | Polish Academy of Sciences

One of the ways of increasing either the productivity or selectivity of processes carried out in trickle bed reactor operation is to employ the BASE-IMPULSE method of periodically changing feeding of the bed with liquid. In this method the liquid feed cycle is characterized by four parameters: the base liquid velocity (w_{Lb}), the impulse liquid velocity (w_{Lip}), and the duration of base (t_b) and impulse (t_{ip}) (see Fig. 1).

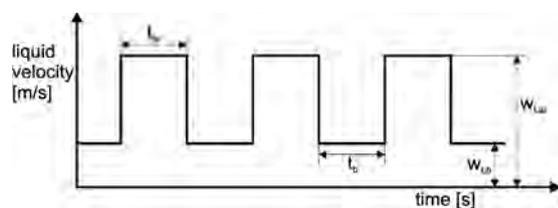


Fig. 1. Parameters characterizing the cyclic flow of liquid through the bed

The Liquid Induced Pulsing Flow (LIPF) regime can be obtained by a proper selection of operational parameters. In this hydrodynamic regime, additional natural pulsations are induced inside the impulse of the liquid. Such a method of reactor operation is particularly beneficial for processes limited by the liquid phase reactant mass transfer to the catalyst surface (e.g. organic compounds of sulfur and nitrogen in the petroleum purification processes).

The aim of this work was to study the potential advantages of using the BASE-IMPULSE method in conducting a process in the trickle-bed reactor working in the LIPF regime. Nitrogen and water solutions of different physicochemical properties

were used during the research as the gas and liquid phase, respectively. The first step in the experiments was to determine the range of velocity changes of the gas and liquid phases where the LIPF regime can be found. Based on the experimental data, universal maps of the flow regimes were developed. The local and average values of liquid holdup and gas pressure drop were also measured.

Next, the local and average values of liquid-solid mass transfer coefficients (k_{LS}) were studied for the LIPF regime. Analysis of the results showed a significant increase in k_{LS} values for the LIPF regime in comparison to the Gas Continuous Flow (GCF) regime that is commonly used in industry. In order to show these benefits distinctly, experimental results were presented in terms of what is called the enhancement coefficient (φ). This parameter was defined as the ratio of the mass transfer coefficients obtained for the LIPF and GCF regimes for the same liquid ($(w_L)_{LIPF} = (w_L)_{GCF}$) and gas ($w_g = \text{idem.}$) velocities. All experimental points were placed above $\varphi = 1$ (Fig. 2).

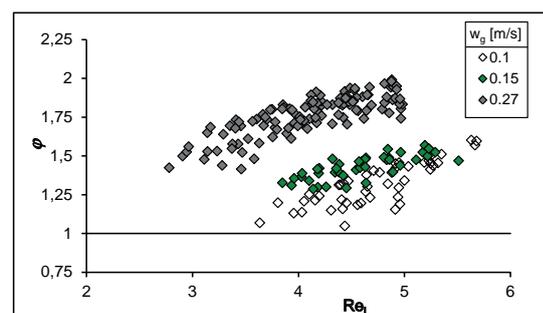


Fig. 2. Enhancement coefficients vs. Reynolds number of liquid phase

This means that the mass transfer coefficients (k_{L_s}) in the LIPF regime were higher than in the GCF regime at the same velocities of both phases. This result proved that the proper selection of parameters characterizing cyclic flow of liquid through the bed allows for some processes carried out in trickle-bed reactors to be intensified solely by means of a change in the hydrodynamic regime of reactor operation. Moreover, as the local values of the liquid holdup and mass transfer coefficients along the bed show, the suggested strategy of operation seems a safe method of trickle-bed reactor exploitation due to a reduction in the hot-spot phenomenon.

References

Gancarczyk A. (2009). *Hydrodynamika reaktora trójfazowego pracującego w warunkach wymuszonego*

przepływu pulsacyjnego [Hydrodynamics of a trickle-bed reactor operating under the induced pulsing flow regime]. PhD thesis, Institute of Chemical Engineering, Polish Academy of Sciences.

Bartelmus G., Krótki T., Gancarczyk A. (2008). Experimental analysis of hydrodynamics and liquid/solid mass transfer in a trickle-bed reactor operating at induced pulsing flow regime. *Chem. Process Eng.*, 29, 551-566.

Institute of Chemical Engineering
ul. Bałtycka 5, 44-100 Gliwice
phone: 48 (32) 234 69 15
fax: 48 (32) 231 03 18
e-mail: secret@iich.gliwice.pl
www.iich.gliwice.pl

Teamwork in Multi-Agent Systems: A Formal Approach

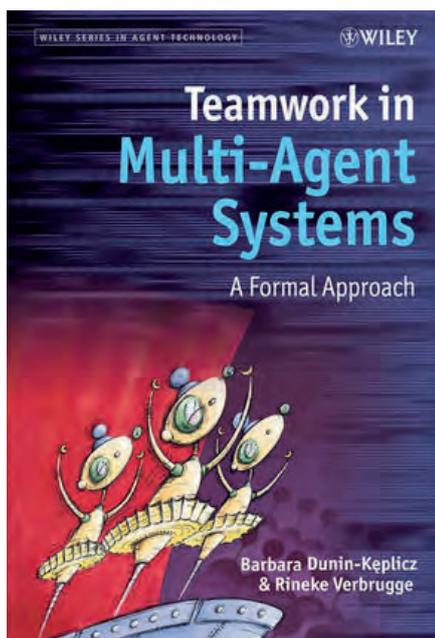
B. Dunin-Kępcicz | Institute of Computer Science | Polish Academy of Sciences

Multi-agent systems are computational systems composed of a collection of loosely-coupled autonomous elements known as agents. Agents are computer systems situated in some environment

that are capable of flexible autonomous actions to meet their designed objectives. The environment in which agents operate and interact is usually dynamic and unpredictable.

In order to solve a problem that is usually beyond their individual capabilities, agents exploit their ability to communicate, cooperate, coordinate, and negotiate with each another. Apparently, these complex social interactions depend on the circumstances and may vary from altruistic cooperation to open conflict. Therefore, one of the central issues in multi-agent systems is the study of how groups work, and how the technology enhancing complex interactions can be implemented. Adaptive patterns of interaction, together with agents' autonomy and the social structure of cooperative groups, are what underlie the novelty and strength of the agent-based approach.

Recently, there has been a growing interdisciplinary community of researchers and research groups working on logical aspects of multi-agent systems from the perspectives of logic, artificial intelligence, computer science, game theory, etc. This line of research has also been intensively



developed at the Institute of Computer Science, Polish Academy of Sciences.

What makes teamwork successful?

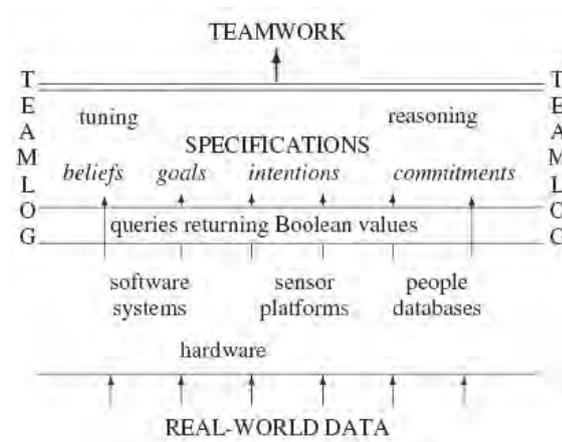
Cooperation does matter, in daily life and in complex applications. After all, many tasks need more than a single agent to be effectively performed. Teams are social groups of agents dedicated to the fulfillment of particular persistent tasks. In modern multi-agent environments, heterogeneous teams often consist of autonomous software agents, various types of robots, and human beings. A paradigmatic example of joint activity is teamwork, in which autonomous agents choose to work together, both in advancement of their own individual goals as well as for the good of the system as a whole. Rescue teams may serve as a good example of cooperation between robots, software agents, and people.

Our study of teamwork has resulted in a descriptive logical theory named *TeamLog*. Building on the individual goals, beliefs, and intentions of the agents involved, it addresses the question what it means for a team to have a *collective intention*, and a *collective commitment* to achieve a common goal. While investigating this issue, we realized the fundamental role played by collective intention in consolidating a group into a closely cooperating team. Then, a plan-based collective commitment leads to team action. The explicit model of teamwork provided by *TeamLog* helps the team to monitor its performance and to re-plan its actions based on the present situation. This leads to the *reconfiguration problem*: how to revise the plan efficiently when the situation changes during plan execution? A generic solution to this problem is provided in our book.

In short, the book focuses upon the attitudes that a group of agents needs to have in order to be able to act as a successful team. *TeamLog*, the first comprehensive logical theory underpinning teamwork in dynamic environments, is based on a long-term research by the authors and guides the reader through a discussion of the essential issues involved in effective and efficient teamwork, including:

- What is teamwork, and how can a logical view of it help in designing teams of agents?
- What is the role of agents' awareness in an uncertain, dynamic environment?
- How does collective intention constitute a team?
- How are plan-based collective commitments related to team action?

- How can one tune collective commitment to the team's organizational structure and communication abilities?
- What are the methodological underpinnings of teamwork in a dynamic environment?
- How does a team and its attitudes adjust to changing circumstances?
- How do collective intentions and collective commitments arise through dialogue?
- What is the computational complexity of *TeamLog*?
- How can one make *TeamLog* efficient in applications?



The research in this book is structured along the lines depicted in the figure above. The object-level information is assumed to be summarized in queries returning Boolean values. In this way, we are able to abstract away from a variety of formalisms and techniques applicable in the course of reasoning about real-world data. This abstraction is essential, since the focus of this book is on the *meta-level*, including formal specification and reasoning about teamwork, as exemplified by the static and dynamic parts of *TeamLog*.

References

Dunin-Kępicz B., Verbrugge R. (2010). *Teamwork in Multi-Agent Systems. A Formal Approach*. England, Wiley.

Institute of Computer Science
ul. Ordonia 21, 01-237 Warszawa
phone: 48 (22) 836 28 41
fax: 48 (22) 837 65 64
e-mail: ipi@ipipan.waw.pl
www.ipipan.waw.pl, www.ipipan.eu

The TeleDiaFoS system for monitoring the treatment of Diabetic Foot Syndrome patients

P. Folyński | P. Ładyżyński | K. Migalska-Musiał | J.M. Wójcicki | Maciej Nałęcz Institute of Biocybernetics and Biomedical Engineering | Polish Academy of Sciences

Introduction

Diabetes is currently recognized as one of the most severe health problems in the world. The total number of diabetic patients is estimated to be greater than 240 million and is rising every year. Late complications of diabetes, resulting from a lack of optimal metabolic control during years of applied treatment, are most costly from the human and economic point of view. Diabetic Foot Syndrome (DFS), the most difficult late complication, is related to neurological or vascular disorders. Initially DFS causes motor difficulties, chronic pain complaints, the emergence of ulcers, and if not treated it may lead to limb amputation. The population of persons afflicted with DFS in Poland can be estimated at approx. 300,000. More than 6% of DFS patients are forced to undergo high amputation (above the ankle). The risk of foot amputation is more than 20 times higher for diabetic patients than for individuals not suffering from diabetes.

The creation of a uniform treatment model, based on personnel skills and diagnostic means, in the

United Kingdom in 1989-2000 yielded tangible benefits both for patients (a 50% lower amputation rate) and for the state (30% less hospitalization). The implementation of a similar system in Brazil resulted in a 70% decrease in foot amputations. Over 70,000 amputations due to DSF are performed in the United States each year. In Poland, there are unfortunately only a few specialist outpatient clinics involved in DSF treatment. This fact urges the creation of a system in which a few outpatient clinics provide care to the largest possible number of diabetic patients.

In order to solve the problem of DSF patient treatment in Poland, a team from the Laboratory of Biomedical Engineering Methods for Supporting Intensive Therapies at the Nałęcz Institute of Biocybernetics and Biomedical Engineering, Polish Academy of Sciences, in Warsaw, in cooperation with the Clinic of Gastroenterology and Metabolic Diseases at Warsaw Medical University, has developed a monitoring system based on telematic techniques. This system is called TeleDiaFoS – an acronym derived from **Telematic Diabetic Foot Syndrome**.

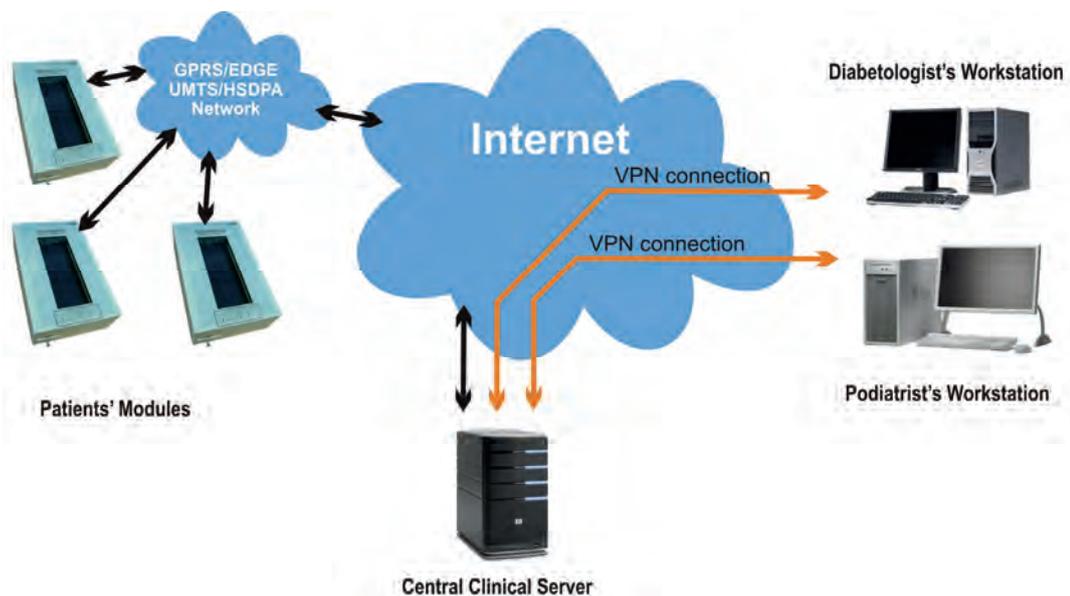


Fig. 1. TeleDiaFoS system structure

TeleDiaFoS System

The TeleDiaFoS system consists of a module for the registration and transmission of digital images of the patient's wound, stationary physician workstations, and a stationary archiving module for DSF diagnosis and treatment data (database). The system structure is shown in Fig. 1.

The database of the TeleDiaFoS system gathers, processes, and edits DFS patient data and presents the results of examinations and monitoring of the course of treatment.

After initial registration of basic patient and disease history data, the patient is provided with instruction concerning diabetes, foot care, changing of dressings, sterile preparation, and usage of the patient module. Data is transmitted from the patient's home via the patient module, which automatically sends in the scanned foot image and text files containing measured data (glucose concentration and blood pressure). The data are fed into the communication module, which places the foot image file into the dedicated database directory and the measured data into the dedicated database table.

System Verification

The TeleDiaFoS system has been verified with a sample of 10 patients qualified for 3-month treatment with an intensive control regime. The research is based on 3 visits to the clinic: visit I, which commences the monitoring period, visit II, which takes place 1 month after commencement, and visit III, which takes place 3 months after the first visit.

All participants were males. Average age was 57.4 years. The duration of diabetes was strongly diversified, ranging from 2 to 19 years. Seven patients were found to have obesity (BMI > 30) and one patient had extreme obesity (BMI > 45). Only patients no. 1 and 8 had no problems with their bodyweight.

Table 1 presents the results of the application of the TeleDiaFoS system to the transmission of scanned foot images to the case physician. The number of transmissions varied from 13 (for patients no. 2 and 10) to 61 (for patient no. 6). On average, each patient made 27.1 transmissions. The mean time between transmissions was 4.5 days, ranging from 1.7 to 9.0 days. Treatment result, as represented by a reduction of the wound area, was not correlated with patient-physician trans-



Fig. 2. Sample foot wound images

mission frequency. Sample images of the wounds recorded by the TeleDiaFoS system are presented in Fig. 2.

Each of the treatment courses lasted 3 months. Three mobile patient modules were used in the project. In total, 271 data transmissions from the patients' residences were carried out. No problems related to patient usage of the system were found, confirming the effectiveness of patient instruction and the simplicity of the system usage. The 10 patients exhibited different results of wound healing:

Patient	Number of transmissions	Number of days of system usage	Mean time between transmissions [days]
1	26	77	3.0
2	13	67	5.2
3	19	84	4.4
4	9	81	9.0
5	17	114	6.7
6	61	103	1.7
7	50	95	1.9
8	26	63	2.4
9	37	131	3.5
10	13	95	7.3
Mean	27.1	91.0	4.5
SD	17.2	21.1	2.5

Table 1. TeleDiaFoS system usage level

the area of the wound decreased significantly for four of them, whereas treatment effect varied in time for the remaining six.

Summary

The TeleDiaFoS system was developed based on an original concept. One of its advantages is that it eliminates community nurse engagement in the monitoring process of patients with DFS. In all other home telecare systems for DFS patients that have been implemented to date, a community nurse was still playing a major role. Another very convenient feature of TeleDiaFoS is wound image transmission in its original size.

The developed system offers an original tool supporting DFS treatment. However, the final result of treatment will always be dependent on the manner of system usage by both patients and case physicians.

The TeleDiaFoS system has won the "Innovation for Health 2009" award from the Working Group for Innovation in Health Care, in the category of Innovative Medical Technologies.

References

- Foltyński P., Ładyżyński P., Wójcicki J.M., Migalska-Musiał K., Rosiński G., Krzymień J., Karnafel W. (2008). Diabetic foot syndrome. A modern approach of treatment. *Proceedings of the International Symposium on Biomedical Engineering, Bangkok 2008*, 123-126.
- Ładyżyński P., Wójcicki J.M., Foltyński P., Rosiński G., Krzymień J., Mrozikiewicz-Rakowska B., Migalska-Musiał K., Karnafel W. (2009). Application of the home telecare system in the treatment of diabetic foot syndrome. In: *IFMBE Proceedings*, Lim Ch.T., Goh J.C.H. (eds.), 23, 1049-1052.
- Foltyński P., Wójcicki J.M., Ładyżyński P., Migalska-Musiał K., Rosiński G., Krzymień J., Karnafel W. (2010, in press). Monitoring of the diabetic foot syndrome treatment. A new perspectives. *Artificial Organs*, 34.

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

Analysis of elastic wave propagation in shell-like structures

M. Krawczuk | P. Kudela | L. Murawski | W. Ostachowicz | A. Żak | Robert Szwalski Institute of Fluid-Flow Machinery | Polish Academy of Sciences

Nowadays many research centers from all over the world are developing damage detection methods utilizing the phenomenon of elastic wave propagation. These methods present a very promising option within various active schemes. Continuous measurement and analysis of registered signals by sensors enables one to detect damage of small size that may be located at relatively long distances of up to several meters from the sensors. Aside from their global character, methods based on changes in elastic wave propagation have the advantage of being negligibly influenced by the external environment (temperature changes or initial stresses can be compensated for effectively).

Our team from the Institute of Fluid-Flow Machinery, Polish Academy of Sciences, in Gdańsk has

developed and created dedicated computer programs – unique on the nationwide and international scale – for simulating elastic wave propagation in shell-like structures. These programs, based on the Spectral Finite Element Method, enable one to analyze the phenomenon of elastic wave propagation in structures made out of isotropic materials as well as laminated composites with fatigue damage of various types.

The Spectral Finite Element Method in the form proposed by Patera is universal for modeling propagation phenomena in domains of complex geometries. The method comes from the application of spectral series (Chebyshev, Fourier) for solving partial differential equations. The idea of the method is similar to the Finite Element Method. Expressing the equations in a weak form enables one to formu-

late stiffness and inertia matrices. These processes are almost identical to the Finite Element Method procedures. The essence of the Spectral Finite Element Method comes from specific approximation. The nodal coordinates of elements are selected in such a manner that they are the roots of a family of Legendre or Chebyshev polynomials. For such selected nodes the set of the shape functions that are spanned over the nodes have the property of discrete orthogonality. As a consequence, together with the Gauss-Lobatto integration rule, this leads naturally to the diagonal form of the inertia matrix. This uncouples the equations of motion and crucially reduces computation time. Moreover, the error of numerical computations decreases exponentially with an increase in the polynomial order; in the literature this is called spectral convergence.

Because of such advantages as low computer memory costs, fast convergence, and the potential to model wave propagation phenomena in domains of complex geometries, the Spectral Finite Element Method has found a very wide range of applications. Some interesting fields of application are fluid dynamics, heat transfer, acoustics, and seismology.

Because modeling of elastic wave propagation requires massive computations that can take a huge

amount of time, parallel computation techniques and algorithms are widely used. In the case of the Spectral Finite Element Method, algorithm parallelization is relatively easy. Effective schemes of such algorithms improving the efficiency of computation can be found in many research papers and reports.

In conclusion, the Method of Spectral Finite Element is a universal and robust tool that can be used for wave propagation analysis in domains of complex geometries, whereas its minor disadvantage comes from the necessity to maintain a possibly homogenous mesh in the entire domain of analysis.

References

- Patera T. (1984). A spectral element method for fluid dynamics: Laminar flow in a channel expansion. *Journal of Computational Physics*, 54:468-488.
- Boyd J.P. (1989). *Chebyshev and Fourier spectral methods*. Springer.
- Pozrikidis (2005). *Introduction to finite and spectral element methods using MATLAB(R)*. Chapman & Hall.
- Canuto, Hussaini M.Y., Quarteroni A., Zang T.A. (1991). *Spectral methods in fluid dynamics*. Springer, 3rd edition.
- Karniadakis G.E., Sherwin S.J. (2005). *Spectral/hp element methods for computational fluid dynamics*. Oxford University Press, 2nd edition.
- Spall R. (1995). Spectral collocation methods for one-dimensional phase-change problems. *International Journal of Heat Mass Transfer*, 15:2743-2748.
- Dauksher W., Emery A.F. (1997). Accuracy in modeling the acoustic wave equation with Chebyshev spectral finite elements. *Finite Elements in Analysis and Design*, 26:115-128.
- Komatitsch D., Ritsema J., Tromp J. (2002). The spectral-element method, beowulf computing, and global seismology. *Science*, 298:1737-1742.
- Komatitsch D., Vilotte J.P., Vai R., Castillo-Covarrubias J.M., Sanchez-Sesma F.J. (1999). The spectral element method for elastic wave equation – application to 2-D and 3-D seismic problems. *International Journal for Numerical Methods in Engineering*, 45:1139-1164.

Robert Szwalski Institute
of Fluid-Flow Machinery
ul. Fiszera 14, 80-952 Gdańsk
phone: 48 (58) 341 12 71
fax: 48 (58) 341 61 44
e-mail: imp@imp.gda.pl
www.imp.gda.pl

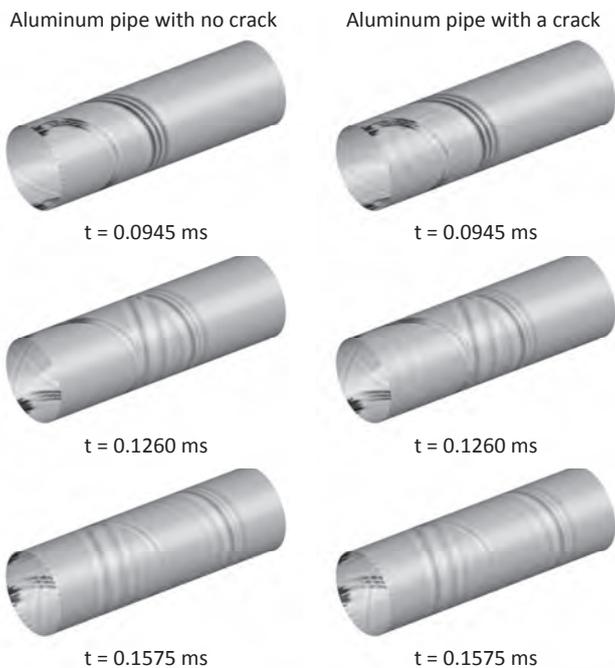


Fig. 1. Propagation of elastic waves (modes S_0 i SH_0) in an aluminum pipe with a stiffener and damage in the form of a fatigue crack at selected time points – results of computations obtained by the Spectral Finite Element Method developed by the team at the Institute of Fluid-Flow Machinery in Gdańsk

Software for the analysis of elastic wave propagation in shell-like structures

M. Krawczuk | P. Kudela | L. Murawski | W. Ostachowicz | A. Żak | Robert Szewalski
Institute of Fluid-Flow Machinery | Polish Academy of Sciences

Analysis of the propagation of elastic waves in solids is a topic of interest for many researchers all around the world. At the outset, research on the propagation of elastic waves mainly had a theoretical and analytical character. Many analytical solutions have been employed for simple geometrical cases and simple boundary conditions. The evolution of numerical methods and the increasing computational power of modern computers has made such analysis much more effective. Despite significant progress in this field, however, the development of more efficient methods for investigating elastic wave propagation still poses a very complex task, especially in composite materials. Our team from the Institute of Fluid-Flow Machinery, Polish Academy of Sciences, in Gdańsk has developed and created a computer program, unique on the national and international scale, for performing simulations of the propagation phenomena in shell-like structures made out of isotropic materials or composite laminates.

The software developed by our team exploits the Method of Spectral Finite Elements – its advantages over the classical Finite Element Method have been well-known for several years. These advantages are clearly visible in the case of the analysis of elastic wave propagation problems in solids. One of them is a crucial reduction in computational time as compared to the classical Finite Element Method. This is a result of the fact that the Spectral Finite Element Method is based on the use of higher-order orthogonal polynomials to build the elemental shape functions, which effectively leads to the diagonal form of the inertia matrices of the elements.

The program for analysis of elastic wave propagation in shell-like structures enables:

- modeling of two-dimensional flat and/or curved structures made out of isotropic materials and composite laminates by a dedicated pre-processor developed by the IFFM team,
- modeling of boundary conditions of any type,

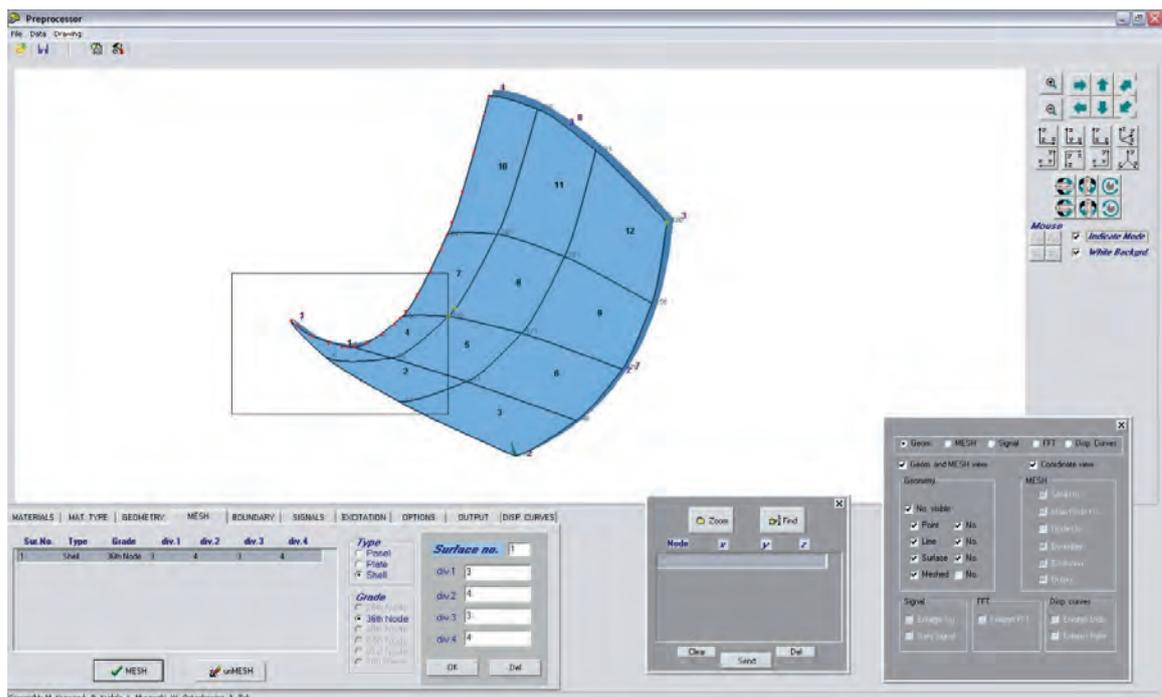


Fig. 1. View of a surface structure after mesh generation of spectral finite elements

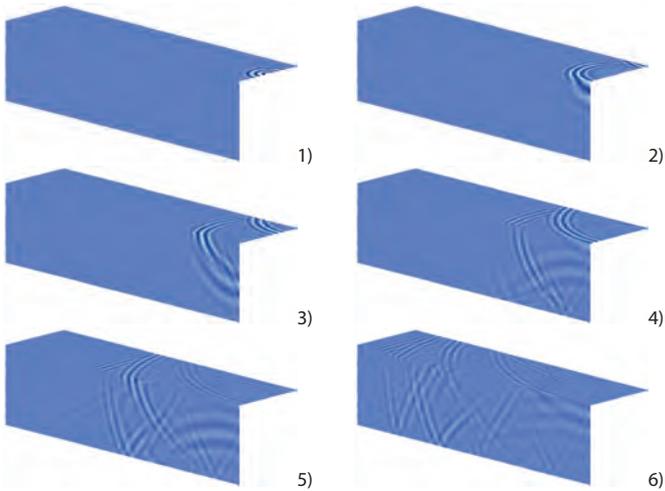


Fig. 2. Patterns of propagating elastic waves in an aluminum angle bar

- modeling of time dependent loads,
- analysis of velocity profiles of propagating waves for longitudinal, transverse, and shear waves as well as dispersion curves of these waves in materials under investigation,
- analysis of the elastic wave propagation in spatial thin-walled structures (flat and curved),
- visualisation of computation results in the form of graphs of structural responses as a function of

time and/or animations of propagating wave patterns.

The software developed by our team has found many applications in investigations of damage detection in structures, especially in Structural Health Monitoring (SHM) techniques. Various SHM methods are finding more and more applications in the fields of aviation, aeronautics, and civil, mechanical, and offshore engineering.

References

Patera A.T. (1984). A spectral element method for fluid dynamics: Laminar flow in a channel expansion. *Journal of Computational Physics*, 54:468-488.

Robert Szewalski Institute
of Fluid-Flow Machinery
ul. Fiszera 14, 80-952 Gdańsk
phone: 48 (58) 341 12 71
fax: 48 (58) 341 61 44
e-mail: imp@imp.gda.pl
www.imp.gda.pl

Agricultural, Forestry, and Veterinary Sciences

For Division V – Agricultural, Forestry and Veterinary Sciences (as for the other divisions), the year 2009 was one of continuation of its management's activities under the current term of office of Academy officials (2007-2010); the Division's chairman is Prof. Andrzej Grzywacz and its deputy chairman is Prof. Zygmunt Reklewski. At the end of 2009, Division V included 33 national members of the Academy (18 full members and 15 corresponding members) plus 24 foreign members. New foreign members of the Academy were elected in 2009: Prof. Thomas C. Mettenleiter (Germany) and Prof. Heriberto Rodriguez-Martinez (Sweden).

It is with deep sorrow that we note that Prof. Tomasz Brandyk, corresponding member of the Academy, Prof. Franciszek Witczak, full member of the Academy, and Prof. Norman Ernst Borlaug, foreign member of the Academy and winner of Nobel Peace Prize passed away in 2009.

There were 16 committees affiliated with the Division, embracing a total of 466 members: the Committee on Agricultural Economics, the Committee on Agricultural Engineering, the Committee on Agrophysics, the Committee on Animal Sciences, the Committee on the Biology of Domestic Animal Reproduction, the Committee on Food Sciences, the Committee on Forestry Sciences, the Committee of Horticultural Sciences, the Committee on Land Reclamation and Rural Environmental Engineering, the Committee on Management of Mountain Regions, the Committee on Physiology, Genetics and Plant Breeding, the Committee on Plant Cultivation, the Committee on Plant Protection, the Committee on Soil Science and Agricultural Chemistry, the Committee on Veterinary Sciences, and the Committee on Wood Technology.

During the year, one Division council meeting (held on 21 November) discussed the preparation of plenary sessions and the current activities of the Division.

The spring plenary session, held on 6 May in Warsaw, evaluated the activities of the Bohdan Dobrzański Institute of Agrophysics in Lublin. The annual report on the Division's activities in 2008 was accepted, the M. Oczapowski Medals granted in 2009 (4 medals) were approved, and information

concerning the transformation of the Research Center for Agricultural and Forest Environment into the Institute of Agricultural and Forest Environment in Poznań was presented. Boards were appointed for evaluating the activities of the Institute of Plant Genetics in Poznań and the Institute of Agricultural and Forest Environment in Poznań and for throwing the director position at the Institute of Agricultural and Forest Environment open to competition. Information was presented on the development of a new draft law regulating the Polish Academy of Sciences; discussion was launched on anticipated transformations of the Academy's departmental structure.

The autumn plenary session, held on 27 October at Jastrzębiec, discussed and evaluated the activities of the new Institute of Agricultural and Forest Environment in Poznań (formerly the Research Center for Agricultural and Forest Environment) within the years 2005-2008; the competition jury for electing the Institute's director was fully established. A resolution was accepted on awarding Division's V scientific prizes for the year 2009. The session's participants were informed on the changes in structural status of the Research Station for Ecological Agriculture and Preservation of Native Breeds in Popielno, as well as on the advancement in work on a new law regulating the Polish Academy of Sciences. Two candidates to become foreign members of Academy were elected.

The Division's particular concern and interest in the year 2009 were focused on: the restructuring problems of the Research Station in Popielno (business plan, investment needs, the transformation of the Experimental Station into a Research Center of the Institute of Genetics and Animal Breeding in Jastrzębiec, new grants and research programs); the preparation of lectures and exhibitions for the Congress of Agricultural Sciences (held in Puławy in May); and discussions about new draft regulations dealing with the financing of science in Poland and the Polish Academy of Sciences.

The Michał Oczapowski scientific prize was granted to Prof. Tadeusz Jezierski (Institute of Genetics and Animal Breeding, Jastrzębiec) and Prof. Zbigniew Jaworski (University of Warmia and



The ceremony of granting the Division V awards and distinctions (A. Jaskot)

Mazury, Olsztyn) for the book *Das Polnische Konik* (The Polish Pony), as recommended by the Committee on Animal Sciences.

The commendations for research projects were awarded as follows. A prize and diploma were awarded to (1) the research team composed of Prof. Jacek A. Modliński, Dr. Jolanta Karasiewicz, Dr. Paweł Gręda, Dr. Anna Piliszek, Dr. Mariusz Sacharczuk (Institute of Genetics and Animal Breeding) and Dr. Abd-el A. Mohammed (Egypt), for their work

on “New perspectives in animal cloning: the use of alternative recipient cells and embryo-somatic chimeras,” as recommended by the Committee on Animal Sciences; (2) to the research team including Assoc. Prof. Bolesław Salmanowicz, Prof. Maria Surma, Prof. Tadeusz Adamski, Monika Langner, Dr. Michał Rębarz (Institute of Plant Genetics, Poznań) and Dr. Bogdan Dobraszczyk (University



From left: Prof. Andrzej Grzywacz (full member of the Academy and chairman of Division V), Assoc. Prof. Bolesław Salmanowicz, Monika Langer, Dr. Michał Rębarz, Prof. Maria Surma, and Prof. Tadeusz Adamski from the Institute of Plant Genetics, Polish Academy of Sciences (A. Jaskot)



From left: Prof. Wojciech Święcicki, corresponding member of the Academy, Prof. Kazimierz Banasik from Warsaw University of Life Sciences (SGGW), Prof. Elżbieta Biernacka from SGGW, and Prof. Edward Pierzgałski, chairman of the Committee on Land Reclamation and Agricultural Environment Engineering, Polish Academy of Sciences (A. Jaskot)

of Reading, UK), for their project on “The influence of qualitative and quantitative composition of high molecular weight glutenin subunits on bread-making quality in wheat and triticale,” as recommended by the Committee on Food Sciences; (3) to the research team composed of Dr. Tadeusz Hura (Franciszek Górski Institute of Plant Physiology), Dr. Maciej T. Grzesiak (Franciszek Górski Institute of Plant Physiology), Prof. Stanisław Grzesiak (Franciszek Górski Institute of Plant Physiology), Assoc. Prof. Andrzej Rzepka (Institute of Biology, University of Life Sciences, Kraków), Dr. Katarzyna Hura (chair of Plant Physiology, Agricultural University of Kraków), Prof. Władysław Filek (chair of Plant Physiology, Agricultural University of Kraków), Assoc. Prof. Andrzej Skoczowski (Franciszek Górski Institute of Plant Physiology), Dr. Ilona Czyczył-Mysza (Franciszek Górski Institute of Plant Physiology), and Dr. Michał Dziurka (Franciszek Górski Institute of Plant Physiology), for their work on “Physiological and biochemical reasons of variability in responses to drought stress in different maize and triticale genotypes,” as recommended by the Committee on Physiology, Genetics, and Plant Breeding. A diploma was earned by: (4) the research team

including Assoc. Prof. Hanna Kwaśna (University of Life Sciences, Poznań), Dr. Geoffrey Batman and Dr. Elanie Ward (UK), Dr. Helgard Nirenberg (Germany), for their work on “Biodiversity of the soil fungi,” as recommended by the Committee on Forestry Sciences; (5) the research team including Prof. Franciszek Przekop, Assoc. Prof. Tomasz Misztal, Magdalena Ciechanowska, Magdalena Łapot, Krystyna Mateusiak (Jan Kielanowski Institute of Animal Physiology and Nutrition, Jabłonna) and Assoc. Prof. Tadeusz Malewski (Museum and Institute of Zoology), for their studies on the “Expression of the GnRH and GnRH receptor genes in the hypothalamus-pituitary unit of ewes during different states of reproduction; influence of the neural systems on the expression of these genes,” as recommended by the Committee on Biology of Animal Reproduction.

The highest scientific awards of Division V – the **Michał Oczapowski Medals** – were granted to: Prof. Mariusz Fotyma (Institute of Soil Science and Plant Cultivation – State Research Institute, Puławy), Prof. Stanisław Przystański (University of Environmental and Life Sciences, Wrocław), Prof. Teresa Żebrowska, full member of the Academy (Jan



From left: Prof. Adolf Horubała, full member of the Academy, Prof. Andrzej Grzywacz, full member of the Academy and chairman of Division V, Barbara Słupecka, chief specialist in Division V, Prof. Zygmunt Reklewski, full member of the Academy, deputy chairman of Division V and president of the “Pro Scientia et Vita” Foundation, Prof. Antoni Rutkowski, full member of the Academy and chairman of the chapter committee of the Michał Oczapowski Medal, Prof. Marian Truszczyński, full member of the Academy, and Dr. Marcin Samiec from the National Research Institute of Animal Production (A. Jaskot)

Kielanowski Institute of Animal Physiology and Nutrition) as well as to the Institute of Building, Mechanization and Electrification in Agriculture in Warsaw.

The **Division V Laurel**, an award established in 2005, is conferred as proof of appreciation and gratitude for outstanding contributions to the development of agricultural, forestry, veterinary sciences and food sciences. In 2009 the Laurel was granted for outstanding contributions to the development of agricultural sciences to: Prof. Krzysztof Nyc (University of Environmental and Life Sciences, Wrocław), Prof. Edward Krzywy (West Pomeranian University of Technology, Szczecin), and Prof. Elżbieta Bier-nacka (Warsaw University of Life Sciences, Warsaw), and to the University of Life Sciences in Lublin for outstanding contributions to the development of agricultural and veterinary sciences.

Two Division V seminars were held in 2009: one on 26 November entitled “State, agriculture, and Polish agrobusiness five years after EU accession,” organized mainly by the Committee on Agricultural Economics, and another on 3 December entitled “Functional genomics in mammary gland physiology and pathology in animals,” organized by the Committee on Veterinary Sciences.

The “Pro Scientia et Vita” foundation, established by Division V members, provided financial support for young scientists for the eighth year.

The scientific activities of the Division, its research units, and its committees resulted in the publication

of 23 scientific journal titles, including: *Acta Agrophysica*, *Acta Physiologiae Plantarum*, *Animal Science Papers and Reports*, *Annual Review of Agricultural Engineering*, *Folia Forestalia Polonica (Series A and B)*, *International Agrophysics*, *Inżynieria Rolnicza (Agricultural Engineering)*, *Journal of Animal and Feed Sciences*, *Journal of Applied Genetics*, *Journal of Plant Protection Research*, *Journal of Water and Land Development*, *Polish Journal of Food and Nutrition Sciences*, *Polish Journal of Soil Science*, *Polish Journal of Veterinary Sciences*, *Prace i Materiały Zootechniczne (Livestock Research Papers and Communications)*, *Problemy Inżynierii Rolniczej (Problems of Agricultural Engineering)*, *Problemy Zagospodarowania Ziemi Górskich (Problems of Management of Mountain Areas)*, *Reproductive Biology*, *Roczniki Nauk Rolniczych - Seria G (Annals of Agricultural Sciences - Series G)*, and *Zagadnienia Ekonomiki Rolnej (Problems of Agricultural Economics)*.

The Division moreover published 8 titles issued by its committees, as well as *Postępy Nauk Rolniczych (Advances in Agricultural Sciences)*, the bimonthly publication of Division V itself. Issues 534-543 of the non-periodic series *Zeszyty Problemowe Postępów Nauk Rolniczych (Advances of Agricultural Sciences – Problem Issues)* were published in 2009, financed by different Polish scientific units, as well as issues 16 and 17 of the series *Biuletyn Informacyjny Wydziału Nauk Rolniczych, Leśnych i Weterynaryjnych PAN (Information Bulletin of Division V – Agricultural, Forestry, and Veterinary Sciences, Polish Academy of Sciences)*.

Cryo-conservation of endangered plant species in Poland

J. Puchalski | A. Mikuła | J.J. Rybczyński | Botanical Garden – Center for Biological Diversity Conservation | Polish Academy of Sciences

The native vascular flora of Poland numbers approx. 2500 species, and of that figure more than 500 are threatened with extinction. In 1992, our Botanical Garden established a seed bank for the preservation of rare, endangered, and legally protected species of vascular plants using cryogenic conditions, which means long-term storage in liquid nitrogen (LN) vapor at temperatures of approx. -150°C. The method is very efficient for *ex situ* conservation purposes because of its many advantages over *ex situ* collections of living plants. Using biochemical

methods, LN can also be used to collect vegetative propagules of these plants. However, ultra-low temperature storage requires many careful studies to determine cryogenic conditions for safe freezing. The aim of our work is to optimize cryopreservation for long-term storage of plant material – propagules and green tissue of Polish native plants – in the germplasm bank.

Experiments have been carried out with approx. 130 vascular species of Polish native flora. The protocols for seed testing and storage in LN, besides

the standard germination ability test, included a special test for low-temperature tolerance using computerized equipment for controlled freezing (Minicool LC 40) with variable conditions of speed and steps of freezing. Three procedures of spore and seed freezing were applied: 1) immediate freezing by direct immersion in LN, 2) slow freezing at a rate of 1.0°C/min to -40°C then freezing at a rate of 10°C/min to -150°C, 3) slow freezing at a rate of 0.7°C/min to -22°C then freezing at a rate of 10°C/min to -150°C. Moisture content of seeds was stabilized at 4-11%, allowing to them to be frozen safely. Samples of 300 seeds underwent a partial test to confirm the correctness of the chosen freezing method and to determine actual germ viability of the tested seeds. In the case of spores, direct embedding into LN was used when propagules were collected at the proper stage in nature. Our research also attempted cryostorage of green living gameto-

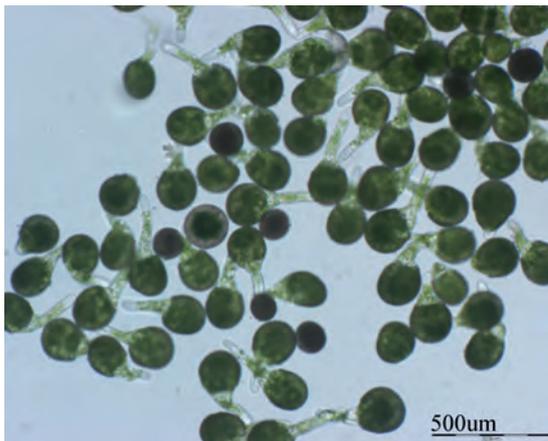


Fig. 1. Spore germination (96%) of *Osmunda regalis* after cryostorage

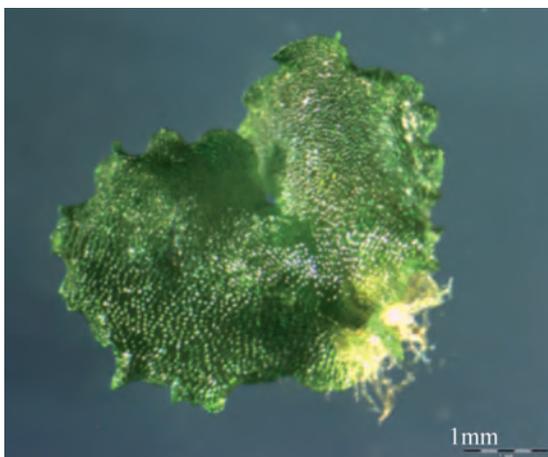


Fig. 2. Heart-shaped gametophyte derived from spore frozen in liquid nitrogen



Fig. 3. Recovery of gametophyte culture after cryopreservation by encapsulation/dehydration



Fig. 4. Sporophyte formation in post-thawing culture

phytes. For cryopreservation of *in vitro* derived fern gametophytes, the encapsulation/dehydration method was employed. In all cases the plant material was placed in 2ml cryovials into LN vapor for storage, and after storage was rapidly thawed in a water bath at about 40°C.

In the case of seed storage, almost 50% of the species investigated responded positively to freezing by direct immersion in LN, over 30% showed the best results with a cooling rate of 1.0°C/min, and about 20% reacted best to freezing at a rate of 0.7°C/min. The fresh collected spores, in turn, retained 87-96% viability for both species after LN treatment; neither chlorophyllous spores (*Osmunda regalis*), which cannot be dried and stored for a long time, nor nonchlorophyllous spores (*Phyllitis scolopendrium*) required any pretreatment before immersion in LN. Green gametophytes could be an alternative plant material for long term storage irrespective of their origin, whether derived directly from spores or clonally multiplied *in vitro*. However, besides



Fig. 5. Cryogenic containers for long-term storage of plant material in liquid nitrogen vapor

alginate encapsulation, their cryostorage required long term 0.25 M sucrose with 10 μ M ABA treatment, with osmotic and air dehydration. For both species studied, 70-100% viability of *in vitro* derived fern gametophytes was achieved. These data indicate that green, physiologically active gametophyte tissue may be utilized as an alternative plant material when spores cannot be used for storage for certain biological reasons. Gametophyte *in vitro* proliferation required 0.5 MS medium without vitamins and nitrogen anions but supplemented with 2% sucrose. Spontaneous *in vitro* fertilization, in the presence of water, and the production of sporophytes are the final requirements checking the accordance with the biological cycle of alternation between haploid and diploid fern generation.

We can conclude that this decade and a half of research work has helped to develop various cryo-

preservation procedures for long-term storage of both propagules (seeds and spores) and living multi-cellular structures of native endangered Polish plants, as a method for long-term, *ex situ* biological diversity conservation.

References

- Mikuła A., Jata K., Rybczyński J.J. (2009). Cryopreservation strategies for *Cyathea australis* (R. BR.) DOMIN. *CryoLetters*, 30(6): 429-439.
- Mikuła A., Olasa M., Śliwińska E., Rybczyński J.J. (2008). Cryopreservation by encapsulation of *Gentiana* spp. cell suspension maintains re-growth, embryogenic competence and DNA content. *Cryoletters*, 29: 409-418.
- Puchalski J. (2004). Bank for plants. *Academia*, 4(4): 24-26.
- Puchalski J., Walters Ch. (2008). Perspectives for cryopreserving seeds and spores of native plants. *EN-SCONEWS*, 4: 3-4.

Botanical Garden – Center for Biological
Diversity Conservation
ul. Prawdziwka 2, 02-973 Warszawa
phone: 48 (22) 648 38 56
fax: 48 (22) 757 66 45
e-mail: ob.sekr@obpan.pl
www.ogrod-powsin.pl

Cultivation of “energy plants” – Benefits and dangers

F. Dubert | Franciszek Górski Institute of Plant Physiology | Polish Academy of Sciences

The term “energy plants” refers to crop plants cultivated for the purposes of harnessing the energy they contain, either by direct combustion or in an engine as biofuel. However, we should note that this is a simplification, because in fact all crop plants are cultivated with the aim of utilizing their energy, even if they are first consumed as food or fodder. This means that the borderline between “energy plants” and other plant species is not all that distinct.

The rising interest in the concept of utilizing plants for energy purposes stems from two main

factors. The first is the increasing concentration of carbon dioxide in the atmosphere, resulting in what is called the global greenhouse effect. It is not the objective of this text to join in the dispute between scientists representing opposing views in the debate over humanity’s role in causing this phenomenon, but it does seem to be clear that it will be highly advisable to curb emissions of this gas into the atmosphere by introducing energy-saving systems and technologies and by promoting pro-ecological behavior. The second cause for the burgeoning inter-



Fig. 1. Miscanthus plants cultivated on an experimental field

est in “energy plants” is the overproduction of food that still persists in some countries. This situation results in special subsidies paid by governments to farmers to keep their lands partly uncultivated or cultivated with plants meant for other purposes, including energy uses. This even concerns cereals, rape, or the so-called C-4 plants like maize, sorghum, miscanthus, or sugar cane. Plants belonging to the latter group are especially valuable in view of their higher efficiency of photosynthesis and crop yield.

Crop plants may be harnessed for energy either via direct combustion or by their conversion into fuel: biogas (from various source plants), ethanol (from plants rich in sugars) or motor oil (from rape or other oily plants). In Poland, a new decree issued by the Minister of the Economy has come into force, stipulating that the share of biomass in fuels, which currently stands at about 5%, should reach 60% in 2014.

Comparison of energy technologies

The combustion of traditional fuels (coal, crude oil, natural gas) yields approx. 8 400 to 15 000 KJ/kg (wood), 17 000 to 21 000 KJ/kg (brown coal),

32 000 KJ/kg (hard coal), 21 400 KJ/kg (ethanol), 41 500 to 44 400 KJ/kg (liquid fuel), to 67 000 KJ/kg (natural gas). However, this process is accompanied by the emission of approx. 2.5 to 3 tons of CO₂ per ton of fuel. In Poland, upwards of 100 million tons of various fuels are extracted yearly, which means that upwards of 300 million tons of CO₂ are released from Poland’s territory into the atmosphere yearly (or 8 tons per inhabitant). So, the combustion of traditional fuels increases the global greenhouse effect via CO₂ emission and the release of great amounts of heat into the environment.

Nuclear energy based on nuclear fission of uranium isotopes, in turn, yields 1 300 000 KJ/kg, thermonuclear energy derived from the fusion of deuterium nuclei into helium (a technology still in the research phase) will yield 700 000 000 KJ/g, and in the future, direct transformation of matter into energy (for example, via the fusion of equal amounts of matter and antimatter) could yield approx. 90 billion KJ/g. But the nuclear power stations currently in operation also augment the global greenhouse effect through their emission of great amounts of heat, hence they do not differ with this respect from coal-fired power stations.

Alternative energy sources (energy plants, photovoltaic cells, heat collectors, wind power stations, etc.) exhibit two common features. First, energy production does not entail CO₂ emission. While combustion of energy plants does release CO₂ into the atmosphere, the same amount of the gas was absorbed during plant cultivation and so the overall CO₂ balance seems to be close to zero. Secondly, none of these sources emits heat into the environment, because they transform the energy present in the environment into usable form. A disadvantage of these energy sources lies in their periodicity of operation. Photovoltaic cells “work” only in daylight, heat collectors produce maximal amounts of hot water in summer, while wind power stations work only if there is sufficient wind speed. Nevertheless, technological progress is promising to raise the share of renewable sources in overall energy production up to almost 20% in the next 20 years.

Energy plants, harnessing not more than 0.4% of solar energy, “lose the competition” against human-made accumulators of energy. However, their great advantage is that these “green collectors of energy” can increase their absorption area of solar radiation, and also they produce highly varied chemical compounds of various properties and application.

Main energy crop species

The energy willow yields a crop of wooden stems of approx. 14 tons/ha yearly, the equivalent of approx. 8 tons of hard coal. A willow plantation may be cultivated for as long as 20 years, and may be watered with communal sludge. However, in the latter case the living stems (with high water content) are harvested, so the calorific value is lowered.

Miscanthus x giganteus, another energy crop that is a target of research by the Institute of Plant Physiology, Polish Academy of Sciences, is a hybrid of *M. sacchariflorus* and *M. sinensis*. *M. giganteus* plants can reach 3.5 m in height. In the third year of cultivation it yields 25-30 tons/ha of dry matter, and maintains this yield for more than 15 years. The crop of dried stems is of caloric value close to that of dry wood. The *Miscanthus* crop from 1 ha is equivalent to 15 tons of hard coal yearly. *Miscanthus* biomass may be used as a fuel in the form of pellets or briquettes, and also due to its high cellulose content it may serve as a component of building materials, paper, and various products like pots, pallets, etc.

Miscanthus, a triploid, does not produce fertile inflorescence. This feature is favorable for the protection of natural biodiversity, because the plant reproduces only vegetatively and cannot on its own spread beyond the field, displace native plant species, or cross with them. *Miscanthus* is reproduced from stolons or *in vitro* culture. Such reproduction is in fact a kind of cloning, hence is not possible the use classic breeding procedures to improve the frost sensitivity of plants especially during the first year of cultivation. Research at our Institute strives to improve *Miscanthus* frost resistance, seeking to use the somaclonal variability occurring in tissue cultures as well as mutagenic variability evoked via plant treatment with chemical mutagenic compounds. Studies have shown that *Miscanthus* plants demonstrate an ability for frost hardening, with a range of hardening temperature higher than for plants of temperate climate. Moreover, an improved method of *in vitro* plant regeneration was developed.

Other potential energy plant species are *Sida hermaphrodita* (sida) and *Helianthus bulbosus* (Jerusalem artichoke). Both of these species are fast growing. *Helianthus bulbosus* moreover forms bulbs containing inuline – a fructose polymer that may be used for ethanol production.



Fig. 2. *Miscanthus* regenerants obtained in *in vitro* cultures



Fig. 3. *In vitro* regenerated *Miscanthus* plants cultivated in glass-house

In addition, “common” crop plants may be cultivated as energy plants. Cereals may be combusted directly, while oilseed rape may be used to yield an oil which, after hydrolysis and esterifying with methanol, may be used as component of diesel oil. Lastly, cereals, potatoes, and sugar beet may be a source of ethanol, which is added to gasoline.

Fears and threats

Energy plant cultivation thus offers advantages of an environmental (near-zero CO₂ bal-

ance), economic (government subsidies), and social nature (relieving surplus labor force in rural areas). However, it also entails various fears and threats.

Firstly, plant mass combustion is a source of controversy because aside from being a food, plant mass is rich in numerous organic compounds of diverse applications. Moreover, energy plants do not in fact have a zero CO₂ balance. They require energy expenditure for cultivation, fertilization, chemical plant protection, and harvesting. These tasks are performed using CO₂-emitting engines, and fertilizer and pesticide production is likewise energy consuming. Also, note that energy plant cultivation is profitable only when prices of mineral energy sources are high. However, these prices may be extremely volatile over short time periods, whereas agricultural production demands long-term decision-making. Miscanthus and willow cultivation, in particular, require many years of price guarantees, which could be provided by governments.

Other fears are that energy plants occupy lands previously slated for food or fodder plant cultivation; that energy plants increase the water demand (for example, production of 25 tons of dry mass from 1 ha yearly requires almost 9,000 tons of water, and thus the total precipitation over Poland's large surface area barely satisfies the agricultural demands); and that when energy plants are combusted together with hard coal the plant ash has to be utilized together with coal ash, even though it may constitute a valuable mineral fertilizer when produced alone.

Moreover, some reports have appeared that cultivation of energy plants has triggered rapid escalation in food prices. This primarily concerns oil rapeseed, because cultivation of industrial varieties for fuel may be more profitable than cultivation of edible oilseed rape varieties. However, diesel oil contains a lot of erucic acid, which is harmful as a component of the human diet, whereas edible oils contain a lot of unsaturated fatty acids, which are not so stable. Decisions about the balance of rape cultivation types therefore need to be made at the moment of sow material supply. Excessive "industrial" rape cultivation may indeed result in higher prices of consumable oil. A similar analysis may be extended to potatoes and cereals slated for animal or human nutrition or for ethanol production, which can result in higher prices of bread, por-

ridges, or edible potatoes. Also, a similar situation can be observed on international markets. Countries that export fuels usually have weakly developed agriculture and exporting fuels enables them to import food from countries with a high level of agriculture. Competition between the two groups of countries results in growth in both food and fuel prices. This is why prices of both groups of products have increased at the highest rate in recent years. A third group of countries, poor in fuel and having agriculture on a low level of development, are in the worst situation.

Final conclusion

Mankind's technological development, demanding systematic growth in per capita energy consumption, will in the near future require qualitatively new technologies and methods of energy production. In this new situation, current methods of energy production are becoming anachronistic. Biofuel resources will be far too little to satisfy all the future energy demands. This means that there is a need for a nuclear technologies, which for the time being are based on nuclear fission of uranium isotopes but must be replaced by thermonuclear energy from deuterium nuclei fission. A new problem which will probably arise is the danger of the Earth overheating, because any nuclear power station is in fact great emitter of heat. This means it will eventually become necessary to transfer both great power stations and also great energy consuming installations away from the planet's surface, moving them into space instead. Solar power stations based on photovoltaic cells will also begin to occupy so great a surface area that they have to be installed in space as well. As a result, the natural environment will remain friendly to all living organisms, including people.

In the meantime, however, there is strong demand for actions planned in the shorter-term perspective, such as:

- the allocation of degraded or polluted areas, where it is impossible to cultivate plants for food or fodder, to the cultivation of energy plants; the ash left behind after the combustion of these plants could be purified before being used as plant fertilizer,
- the use of biological sewage for watering of these plants,
- the use of plants like Miscanthus mainly to produce many everyday objects and certain in-

dustrial materials, to be combusted after they are used up; such materials may therefore “wait” even many years for combustion, preserving in the meantime considerable amounts of carbon in their biomass.

Franciszek Górski Institute of Plant Physiology
 ul. Niezapominajek 21, 30-349 Kraków
 phone: 48 (12) 425 18 33
 fax: 48 (12) 425 18 44
 e-mail: ifr@ifr-pan.krakow.pl
 www.ifr-pan.krakow.pl

Transglutaminase – An enzyme lowering the allergenic properties of cow milk proteins

B. Wróblewska | Institute of Animal Reproduction and Food Research | Polish Academy of Sciences

One of the leading avenues of research pursued by our Institute’s Department of Food Immunology and Microbiology is the goal of lowering the allergenicity of food proteins. The rationale behind the selection of this research focus is the ever-current problem of milk protein allergies. It has been estimated that approximately 40% of Poland’s population suffers from various forms of allergy (9 million from allergic rhinitis, about 5.5 million from symptoms of asthma, and almost every second child from upper respiratory tract infections), whereas food allergies in specific affect around 6-8% of the population of children and 2-3% of adults. Such facts give rise to a need to be able to provide a fully nutritious, low-antigen diet that could offer an alternative solution for patients suffering from food

allergies. Research to date has shown that the technological processes implemented during food production can variously affect allergenic potential – for instance, thermal processes, enzymatic hydrolysis, and bioconversion with the use of bacteria enzymes may lead to reduced allergenicity. One innovative interpretation of this subject was a proposal to use microbiological transglutaminase (m-TG), a cross-linking enzyme, to reduce the allergenic potential of milk proteins during the production of fermented milk drinks (Fig. 1). m-TG does not show allergenic properties because despite its chain-linking abilities, it does not bind with human immunoglobulin and it is quickly hydrolyzed by pepsin. A daily dosage which is safe for human consumption varies from 8 to 13 mg/day, depending on the consumer’s age.

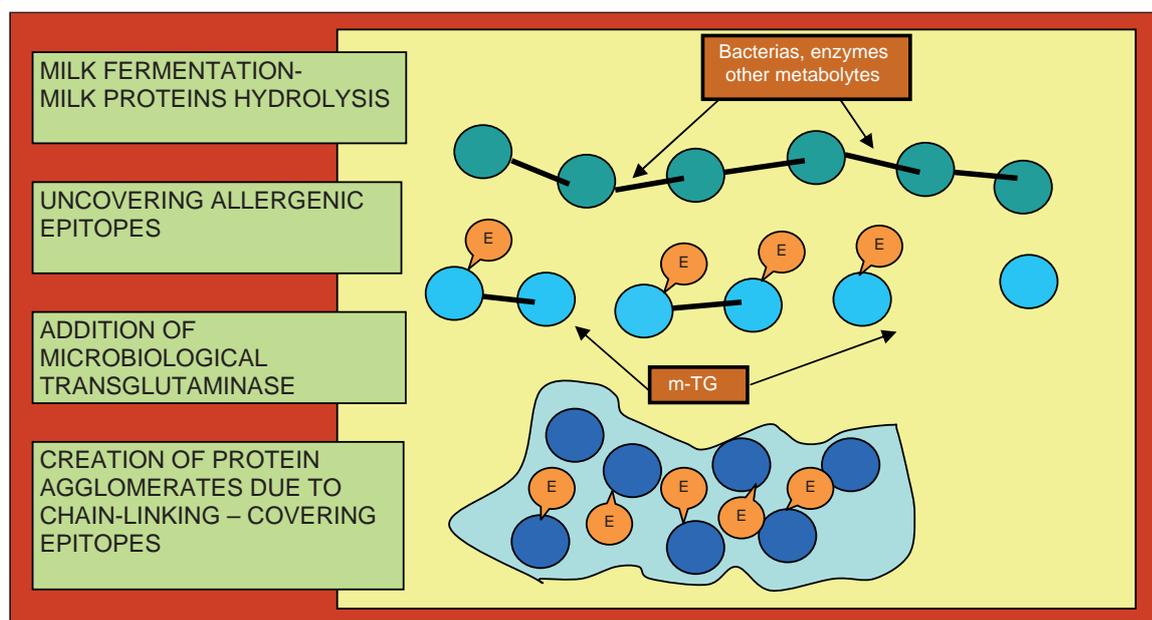


Fig. 1. Diagram presenting the concept of the research into the influence of m-TG on allergenic proteins

Yogurt drinks with m-TG added were produced with the use of commercial yogurt strains obtained from the company Danisco-Biolacta in Olsztyn: Yo-mix™ 495, Yo-mix™ 511, Yo-mix™ 207, which contained thermophilic bacteria *Streptococcus thermophilus* and *Lactobacillus delbrueckii ssp bulgaricus*. Kefir drink was produced with the use of liofilized kefir starter, containing mainly mesophilic bacteria of milk fermentation: *Lactobacillus brevis*, *L. acidophilus*, *L. casei*, *L. lactis*, *Lactococcus lactis*, *Leuconostoc mesenteroides*, *Acetobacter sp.* and yeast *Kluyveromyces*, *Candida*, *Torulopsis*, *Pihia* or *Saccharomyces*. Also prepared was a caramelized drink with the use of *Lactobacillus casei* bacteria and the drink CHOOZIT™ MK 1 containing meso- and thermophilic diary bacteria cultures (*Lactococcus lactis*, *Lactococcus lactis ssp. lactis biovar. diacetilactis*, *Lactococcus mesenteroides ssp. mesenteroides*, *Streptococcus thermophilus*, *Lactobacillus acidophilus*), as well as probiotic drinks with the use of strains *Lactobacillus rhamnosus*, *Lactobacillus acidophilus*, and *Lactobacillus casei*.

This research has led to several vital observations. Transglutaminase added together with yoghurt culture starters during the technological process of producing fermented milk drinks resulted in a lengthening of the time of the fermentation process. This occurred due to the limitation of sources of nutrients indispensable for the multiplication of microorganisms, which were used to chain-link short proteins by m-TG into polymers of about 200 kDa molecular mass (Fig. 2). The exception was a

product obtained as a result of applying *Lactobacillus casei*, where the fermentation time was shortened.

The use of varied temperature during fermentation yielded the observation of positive results of the synergistic activity of bacterial enzymes and m-TG combined, expressing itself in the total reduction of immunoreactive forms of α -la and β -lg, obtained when 37°C was applied rather than 42°C.

As a result of the activity of microbiological strains, milk proteins were hydrolyzed by the proteolytic enzymes. This resulted in the destruction of earlier recognized epitopes, mostly conformational. It was also possible to identify new amino acid sequences of allergenic quality, which had earlier been bound in the protein structure. The activity of m-TG resulted in chain-linking, and at the same time building the discovered antigenic determinants into protein agglomerates, hence preventing their identification by anti-bodies turned against major milk allergens. Analyzing the results achieved during determination of the immunoreactivity of kefir products, it was found that m-TG lowers the ability to bind proteins with polyclonal antibodies of rabbits directed against casein. One of the strongest milk allergens, α -casein, was characterized by 50% lowered immunoreactivity in kefir drink produced with the use of m-TG in comparison to the fresh product without m-TG, and the process of cool storage did not cause further changes in this status. However, it was found that storing kefir in cool temperature did have an adverse influence on the binding of epitopes corresponding to α -la, because

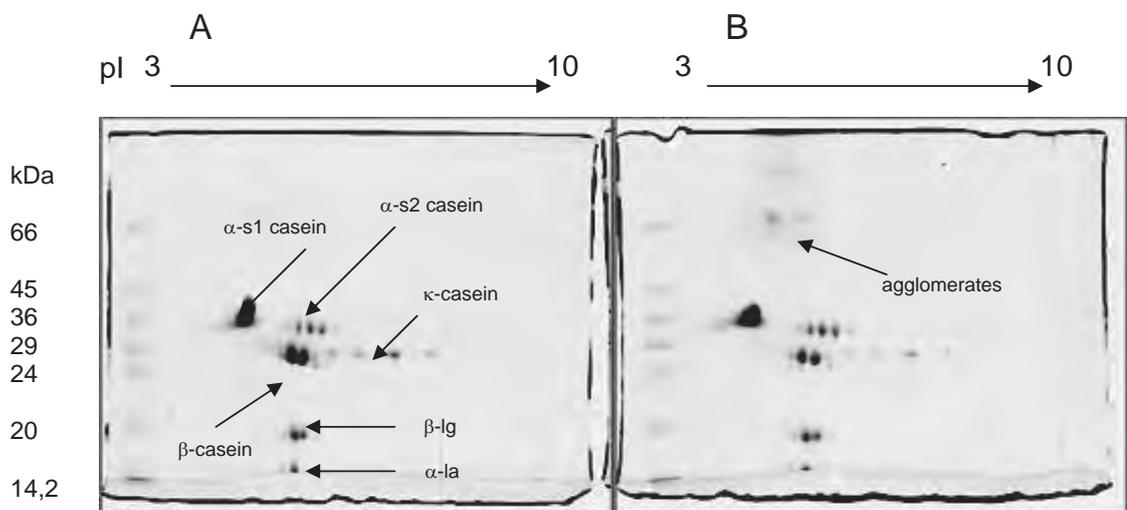


Fig. 2. Diagonal electrophoresis of milk proteins in Yo-mix™ 495 yoghurt obtained during fermentation conducted in 37°C: A) without m-TG, B) with the addition of m-TG

their level was twice as high in stored than in fresh kefir. In all the kefir samples analyzed, the presence of allergenic fractions of β -lg was not confirmed.

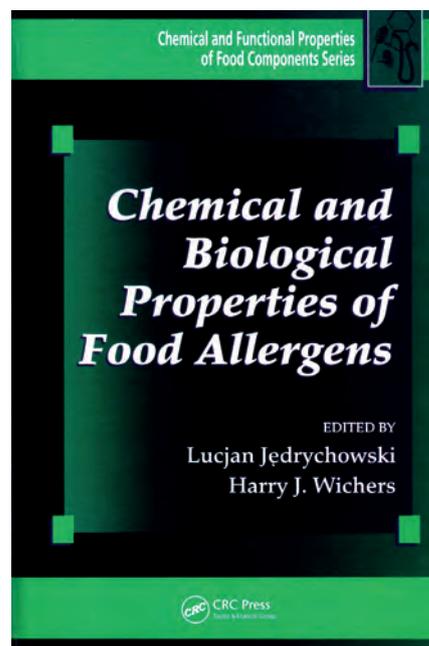
In the drink produced with the use of *Lactobacillus acidophilus*, a reduction in immunoreactivity potential of two proteins was noted, i.e. α -casein by 50% and β -lactoglobulin by over 80%. Cool storage time had a disadvantageous effect on the binding of allergenic determinants characteristic for the presence of α -la and κ -casein, resulting in an increase in immunoreactivity level by 65% and more than 200%, respectively, as compared to fresh drink.

The method of immunoblotting made it possible to discover interactions between IgE and potential allergens present in yoghurt, kefir, and probiotic fermented drinks in the serum of people allergic to milk proteins. Apart from a mild interaction with α -casein, a strong interaction with long proteins (i.e. BSA and lactoferrin) was observed, a finding that opens up a new perspective for research on cow milk protein allergy. The strongest allergens had previously been seen in two proteins: β -lg and α -casein. The current research has shown that attention should now focus on high-molecular-weight proteins, as compounds which are proteolytically and thermally resistant, a basic feature of allergens.

A general organoleptic evaluation, performed by a trained panel from our Institute's Sensory Laboratory, found a positive influence of m-TG on the required features of the fermented products obtained, i.e. sour taste, the taste of sour milk, and two features of texture: thickness and smoothness.

Adding m-TG during the production of yoghurt fermented drinks would make it possible to forego the process of thickening milk with milk powder or protein isolates, which would comprise an additional, economically beneficial, aspect of obtaining milk drinks low in antigens.

All in all, it should be stressed that this research was the first project considering the use of m-TG to lower the immunoreactivity of fermented milk drinks, and the findings fell within the scope of interest of Danisco-Biolacta, the industrial partner for the project. So far, the team's research and international cooperation have resulted in the publication of a book in the United States entitled *Chemical and Functional Properties of Food Components Series: Chemical and Biological Properties of Food Allergens* (CRC Press Taylor & Francis Group



Boca Raton London New York, 2009), edited by Lucjan Jędrychowski and Harry J. Wichers, which also contains partial results of the original research.

References

- Wróblewska B., Kaliszewska B., Kołakowski P., Pawlikowska K., Troszyńska A. (2010). Impact of transglutaminase reaction on the immunoreactive and sensory quality of yoghurt starter. *World Journal of Microbiology and Biotechnology*, (in press) doi: 10.1007/s11274-010-0446-z.
- Wróblewska B., Kołakowski P., Pawlikowska K., Troszyńska A., Kaliszewska A. (2009). Influence of the addition of transglutaminase on the immunoreactivity of milk proteins and sensory quality of kefir. *Food Hydrocolloids*, 8, 23, 2434-2445. doi:10.1016/j.foodhyd.2009.06.023.
- Wróblewska B., Jędrychowski L., Hajos G., Szabó E. (2008). Influence of Alcalase and Transglutaminase Hydrolysis on Immunoreactivity of Cow Whey Milk Proteins. *Czech Journal of Food Sciences*, 26, 15-23.

Institute of Animal Reproduction
and Food Research
ul. Tuwima 10, 10-747 Olsztyn
phone: 48 (89) 523 46 86
fax: 48 (89) 524 01 24
e-mail: instytut@pan.olsztyn.pl
www.pan.olsztyn.pl

The System for Forecasting Disease Epidemics (SPEC) – Applying knowledge of fungal pathogen life cycles

M. Jędrzycka | J. Kaczmarek | A. Dawidziuk | Institute of Plant Genetics | Polish Academy of Sciences
A. Brachaczek | DuPont Poland

Studying the development and abundance of a pathogen's primary inoculum is key to developing properly constructed decision-support systems aimed at the protection of agricultural crops against diseases. The inevitable consequence of crop disease is lost yield and decreased crop quality, making a crop farm less competitive in the EU and global market. Annual losses due to the main diseases of cereals and other main crops, such as oilseed rape, sugar beet, or potatoes, run into the billions of euros. Brassicas stem canker, a main constraint on spring and winter oilseed rape (*Brassica napus* L.) production, alone can cause the loss of nearly €60M per season in the UK – a country whose oilseed rape production is comparable to that of Poland. The disease is caused by two related fungal pathogens: *Leptosphaeria maculans* Desm. Ces. et de Not and *L. biglobosa* sp. nov. Shoemaker & Brun. The path-

ogens belong to the phylum Ascomycota, subphylum Pezizomycotina, class Dothideomycetes, order Pleosporales and family Leptosphaeriaceae. They co-habit and infect host plants of the Brassicaceae family. Besides oilseed rape they are frequently found on vegetable brassicas (*B. oleracea* L.), radish (*Raphanus sativus* L.), rocketsalad (*Eruca vesicaria* [L.] Cav. spp. *sativa* [P. Mill.] Thellung), crambe (*Crambe abyssinica* Hochst.) and white mustard (*Sinapis alba* L.), as well as numerous weeds. Such a broad spectrum of host plants, including oilseed rape – one of the most profitable agricultural crops in Poland, the EU, Canada, China, and Australia – make the disease a worldwide problem.

The System for Forecasting Disease Epidemics (known as "SPEC" after its Polish acronym), is devoted to tackling this intractable issue. As both pathogens of *Leptosphaeria* sp. share a similar life cycle, with ascospores being the primary source of plant infection, the SPEC system has focused on detailed studies of the pseudothecia maturation process, followed by monitoring of ascospore concentrations in Poland. The maturity of fruiting bodies is screened in 45 experimental sites spread across the whole country and ascospore release is studied in 10 main climatic regions of Poland, coinciding with the most intensive production of oilseed rape, including Pomerania, Wielkopolska (Great Poland), Mazovia, Warmia, Mazuria, Upper and Lower Silesia with the Opole region, as well as Małopolska (Little Poland), the Lublin region and the Carpathian Foothills (Fig. 1).

L. maculans and *L. biglobosa* ascospore detection is performed using Hirst type volumetric spore traps (Burkard Manufacturing, UK or Lanzoni, Italy). The system encompasses visual observations under a light microscope and molecular detection using quantitative PCR with species specific primers and SYBR Green and/or dual labeled fluorescent probe chemistry. Until recently the data obtained at one site in a region were extrapolated to the whole ecological zone. However, the SPEC system has since 2008 been supplemented with the SimMat math-



Fig. 1. The location of experiment sites of the SPEC system; grey circles show the oilseed rape stubble collection sites and the pictograms of spore traps show the monitoring sites of *Leptosphaeria maculans* and *L. biglobosa* ascospore concentration

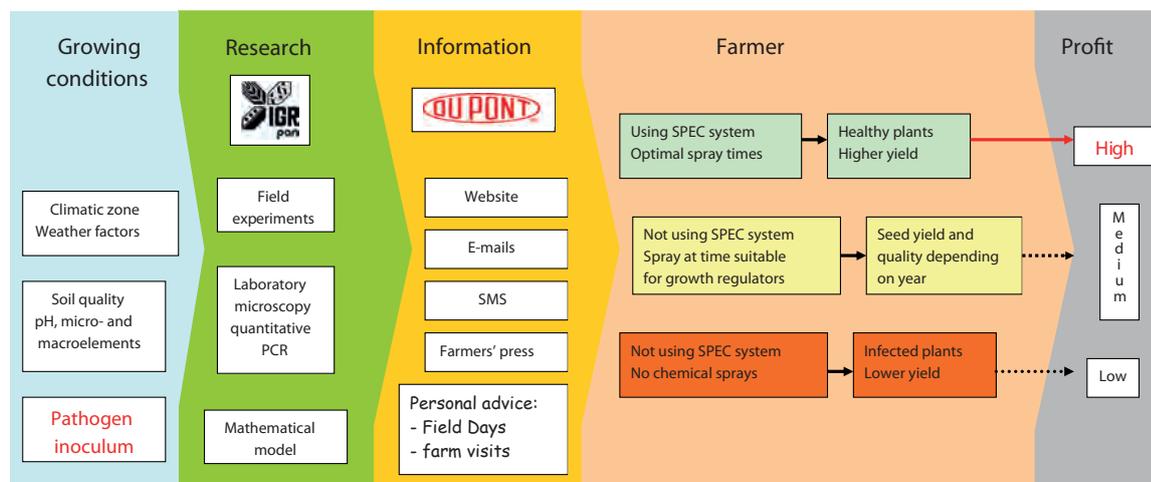


Fig. 2. The environment and parts of the SPEC system: the elements of input – research data processing – forecast distribution (output) – commercial effect

emathical model of pseudothecia maturation, and in 2010 the SimAsco model of ascospore release was developed. The models now allow for the primary inoculum to be forecast at each farm equipped with a weather station collecting air temperature and daily precipitation data.

The SPEC system has been in constant operation since 2004. The scientific underpinnings are developed and all research tasks are performed by the Institute of Plant Genetics, Polish Academy of Sciences, in Poznań, whereas logistic aspects, including the distribution of results, are handled by DuPont Poland – the Polish branch of the company well-known worldwide with broad activities in the sector of agriculture, including pesticide production (Fig. 2). The collection and preliminary preparation of samples is performed by numerous cooperating institutes and organizations, mainly the Research Center for Cultivar Testing, the Institute of Plant Protection, the Institute of Soil Science and Plant Cultivation, Rzeszów University, extension services located in different parts of Poland, as well as privately owned farms with large oilseed rape production. The SPEC activities are undertaken under the patronage of the Polish Association of Oilseed Rape Producers (KZPR).

The originality of the SPEC system lies in its collection of the most up-to-date, region-dependent monitoring data, which is next seamlessly combined with modeled information to yield forecast communications that are immediately transferred to end-users via two websites (educational and commercial), e-mails, and SMS text messages. Such fast dissemination of research results is made possible

by close cooperation with DuPont Poland, with its large database of oilseed rape growing farmers. The numbers of such communications normally reach around 10,000 per year. This enormous number of virtual contacts with farmers is further increased by active searching of SPEC information on the websites, with about 15,000 visitors per year. Such immediate transfer of research results is comparable to the aerobiological alerts for selected pollen grains and fungal spores, allowing allergy sufferers to prepare for the pollen season. For the SPEC system, the beneficiaries are farmers who are warned about the rapeseed crop disease risk in their farm region, enabling them to prepare well for the protection of their crops.

SPEC is the largest monitoring system of its kind in Europe and the third largest in the world. Thanks to numerous collaborations it is constantly being improved and enlarged to encompass new diseases. Recently it proved its high resolution in detecting the ascospores of *Pyrenopeziza brassicae* Sutton et Rawlinson in north Poland, the cause of light leaf spot in oilseed rape. The success of the Rothamsted Research team in molecular detection of *Sclerotinia sclerotiorum* (Lib.) de Bary, responsible for stem rot or white mould in numerous agricultural, horticultural, and ornamental plants, has opened up prospects for further extension of the SPEC system in the monitoring of new pathogenic fungal species.

The extensive experience accumulated by the Laboratory of Resistance Genetics at the Institute of Plant Genetics in Poznań in spore trapping and molecular detection of minute amounts of fungal DNA in air samples has led it to organize interna-

tional workshops for researchers interested in establishing similar systems in neighboring countries, such as the Czech Republic, Sweden, and Latvia. Such efforts, together with the spore trapping skills of UK and French colleagues, may finally result in the development of a European aerobiological network of spore traps for the forecasting of airborne propagules of fungi that cause yield losses to agricultural crops. Moreover, through collaboration with the University of Life Sciences in Lublin and Rzeszów University, volumetric traps are also being used to monitor the spores of *Alternaria* spp., and *Cladosporium* spp., responsible for allergenic reactions in people. Collaboration with the Institute of

Plant Breeding and Acclimatization, in turn, has facilitated the study of the potential transfer of GMO pollen grains. Pollen and spore trapping are powerful tools that can be used to help in solving problems in different biological fields, comprising basic and applied research.

Institute of Plant Genetics
ul. Strzeszyńska 34, 60-479 Poznań
phone: 48 (61) 655 02 00
fax: 48 (61) 655 03 01
e-mail: office@igr.poznan.pl
www.igr.poznan.pl

Medical Sciences

Division VI – Medical Sciences represents the medical scientific and academic community in Poland (including universities and respective academic schools), promotes research in medicine, pharmacy, physical training, and health education, and supervises research activity at the institutes affiliated with the Division. The Division's chairman is Prof. Wojciech Kostowski, a psycho- and neuropharmacologist, and its deputy chairmen are Prof. Sławomir Majewski, a dermatologist and immunologist, and Prof. Jacek Zaremba, a specialist in clinical genetics and neurology.

At the end of 2009 the Division had 35 national members (17 full members and 18 corresponding members) as well as 22 foreign members of the Academy. One full member of the Division, Prof. Jan Steffen, passed away in 2009. Three new foreign members were elected: Prof. Zbigniew Darzynkiewicz (USA), Prof. Tade-

usz Maliński (USA), and Prof. Arne Schousboe (Denmark).

Division VI put forward a motion for the Nicolaus Copernicus Medal of the Polish Academy of Sciences to be awarded to Prof. Noel Rose – an eminent immunologist and pathologist, discoverer of the phenomenon of autoimmunization. The medal was awarded by Prof. Michał Kleiber, president of the Academy, during the “Copernicus Tomb Mystery” seminar organized by the Polish and Swedish Embassies in the USA and the Carnegie Institution for Science, Washington, on 3 December 2009. Another Medal of the Academy was given – at the initiative of Division VI – to Prof. Jan Venulet, the outstanding Polish pharmacologist who invented and introduced a system for monitoring the side effects and unwanted effects of pharmaceutical products. The Medal was conferred upon him by Prof. Andrzej Górski, vice-president of the



The ceremony of granting the Division VI scientific awards. From left: Prof. Andrzej Górski (vice-president of the Academy), Prof. Janusz Komender, Prof. Wojciech Kostowski (chairman of Division VI), Prof. Jerzy Kołodziejczak, Prof. Andrzej Trzebski, Assoc. Prof. Agnieszka Słowik, Prof. Jacek Dubiel, Prof. Andrzej Szczudlik (A. Jaskot)

Academy, and Prof. Wojciech Kostowski, chairman of Division VI, at a special ceremony on 5 November 2009.

The Division prepared opinions on several draft legal regulations concerning science and higher education.

Two plenary sessions of the Division took place in 2009. At the session on 26 March Prof. Leszek Kubicki, chief editor of the monthly *Państwo i Prawo* (State and Law), presented a lecture on “Legal aspects of the bills concerning the reforms of the science in Poland;” Prof. Marek Krawczyk, president of the Medical University of Warsaw, delivered a special lecture entitled “Bicentenary of the Medical University of Warsaw.” Prof. Andrzej Górski, vice-president of the Academy, presented a lecture on the occasion of the 55th anniversary of the death of Prof. Ludwik Hirsztfeld. The members of the Division accepted its Annual Report for 2008.

At the session on 29 October, Prof. Marek Nowacki, director of the Institute of Oncology in Warsaw gave a tribute to Prof. Jan Steffen, full member of the Polish Academy of Sciences, deceased in 2009.

Dr. Piotr Warczyński, director of the Organization and Health Care Department at the Polish Ministry of Health delivered a presentation on “The role and situation of the research institutes in the health care system” and Dr. Roman Danielewicz, director of the Department of Science and Higher Education at the Polish Ministry of Health, presented a commentary to it. Prof. Michał Kleiber, president of the Academy, took part in the discussion on these issues.

At the General Assembly of the Academy on 10 December 2009, the Division of Medical Sci-

ences organized a session on the “Status and prospects for medical sciences in Poland,” during which seven presentations were delivered: “The role of the Academy in the development of medical sciences in Poland” by Prof. Wojciech Kostowski, “Position of medical sciences in the international arena” by Prof. Andrzej Górski, “Status and problems of cardiology in Poland” by Prof. Witold Rużyłło, “Achievements and problems of transplantology” by Prof. Marek Krawczyk, “Achievements and problems of genetics” by Prof. Jerzy Nowak, “Achievements and problems of oncology” by Prof. Marek Nowacki, and “Genetic congenital defects in the arts” by Prof. Janusz Limon.

The Division participated in drawing up the Academy’s statement regarding the status of medical sciences in Poland.

The Division participated in the 13th Science Festival in Jabłonna delivering presentations and lectures, namely: “Stem Cells – prospects for application in medicine” by Prof. Krystyna Domańska-Janik, Mossakowski Medical Research Center, and “Genetic restoration of extinct species – the example of the aurochs” by Prof. Ryszard Słomski, Institute of Human Genetics, Polish Academy of Sciences. Theoretically, genetic engineering might be able to bring back extinct species. There are numerous resources of extinct animal DNA that have been preserved, which might be transplanted into an egg of another close relative of the creature. At this point such efforts have enjoyed only very modest success, although some operations are getting closer to moderate success (e.g. with the recently extinct Tasmanian tiger).

The Division organized a press conference on “Smart drugs – facts and myths,” presided over by



Division VI press conference on “Smart drugs – facts and myths” (A. Jaskot)



Prof. Wojciech Kostowski, Chairman of the Division. During the session the opinions of several scientists were presented regarding the controversial problem of poorly recognized psychotropic products of this kind being available on the market. “Smart drugs” are named for their supposed ability to stimulate the mind and emotions. However, most of them may induce psychostimulants and variously expressed hallucinogenic effects. Furthermore, smart drugs are said to induce a desire to use stronger, illegal compounds. One example is *Salvia Divinorum*, a psychoactive mint used in spiritual practices by the people of Mexico.

The scientific committees of Division VI drafted and presented various important declarations and opinions, including a declaration on the nutrition of the Polish population (by the Committee on Human Nutrition Science), an opinion on the parliamentary bill regarding sports (by the Committee on Rehabilitation, Physical Education, and Social Integration), an opinion considering health care for school children and indispensable actions targeted at its improvement, as well as an opinion regarding medical care for patients affected with rare (orphan) diseases in Poland (by the Committee on Human Development).

The Commission of Pulmonology Diseases of the Committee on Clinical Pathophysiology prepared and published an opinion considering sepsis. The Committee on Rehabilitation, Physical Education, and Social Integration organized the 1st International Congress on “Polish Rehabilitation” and through the Committee’s initiative a valuable publication *Polish Rehabilitation 1945-2009* appeared.

The 2009 awards and prizes of the Division were bestowed upon the following scientists: the 19th Jędrzej Śniadecki Medal went to Prof. Barbara Przewłocka from the Institute of Pharmacology, Polish Academy of Sciences, in Kraków for her outstanding contributions to the fields of pharmacology and pharmacotherapy (particularly in the treatment of various types of pain); the Division’s Individual Scientific Prize went to Dr. Cezary Żekanowski from the Mossakowski Medical Research Center for a series of publications on the “variability of mitochondrial and nuclear DNA as a factor in the pathology of neurodegenerative diseases of the CNS.” The Collective Scientific Awards went to: the team of Prof. Władysława A. Daniel, Dr. Jacek Wójcikowski, and Dr. Anna Haduch from the Institute of Pharmacology in Kraków for a series



Prof. Jan Venulet – the laureate of the Medal of the Polish Academy of Sciences (A. Jaskot)

of publications on the “Mechanisms of the interactions between psychotropic drugs and cytochrom P450;” the team of Prof. Jacek S. Dubiel, Dr. Dariusz Dudek, Dr. Tomasz Rakowski, Dr. Artur Dziewierz, and Dr. Zbigniew Siudak from the II Department of Cardiology, Collegium Medicum of Jagiellonian University in Kraków for a series of publications on “the invasive therapy of myocardial infarction aimed at obtaining reduction of mortality through collaboration of a network of hospitals in the voivodship of Małopolska;” the team of Dr. Agnieszka Słowik, Prof. Andrzej Szczudlik, and Dr. Barbara Tomik from the Department of Neurology, Collegium Medicum of Jagiellonian University in Kraków for a series of publications on “Paraoxonase polymorphism and the risk of nervous system disease associated with ageing.”

The special honorary prizes for medical students – the Doctor Waclaw Mayzel Medical Laurel – were awarded to the following persons: Marek Bugajski, Paweł Salwa (Warsaw Medical University), Anna Mackiewicz (Warsaw Medical University), Weronika Broniek, and Natalia Wiatr (Collegium Medicum, Jagiellonian University, Kraków).

The Plenary Session of the Division gave its endorsement to the scientific and organizational activity of the Institute of Medical Biology in Łódź.

Overall, members of Division VI published 269 papers in 2009, primarily in international scientific journals, and they organized and actively participated in many scientific meetings and conferences.

Five research institutes are affiliated with Division VI, namely: the 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 on Human Nutrition affiliated with the Division.

The Division supervises the activity of 11 scientific committees (with over 319 members in all) and 76 subcommittees (1100 members) which represent the medical sciences in Poland. The chairpersons of the committees, mostly non-members of the Academy, participate in the plenary sessions of the Division and enjoy rights equal to those of the Academy's members themselves, except with regards to electing candidates to become new Academy members. Each committee establishes special commissions related to various fields of medical research; such commission members are in a large part drawn from outside the committee body.

The Division organizes the international representation of medical and biomedical disciplines in Poland, via national committees of the Polish Acad-

emy of Sciences. Prof. Wojciech Kostowski, chairman of Division VI, represents the Academy to the Council of International Organizations of Medical Sciences (CIOMS), whereas Prof. Sławomir Majewski represents the Academy to the European Academies Science Advisory Council (EASAC). Prof. Anna Członkowska represents the Polish Academy of Sciences to the European Medical Research Council Standing Committee of the European Science Foundation (EMRC ESF). Prof. Andrzej Trzeb-ski is a member of the Executive Committee of the International Medical Panel (IAMP), Prof. Janusz Komender is chairman of the Polish National Committee for Cooperation with the PUGWASH Conferences on Science and World Affairs. There are 7 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 Pharmacology (IUPHAR), the National Committee for Cooperation with the International Union of Immunological Societies (IUIS), the National Committee for Cooperation with the International Union of Nutrition Sciences (IUNS), and the National Committee for Cooperation with the International Council of Medical Societies (ICOMS). The Academy is also represented by the National Committee for Cooperation with the International Council on Laboratory Animal Science (ICLAS) and represents Polish scientists to the International Federation of Societies of Electron Microscopy (IFSEM).

Cytogenetic anomalies in male infertility

M. Kurpisz | E. Wiland | M. Olszewska | Institute of Human Genetics | Polish Academy of Sciences

There are a number of factors that may underlie male infertility, which according to different sources may constitute 35-45% of the overall infertility rate seen in human couples. Reproductive problems started in the latter half of the past century and may now involve as much as 1/5 couples, making it of global impact. An interesting transformation in the epidemiology of infertility from the 20th to 21st century revealed a significant change in the hierarchy of factors that may be responsible for this phenomenon. The first observed (according

to the WHO) predominance of female reproductive organ dysfunction (ovaries) has quickly been supplanted by the male infertility factor, which has now been defined as severe oligozoospermia/azoospermia. It has become clear that a variety of molecular factors may underlie oligozoospermia or azoospermia, including: aberrant immune response against sperm, red-ox metabolism of semen (due to development of external stimuli, infections, etc.), genetic factors, sperm toxicology, and others.



Fig. 1. Example of multicolor-FISH on human meiotic chromosomes in spermatocytes I from t(9;13)(p10;q11) carrier

All these factors are under examination at the Department of Reproductive Biology and Stem Cells (Institute of Human Genetics, Polish Academy of Sciences). At least several levels must be recognized: a) cytogenetic analysis of infertile individual (peripheral blood karyotyping), b) sperm chromosome analysis (very complex but progressing mostly due to development of FISH techniques), c) dissection of sperm DNA quality (lacking a test with good prognostic value), d) global wide-association study (GWAS) to identify errors (in infertile population) in approx. 2000 genes participating in spermatogenesis, and e) DNA sequencing.

The rough estimations made so far indicate that cytogenetic anomalies may be responsible for as much as 10% of male infertility (this being a conservative estimate). Taking into account solely the revealed ratio of chromosomal aberrations observed in peripheral blood we may find a range of 3-13% of chromosomal errors in infertile population – a striking difference compared to 0.7% observed in normal population of healthy newborns. Sperm morphology, however, unless severely compromised, cannot be a common indicator of potential genetic error. It has been documented that even in physiological semen the number of chromosome aberrations appears to be quite significant – up to 20% aberrations (including both number and structure)

can be taken as a normal range. However, in all studied groups of men with normal somatic karyotype but with reproductive failure, the revealed aberration frequency (in spermatozoa) was significantly higher than in the control population.

Reciprocal chromosomal translocations (RCT) have been known to constitute a very significant proportion of the so far revealed chromosome aberrations (in male infertility) that are responsible for reproductive failure, which amounts to approx. 1% of so far identified male infertility reasons. The pattern of meiotic segregation is determined by variety of factors. Those most commonly mentioned in the literature are: a) chromosome type involved in translocation, b) breakpoint localizations, c) length of the interstitial and translocated segments, d) localization and number of chiasmata. The meiotic segregation pattern of sperm cells from more than 140 different reciprocal translocations has so far been described. Literature data has shown that the majority of gametes arise from alternate segregation (mean 56%, with range between 19-80%). Our results (15 translocations analyzed so far) generally confirm this data (range of 34-57% with mean 50%). It is suggested that reproductive failures ascribed to RCT translocation carriers may result mostly from the elimination of genetically unbalanced embryos or fetuses (spontaneous miscarriage) which are the consequence of the lack of prezygotic selection. Another side-effect of such a lack may be the live birth of severely affected (with congenital anomalies) genetically unbalanced newborns. Both types of reproductive failure (spontaneous miscarriage and early death of malformed newborn) produce severe psychological feedback to a couple that may require genetic counseling.

Reproductive failures most often draw attention to family studies and the construction of pedigrees, from which a probability predictive value can be calculated. However, insufficient number of analyzed families in the pedigree under study and individual characteristics of each particular translocation makes such calculations difficult. One of the goals of the work carried out at our Department was to corroborate data obtained from traditional cytogenetic analysis (pedigree) in opposition to the proportion of genetically balanced spermatozoa obtained by FISH analysis. In some cases we confirmed an outcome that has been obtained by a risk estimate from already collected empirical data, while in some translocations this was not the case (Midro et al., 2006;

Wiland, 2010). Another interesting topic observed in our studies was a familial meiotic segregation pattern in the father and son (carriers of the same translocation), where we discovered an identical pattern of sperm segregation but different sperm quality. In the range of 6 translocations analyzed we were also able to tell that relationship between sperm segregation pattern and sperm DNA fragmentation (quality) was a remote one. For our study (Olszewska et al., 2010) the reference point of sperm DNA fragmentation was established at the level of 4%, following the literature reference data which showed that the best embryo rate was found in the spermatozoa subgroup with DNA fragmentation <4%. However, a correlation between high sperm DNA fragmentation level and the defined feature of meiotic segregation pattern was not found. In contrast, one RCT carrier case revealed only 5.66% of sperm DNA fragmentation while the majority of sperm cells (>65%) were genetically unbalanced. On the other hand, the proportion of genetically balanced/unbalanced sperm (meiotic segregation pattern) revealed in our study was faithfully reflected when studying early embryo karyotypes (Wiland, 2010). After selection of a genetically balanced embryo, a healthy offspring was delivered.

The recent literature has provided interesting and novel information concerning the specific architecture of the spermatozoon's nucleus. It has been acknowledged that the centromeres of the spermatozoal chromosomes are directed toward the center of the cell nucleus, where they form a separate area called a chromocenter. Telomeres of the p and q arms of the same chromosome form peripherally located dimers. Such topology is currently a subject of further research. Studies undertaken in our Department have shown that the chromosomal topology in the spermatozoon's nucleus can be changed as a

result of incorrect meiosis, which is often observed in RCT carriers or which is indicated by a higher level of aneuploidy (Wiland et. al., 2008; Wiland, 2010). We may therefore conclude that the observed spatial changes in chromosome positions may also be a cause for reproductive failure, one that has until now not been identified in infertility research.

References

- Midro A.T., Wiland E., Panasiuk B., Leśniewicz R., Kurpisz M. (2006). Risk evaluation of carriers with chromosome reciprocal translocation t(7;13) (q34;q13) and concomitant meiotic segregation analyzed by FISH on ejaculated spermatozoa. *Am. J. Med. Genet.*, 140A, 245-256.
- Wiland E., Żegała M., Kurpisz M. (2008). Interindividual differences and alterations in the topology of chromosomes in human sperm nuclei of fertile donors and carriers of reciprocal translocations. *Chromosome Res.*, 16, 291-305.
- Wiland E. (2010). Cytogenetic studies of spermatozoa and somatic cells of men with reproductive failure. *Nowiny Lekarskie (Suppl. I)*, 79.
- Olszewska M., Frączek M., Huleyuk N., Wiland E., Zastavna D., Panasiuk B., Midro A.T., Kurpisz M. (2010). Meiotic segregation pattern and DNA fragmentation levels in spermatozoa of six different reciprocal chromosome translocation carriers with reproductive failure. *J. Androl., (Suppl.)*, March/April, 56.

Institute of Human Genetics
ul. Strzeszyńska 32, 60-479 Poznań
phone: 48 (61) 823 91 00
fax: 48 (61) 823 32 35
e-mail: igcz@man.poznan.pl
www.igcz.poznan.pl

Light and endogenous biological clocks – Impact on melatonin signaling

J.B. Zawilska | Institute of Medical Biology | Polish Academy of Sciences

Life on Earth is subjected to a strict regimen of cyclical changes, the most prominent being the daily variations between day and night and the annual succession of seasons. In the course of evolution

various organisms have learnt how to predict and adapt to cyclical changes in their environment. This, in turn, has led to the development of numerous rhythmical processes occurring within organisms,

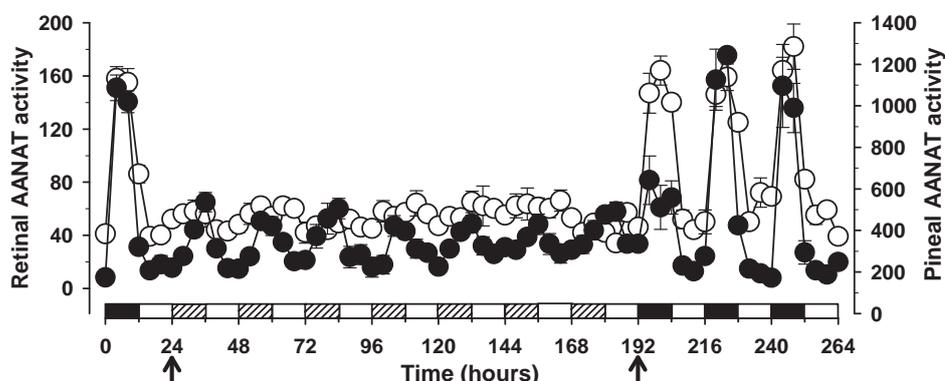


Fig. 1. Changes in AANAT activity in retinas (filled circles) and pineal glands (open circles) of turkeys exposed to continuous light (LL). Black bars represent the duration of the dark phase, white bars the duration of the (subjective) light phase and hatched bars the duration of the subjective dark phase. Arrows point to the beginning and end of LL. AANAT activity is expressed in pmol/h/mg tissue. Values shown are means \pm SEM ($n = 4-6$ animals/time point)

which are currently known to be found in representatives of all kingdoms. Circadian rhythms (including, for example, the sleep-wake cycle and rhythmic oscillation in circulating melatonin level), with a period of approximately 24h, are the most common and the best understood of all biological rhythms. They are generated by endogenous biological pacemakers and synchronized with environmental conditions. Among the synchronizing signals, two are of a special importance: the light (exogenous) and melatonin (endogenous) biological clocks. In humans social and psychological factors are also involved in the regulation of biological rhythms.

For several years the Institute for Medical Biology, Polish Academy of Sciences, has studied the regulation of melatonin biosynthesis in the vertebrate pineal gland and retina, and the dopamine-melatonin-light interaction. Our findings have demonstrated that in both tissues melatonin is produced in a well-expressed circadian rhythm generated by endogenous biological clocks. Melatonin rhythm in the retina is synchronized with but also independent from the rhythm in the pineal gland. Melatonin levels and the activity of serotonin N-acetyltransferase (AANAT, the penultimate and key regulatory enzyme in the melatonin biosynthetic pathway) in the retina of birds are several-fold higher than in mammals, making this tissue a valuable model for studies on the molecular mechanisms involved in the control of the hormone's production. Light is the most important environmental factor regulating melatonin synthesis. Exposure of animals or tissue cultures to light (full spectrum white light,

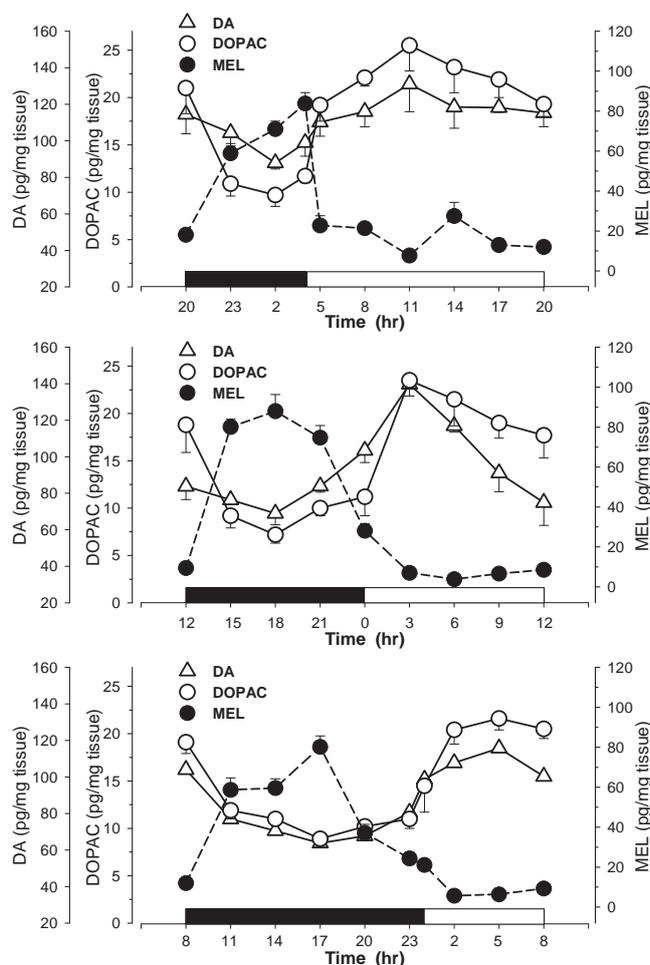


Fig. 2. Diurnal variations in dopamine (open triangles), DOPAC (open circles), and melatonin (filled circles) levels in the retina of turkeys kept under three different photoperiodic regimes: (top) long photoperiod (16h light:8h dark; 16L:8D), (middle) regular photoperiod (12L:12D), and (bottom) short photoperiod (8L:16D). The solid bar on the x-axis indicates the light off time. Values shown are means \pm SEM ($n = 5-6$ animals/time point)

monochromatic visible light, and near ultraviolet radiation – UVA) suppressed the nighttime melatonin production in the pineal gland and retina. The magnitude of the observed changes was dependent on species, tissue (with the retina being more sensitive to changes in the environmental lighting conditions than the pineal gland), wavelength, exposure time, and photoperiodic history of animals. We have shown, for the first time, that: (1) the pineal gland of galliforms is directly sensitive to UVA light; (2) proteosomal proteolysis plays an important role in UVA-evoked decrease of pineal AANAT activity; (3) in contrast to mammals, pineal glands of light-exposed galliformes maintain limited capacity to rhythmically produce melatonin (Fig. 1).

Results from studies on the dopamine-melatonin-light interaction in the retina have demonstrated that levels of dopamine (DA) and 3,4-dihydroxyphenylacetic acid (DOPAC, the major metabolite of retinal DA) fluctuate in a circadian rhythm, with values high during the daytime and low during the nighttime. The rhythmic changes in DA content and metabolism are out of phase with daily oscillation in melatonin level (Fig. 2). Melatonin reduced the daytime levels of DOPAC (Fig. 3), whereas quinpirole (the selective agonist of D_4/D_2 -DA recep-

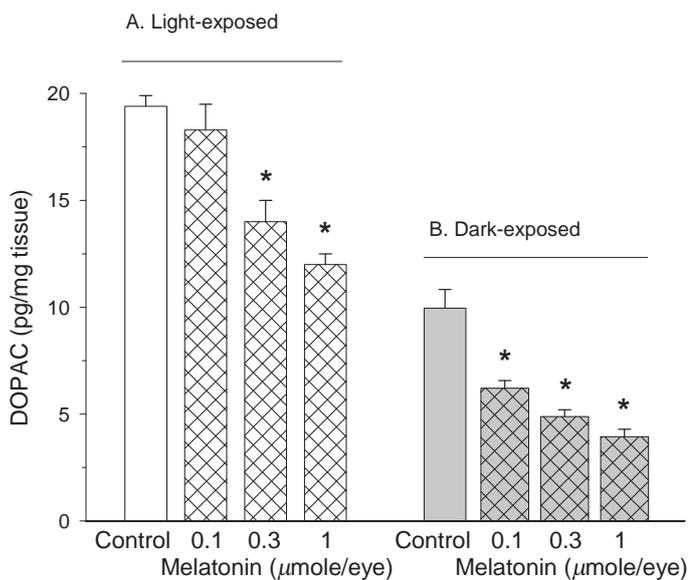


Fig. 3. The effect of melatonin on daytime DOPAC levels in the turkey retina. At the end of the fifth hour of the light or the subjective light phase groups of turkeys were injected intraocularly with melatonin (0.1, 0.3 and 1 µmol/eye). Control groups received vehicle. Birds were killed 1h later. Values shown are means ± SEM (n = 4-6 animals/time point). *p<0.05 versus *Control*

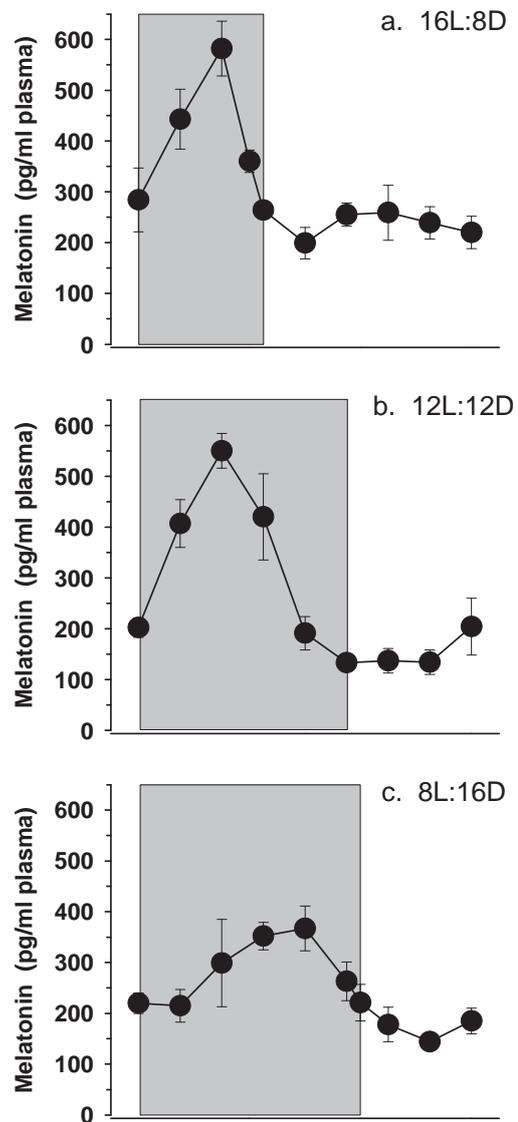


Fig. 4. Diurnal variation in plasma melatonin concentrations in turkeys kept under three different photoperiodic regimes: (a) long photoperiod (16h light:8h dark; 16L:8D), (b) regular photoperiod (12L:12D), and (c) short photoperiod (8L:16D). Values shown are means ± SEM (n = 4-6 animals/time point)

tors) suppressed the nighttime melatonin. These observations led us to propose that in the retina DA and melatonin are components of a mutually interplaying (in a negative manner) system and act as chemical analogs of light and darkness, respectively.

In temperate latitudes, the daylength (photoperiod) appears to be the most reliable parameter of all the seasonal cues, and as such, it is used by animals to indicate the time of year in order to synchronize the endogenous annual rhythms of physiology and behavior to environmental conditions. In several

vertebrates environmental photoperiodic information is transformed into a neuroendocrine signal, the hormone melatonin. We have demonstrated that photoperiod plays an important role in regulating the rhythmic melatonergic signal in the turkey. Namely, the duration of elevated nocturnal melatonin levels in the pineal gland, retina, and plasma (Fig. 4) changed markedly in response to the length of the dark phase, being longest during the short photoperiod with 16h of darkness. Furthermore, the magnitude of the light-evoked suppression of nighttime pineal AANAT activity was also influenced by photoperiod, being smallest under the long photoperiod. Finally, rhythmic oscillations in retinal DA/DOPAC levels were dependent on the photoperiod history of the animals.

References

Zawilska J.B., Lorenc A., Berezińska M., Vivien-Roels B., Pevet P., Skene D.J. (2007). Photoperiod-dependent changes in melatonin biosynthesis in the

turkey pineal gland and retina. *Poultry Sci.* 86: 1397-1405.

Lorenc-Duda A., Berezińska M., Bothorel B., Pevet P., Zawilska J.B. (2008). Turkey retina and pineal gland differentially respond to constant environment. *J. Comp. Physiol. (A)* 194: 907-914.

Lorenc-Duda A., Berezińska M., Urbańska A., Gołmbiowska K., Zawilska J.B. (2009). Dopamine in the turkey retina – an impact of environmental light, circadian clock, and melatonin. *J. Mol. Neurosci.* 38: 12-18.

Zawilska J.B., Skene D.J., Arendt J. (2009). Physiology and pharmacology of melatonin in relation to biological rhythms. *Pharmacol. Reports* 61: 383-410.

Institute of Medical Biology
ul. Lodowa 106, 93-232 Łódź
phone: 48 (42) 272 36 33
fax: 48 (42) 272 36 30
e-mail: aobidowska@cbm.pan.pl
www.cbm.pan.pl

Negative regulatory functions of the linker for activation of T cells adapter molecule

A. Miązek | P. Kisielow | Ludwik Hirszfild Institute of Immunology and Experimental Therapy | Polish Academy of Sciences

Lymphocytes are unique cells of the immune system able to discriminate between self and non-self antigens. Antigen recognition by lymphocytes is mediated by multi subunit receptors present on their surface. Upon engagement by an antigen, receptors not only trigger an immune response but also transduce a variety of signals essential for lymphocyte development, differentiation, and survival. Signal transduction by antigen receptors is aided by a family of transmembrane adaptor proteins (TRAPs). TRAPs are devoid of enzymatic activity but upon tyrosine phosphorylation become docking sites for multiple cytoplasmic enzymes or adaptors that are brought to the vicinity of antigen receptors at the cell membrane. Coordinated assembly of multi-protein complexes mediated by TRAPs initiates signaling cascades that translate affinity and avidity of receptor engagement into various cell fates.

In view of erroneous lymphocyte responses accompanying numerous immune pathologies (i.e. autoimmune syndromes, allergy), a better understanding of the function of TRAPs seems of primary importance.

The linker for activation of T cells (LAT) is a member of the TRAPs family expressed on mature, thymus derived lymphocytes (T cells) and their committed precursors from the CD25+CD44+ stage on (Miązek et al., 2009), natural killer (NK) lymphocytes, mast cells, megakaryocytes and pre-B cells. LAT exerts a key positive regulatory function during T cell development and activation. In mice carrying loss-of-function mutations of the LAT alleles, a complete developmental block of T cell maturation occurs at an early intrathymic stage. Likewise, the mature T cell line Jurkat, which is deficient in the LAT adaptor, is unable to mobilize calcium, activate Erk kinase and upregulate expres-

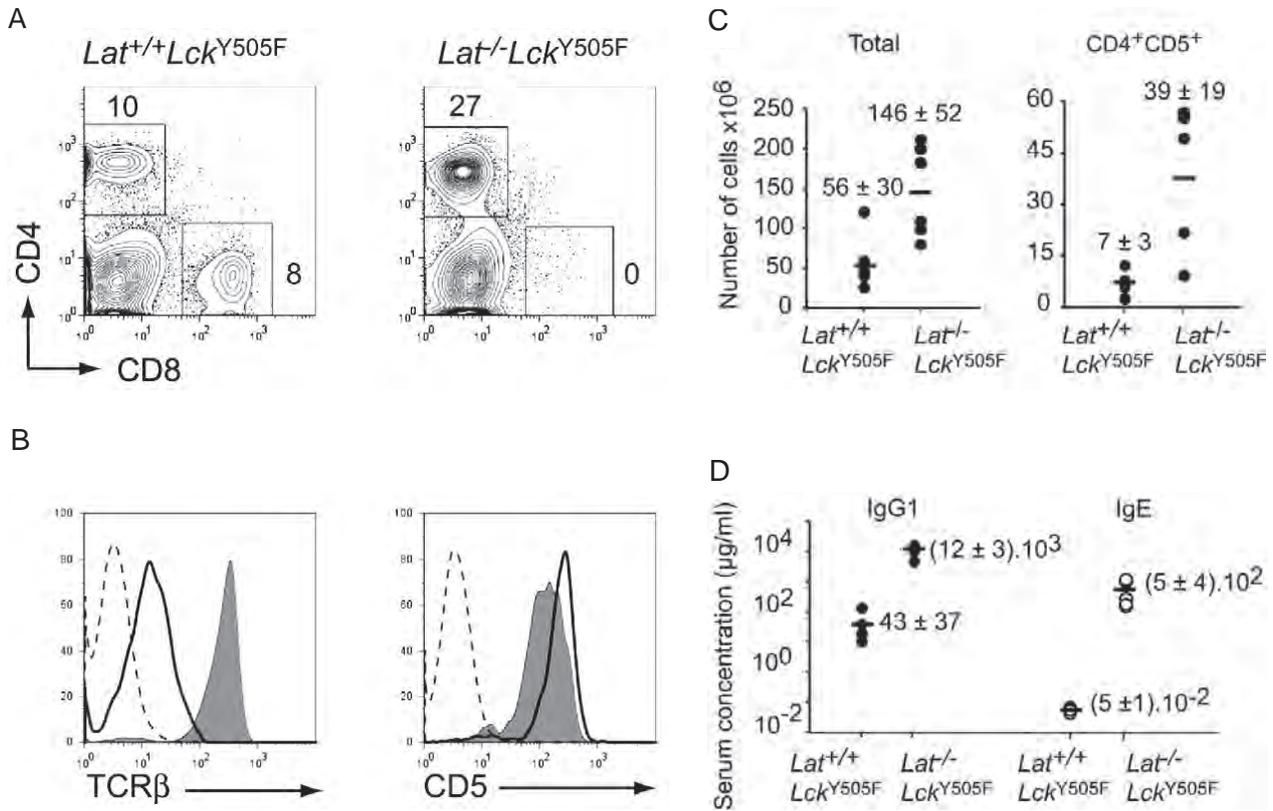


Fig. 1. LAT-deficient CD4⁺ T cells found in the periphery of *Lat*^{-/-} *Lck*^{Y505F} mice deploy a Th2 pathogenic phenotype. (A) Expression of CD4 and CD8 on total splenocytes from *Lat*^{+/+} *Lck*^{Y505F} and *Lat*^{-/-} *Lck*^{Y505F} mice. Numbers in outlined areas indicate percentage of cells. (B) Expression of TCRβ and CD5 on CD4⁺ T cells from *Lat*^{+/+} *Lck*^{Y505F} (gray histogram) and *Lat*^{-/-} *Lck*^{Y505F} (solid line) mice. Dashed line indicates isotype control staining. (C) Number of total and CD5⁺ CD4⁺ T cells present in the spleen. (D) Concentrations of IgG1 and IgE antibodies in serum samples from *Lat*^{+/+} *Lck*^{Y505F} and *Lat*^{-/-} *Lck*^{Y505F} mice. The mean (horizontal bar) and standard deviation are indicated for each panel. Data are representative of 6 independent experiments performed on 9-week-old mice. (after Mingueneau et al. 2009)

sion of CD69 molecules upon T cell antigen receptor (TCR) engagement.

In agreement with its positive regulatory role, the mutation of C-terminal tyrosine 136 (Y136F) residue, interacting with the PLCγ1 kinase, leads to a partial block of thymocyte development. Surprisingly, few CD4⁺ T helper lymphocytes that emerge in the peripheral lymphoid organs of LAT Y136F mutant mice undergo uncontrolled proliferation and polarization towards excessive Th2 response (Aguado et al., 2002). Chronic and excessive Th2 cytokine production, in turn, activates polyclonal B cell response leading to hypergammaglobulinemia and autoimmune nephritis. The mechanism of this paradoxical phenotype has long been a matter of debate. It was postulated that due to inefficient signaling, only thymocytes expressing TCRs with high affinity towards self antigens undergo positive selection in the thymus of

LAT Y136F mice. Consequently, once in the periphery, these cells would react against self antigens which in the context of abrogated LAT-PLCγ1 interaction would create excessive, unbalanced positive signaling.

The specificity of LAT Y136F mutation for the development of autoimmune Th2 pathology observed in mutant mice has recently been called into question.

By using thymus specific expression of a gain-of-function allele of Lck kinase (Lck Y505F) in LAT knockout mice, Mingueneau and colleagues (Mingueneau et al., 2009) overcame the compromised pre-TCR and TCR signaling, allowing for the emergence of LAT deficient T helper lymphocytes in the periphery of double mutant mice. These T lymphocytes were, by means of cell surface phenotype and the profile of interleukin production, identical with the T helper cells from the LAT Y136F mice

(Fig. 1A, B). Moreover expanded LAT deficient peripheral lymphocytes of Lat^{-/-} x LckY505F mice triggered a lymphoproliferative disorder similar to the one originally described in LAT Y136F mice (Fig. 1C, D).

These and other data obtained with LAT mutant mice carrying compound mutations of regulatory tyrosines indicate that lymphoproliferative 'LAT Y136F-like' pathology unfolds irrespectively of any specific interaction of particular tyrosine residue in the LAT molecule. Instead, these results suggest that LAT signaling pathology (LSP) takes shape every time LAT signalosomes are missing or fail to assemble molecules that attenuate upstream components of the TCR signaling cassette and/or components of accessory signaling cassettes functioning independently of TCR. It will be interesting to better define negative regulatory networks of the LAT signalosome. This is especially important in light of an observation that oxidative stress induces membrane displacement of LAT from the surface of T cells found in synovial fluid of patients suffering from the rheumatoid arthritis. If LAT displacement might locally mimic the loss of LAT function, the number of Th2 dependent autoimmune diseases could be explained by alteration of LAT expression or its intracellular localization.

References

- Miążek A., Macha K., Łaszkiewicz A., Kissenpfennig A., Malissen B., Kisielow P. (2009). Peripheral Thy1+ lymphocytes rearranging TCR-gammadelta genes in LAT-deficient mice. *Eur. J. Immunol.* Sep; 39(9): 2596-605.
- Mingueneau M., Roncagalli R., Grégoire C., Kissenpfennig A., Miążek A., Archambaud C., Wang Y., Perrin P., Bertosio E., Sansoni A., Richelme S., Locksley R.M., Aguado E., Malissen M., Malissen B. (2009). Loss of the LAT adaptor converts antigen-responsive T cells into pathogenic effectors that function independently of the T cell receptor. *Immunity.* Aug 21; 31(2):197-208.
- Aguado E., Richelme S., Nuñez-Cruz S., Miążek A., Mura A.M., Richelme M., Guo X.J., Sainty D., He H.T., Malissen B., Malissen M. (2002). Induction of T helper type 2 immunity by a point mutation in the LAT adaptor. *Science.* Jun 14; 296(5575): 2036-40.

Ludwik Hirsfeld Institute of Immunology
 and Experimental Therapy
 ul. Weigla 12, 53-114 Wrocław
 phone: 48 (71) 337 11 72
 fax: 48 (71) 337 13 82
 e-mail: secret@iitd.pan.wroc.pl
 www.iitd.pan.wroc.pl

Earth and Mining Sciences

Division VII – Earth and Mining Sciences covers the following fields: geology, geophysics, oceanography, geodesy, geography, environmental engineering, and mining sciences. At the end of 2009 the Division consisted of 31 members, including 18 full members and 13 corresponding members of the Academy. There were also 20 foreign members. Two members of the Academy – Professors Ludomir Baran and Mark N. Berdichevski – passed away in 2009.

The Division is headed by Prof. Bogdan Ney (full member of the Academy) as chairman, with Prof. Andrzej Ciołkosz and Prof. Ryszard Marcinowski (corresponding member of the Academy) as deputy chairmen.

The Division coordinated the activities of 7 research institutes plus the Museum of the Earth. Eleven scientific committees with 39 sections or commissions are associated with the Division, assembling 366 members, including 46 members of the Academy. A number of scientific journals and other periodicals belonging to the committees of Division VII continued to be published in 2009,

including: *Acta Geologica Polonica*, *Acta Geophysica Polonica*, *Archives of Mining Sciences*, *Mineralogical Archives*, *Management of Mineral Resources*, *Geodesy and Cartography*, *Studies of the Committee on Water Management*, *Studia Quaternaria*, and *Oceanology*. The journals *Acta Geologica Polonica* and *Oceanology* are indexed by the Institute for Scientific Information (Thomson Reuters) in Philadelphia. In addition, each of the institutes publishes their own journals and periodicals, often of international or nationwide scope.

Two plenary sessions of the Division were held in 2009. The spring session of the Division was held on May 6, 2009. Prof. Andrzej Żelaźniewicz, corresponding member of the Academy (chairman on the Committee of Geological Sciences) and Prof. Leszek Marks (chairman of the Committee on Quaternary Research) presented a paper on “The cause of climate change as seen by a geologist.” An autumn session of the Division took place on October 30, 2009. The members of the Division had granted the Stanisław Staszic Award to Prof. Krystyna Wasylikowa and Prof. Andrzej Witkowski for the pub-



The Ceremony for granting the Division's scientific awards. From left: Prof. Bogdan Ney, Prof. Michał Szulczewski (chairman of the Awards Commission), Prof. Krystyna Wasylikowa, Prof. Andrzej Witkowski (winners of the Stanisław Staszic Scientific Award), Prof. Ryszard Marcinowski, Prof. Stanisław Massel, Prof. Leszek Marks, Dr. Artur Kędzior (winner of the Wawrzyniec Teisseyre Award), Prof. Teresa Madeyska (A. Jaskot)

lication of their book on *The palaeoecology of Lake Zeribar and surrounding areas, Western Iran, during the last 48,000 years*. Dr. Artur Kędziora received the Wawrzyniec Teisseyre Award for his paper on the “Depositional architecture of the Zabrze Beds (Namurian B) within the Main Anticline of the Upper Silesia Coal Basin, Poland.” Prof. Maria Włodarska-Kowalczyk was commended with the Maurycy Pius Rudzki Award for her work on the “Biodiversity of zoobentos in arctic fiords,” and Dr. Teresa Wing-Dudek won the Ignacy Domeyko Award for her work on “Interstratified kaolinite-smectite: Nature of the layers and mechanism of smectite kaolonization” and the “Structure of mixed-layer kaolinite-smectite and smectite-to-kaolinite transformation mechanism from synthesis experiments.”

The members of the Division elected Prof. Ewald Brückl from Austria to become a foreign member of the Polish Academy of Sciences. The president of the Academy appointed new directors: Prof. Janusz Pempowiak was installed as director at the Institute of Oceanology, Prof. Marek Degórski at the Institute of Geography and Spatial Planning.

The Division also coordinated the activities of its affiliated Scientific Committees and supervised the activities of the scientific institutes belonging to the Division.

Many members of Division VII were commended or honored in 2009. Prof. Piotr Kowalik received an honorary doctorate from the Wrocław University of Environmental and Life Sciences, a Badge of Merit from the Polish Minister of the Environment, as well as the Main Prize for scientific achievements granted by the Polish Minister of Science and Higher Education. The Polish Minister of the Environ-

ment also commended Prof. Michał Szulczewski and Prof. Ryszard Marcinowski for their special scientific achievements.

Prof. Ryszard Domański received a Gold Medal for Longstanding Service from the President of the Republic of Poland, and a Gold Hipolit Statue from the Hipolit Cegielski Society in Poznań. The International Mine Ventilation Committee granted Prof. Waclaw Trutwin a Diploma of Merit for his organization of the International Congress of Ventilation of Mines in Kraków and for chairing the Committee of International Congresses of Mine Ventilation. The President of the Republic of Poland also granted Prof. Józef Dubiński a Gold Medal for Longstanding Service.

The Rector of Stanisław Staszic University of Science and Technology granted Prof. Jakub Siemek an award (first class) for his publication activities and the title of Honorary Professor of the Stanisław Staszic University of Science and Technology. The World Meteorological Organization (WMO) and International Committee of the Scientific Union (ICSU) granted Prof. Aleksander Guterch a “Certificate of Appreciation” for his outstanding activities in international cooperation in the framework of the International Polar Year 2007-2009.

In 2009 the Division VII scientific committees organized 25 plenary sessions and several section meetings. The scientific activities of the committees are documented by the organization of 35 national conferences over the last year. The overall number of lectures presented during the conferences was 893. The members of the committees drew up several scientific opinions for the use of Polish government, industry, and various organizations.

The European Plate: A natural laboratory for understanding geodynamical processes

M. Grad | Institute of Geophysics | Polish Academy of Sciences | University of Warsaw
A. Guterch | Institute of Geophysics | Polish Academy of Sciences

The new Moho depth map of the European Plate

The seismic discontinuity discovered by Mohorovičić is a primary definition of the boundary between the Earth’s crust and upper mantle, given in terms of the velocities of seismic waves. In general,

P-wave velocity is about 7 km s^{-1} in the lower crust and about 8 km s^{-1} in the uppermost mantle. So the P-wave velocity contrasts at the Moho discontinuity is quite large, being up to $1\text{-}1.5 \text{ km s}^{-1}$. This indicates a significant change in the rock types between the Earth’s crust and uppermost mantle.

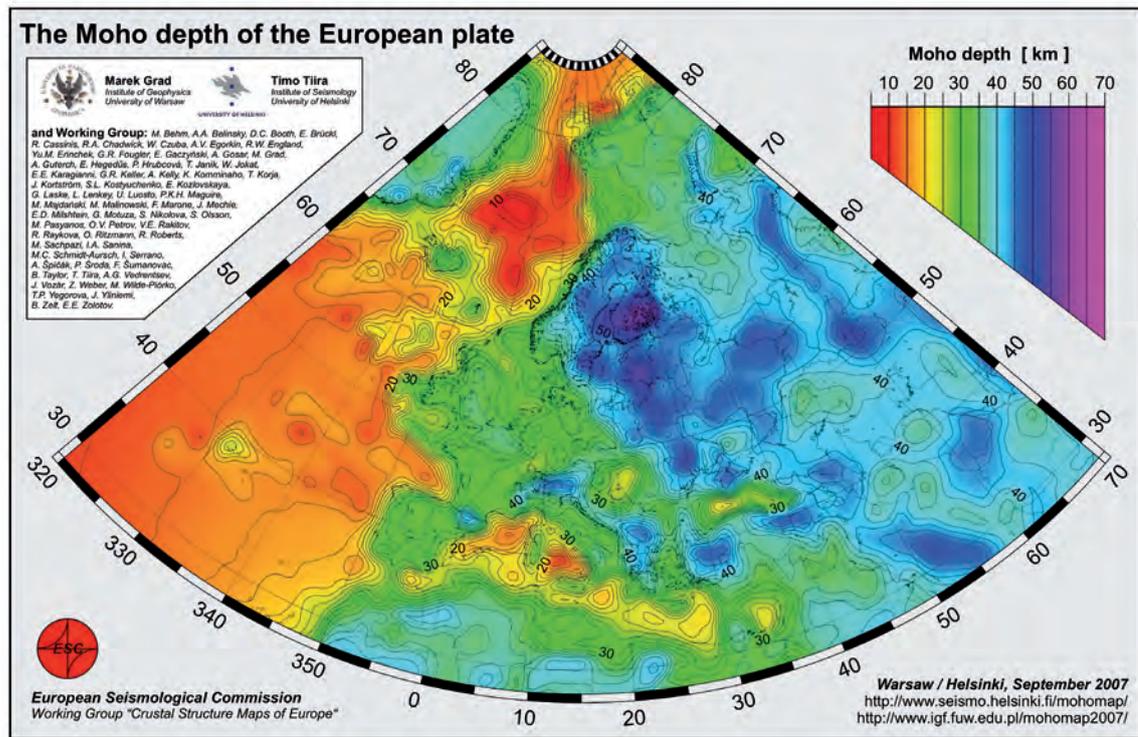


Fig. 1. The new Moho depth map of the European Plate (the thickness of the Earth's crust). The database for this compilation comprises more than 250 data sets from individual seismic profiles, 3-D models obtained by body and surface waves, and maps of seismic and/or gravity data compilations

The European Plate has a 4.5 Gy long and complex history. This is reflected in the present-day large-scale crustal structures. A new digital Moho depth map (Fig. 1) has been compiled from more than 250 data sets of individual seismic profiles published before September 2007. The map covers the area of the whole European Plate, extending from the mid-Atlantic ridge in the west and the Ural Mountains in the east and from the Mediterranean Sea in the south to the Barents Sea and Spitsbergen in the Arctic in the north. The complex tectonic history of Europe reflects the breakup of the Neoproterozoic supercontinents Rodinia/Pannotia to form the fragment of Baltica and the subsequent growth of continental Europe, beginning with the Caledonian orogeny. Caledonian and younger Variscan orogenies involved accretion of Laurentian and Gondwanan terranes to the rifted margin of Baltica during the Paleozoic. The suite of sutures and terranes that formed, the so-called Trans-European Suture Zone (TESZ) adjacent to the rifted margin of Baltica, extends from the British Isles to the Black Sea region. Understanding its structure and evolution is one of the key tectonic challenges in Europe and is certainly of global importance to stud-

ies in terrane tectonics and continental evolution. The younger Alps, Carpathian Mountains arc and Pannonian backarc basin in the south form inter-related components of the Mediterranean arc-basin complex and are the result of intricate Mesozoic/Cenozoic plate interactions in the Mediterranean region as the Tethys Ocean, closed during the convergence of Europe and Afro-Arabia. In general, three large domains within the European Plate crust are visible (Fig.1). The oldest Archean and Proterozoic crust has a thickness of 40-60 km, the continental Variscan and Alpine crust has a thickness of 20-40 km, and the youngest oceanic Atlantic crust has a thickness of 10-20 km.

New results of lithospheric studies of the European plate in Northern Atlantic and Eastern Alps

The area of the Northern Atlantic plays important role in present day tectonics. The development of the passive continental margins of the Barents Sea continental platform, rifting and subsequent seafloor spreading are processes determining the face of our planet. Here we report the findings of investiga-

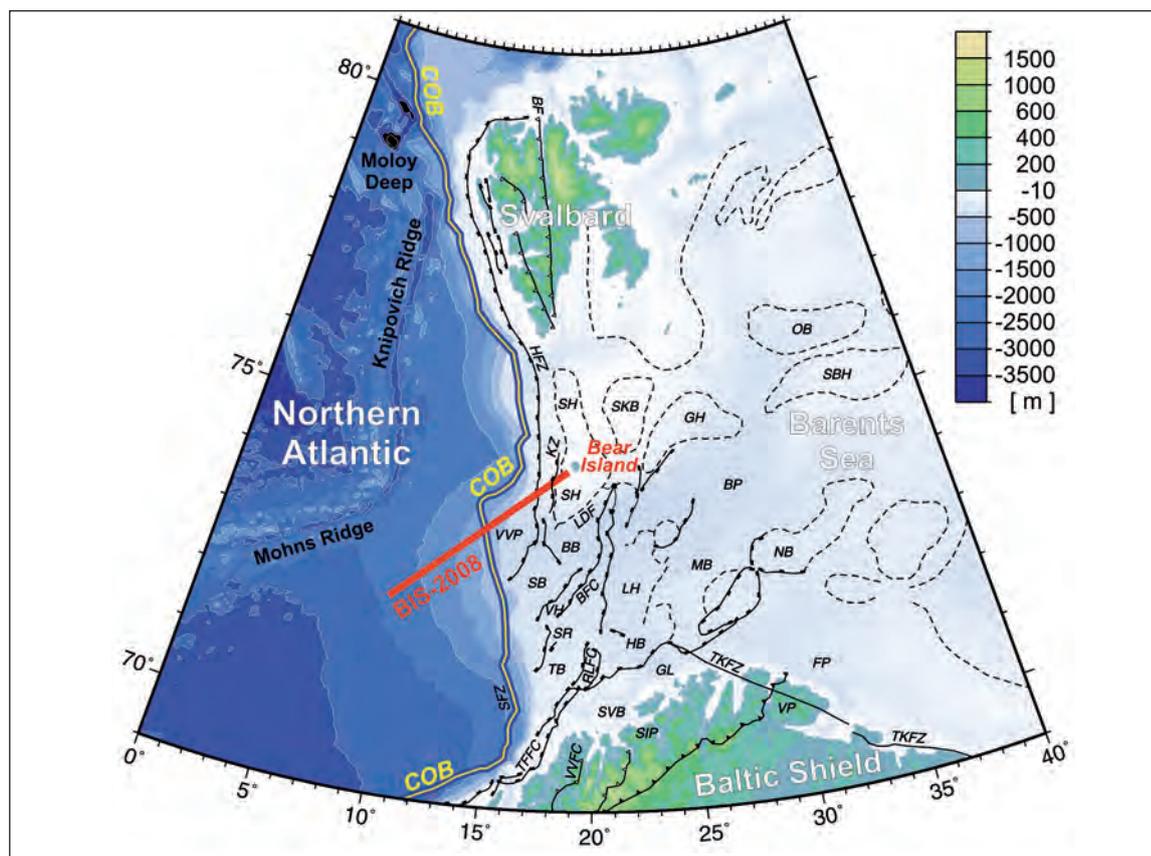


Fig. 2. Location map of the BIS-2008 seismic profile (Mohns Ridge-Bear Island) on the background of topography/bathymetry map and simplified tectonic elements of the continental margin in the area of the Northern Atlantic (Norwegian-Greenland Sea). COB – continental-ocean boundary; main fault zones and basins: BB – Bjørnøya Basin, BF – Billefjorden Fault, BP – Bjæmerland Platform, BFC – Bjørnøyrenna Fault Complex, FP – Finnmark Platform, GH – Gardarbanken High, HB – Hammerfest Basin, HFZ – Hornsund Fault Zone, KF – Knølegga Fault, LDF – Leirdjupet Fault, LH – Loppa High, NB – Nordkapp Basin, OB – Olga Basin, SB – Sørvestsnaget Basin, SBH – Sentralbanken High, SH – Stappen High, SKB – Sørkapp Basin, SFZ – Senja Fracture Zone, SR – Senja Ridge, TFCC – Trømso-Finnmark Fault Complex, TB – Tromsø Basin, TKFZ – Trollfjord-Komagelv Fault Zone, VH – Veslemøy High, VP – Varanger Platform, VVP – Vestbakken Volcanic Province

tions along the seismic refraction profile, performed within the 4th International Polar Year (IPY) under the framework of the international project “The Dynamic Continental Margin Between the Mid-Atlantic-Ridge (Mohns Ridge, Knipovich Ridge) and the Bear Island Region.” A 410 km long Ocean Bottom Seismometer profile BIS 2008 (Fig. 2) from Bear Island in the Barents Sea to the oceanic crust formed along the Mohns Ridge was modeled using raytracing with regard to the observed P-waves.

The northeastern part of the crustal model (Fig. 3) represents typical continental crust, thinned from approx. 30 km thickness beneath Bear Island to approx. 13 km within the COT. The shallowest 3-4 km of the sediments along the continental slope predominantly represents Plio-Pleistocene glaci-

genic deposits. This wedge is underlain by an approx. 1.5 km thick layer of volcanics, known as the Vestbakken Volcanic Province. A 3-4 km thick sedimentary basin beneath the volcanic is modeled between the HFZ and the KF. The P-wave velocity within the layer varies with depth from approx. 5.1 km/s to 5.5 km/s, suggesting predominantly Permian/Carboniferous age. The P-wave velocity in the 3-4 km thick lowermost continental crust is significantly higher than normal (approx. 7.5 km/s). We interpret this layer as a mixture of mafic intrusions and continental crystalline blocks, dominantly related to the Paleocene-Early Eocene event. The crystalline portion of the crust within the southwestern part of the COT consists of an approx. 30 km wide and approx. 6 km thick high-velocity

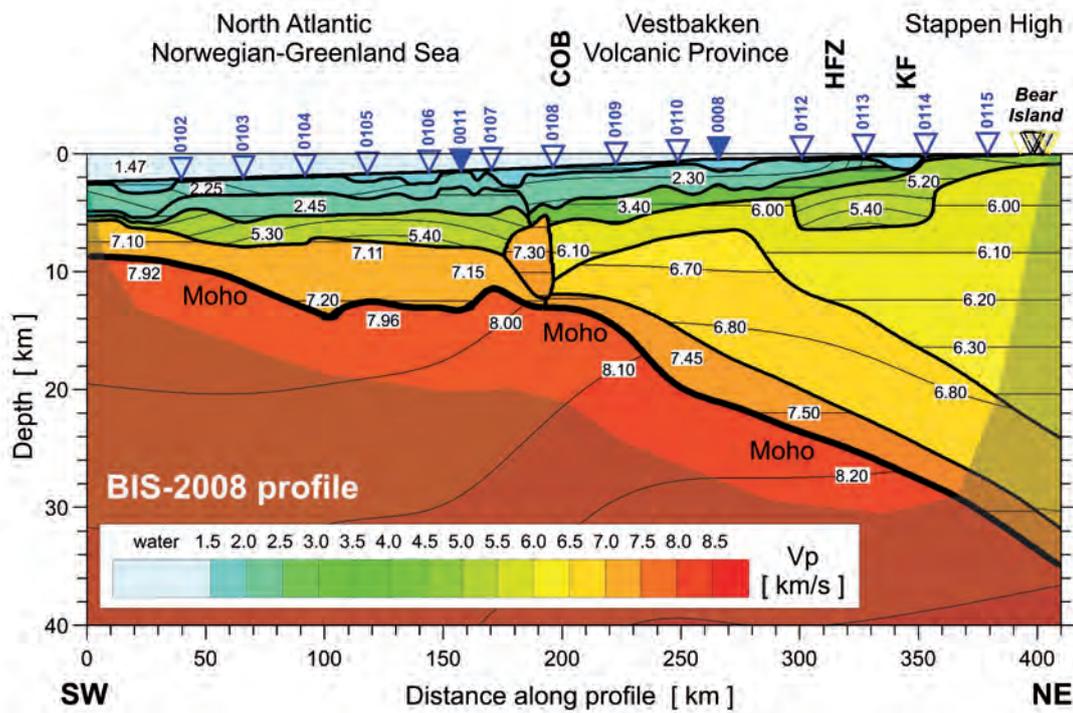


Fig. 3. Two-dimensional seismic P-wave velocity model along the BIS-2008 profile with vertical exaggeration 5:1. Triangles show location of Ocean Bottom Seismographs and land stations; black lines represent seismic discontinuities (boundaries); colors represent the distribution of the P-wave velocity and numbers in the model are P-wave velocities in km/s; areas of missing ray coverage are marked by grey overlay; Moho – lower boundary of the Earth’s crust; COB – continental-ocean boundary; HFZ – Hornsund Fault Zone, KF – Knølegga Fault

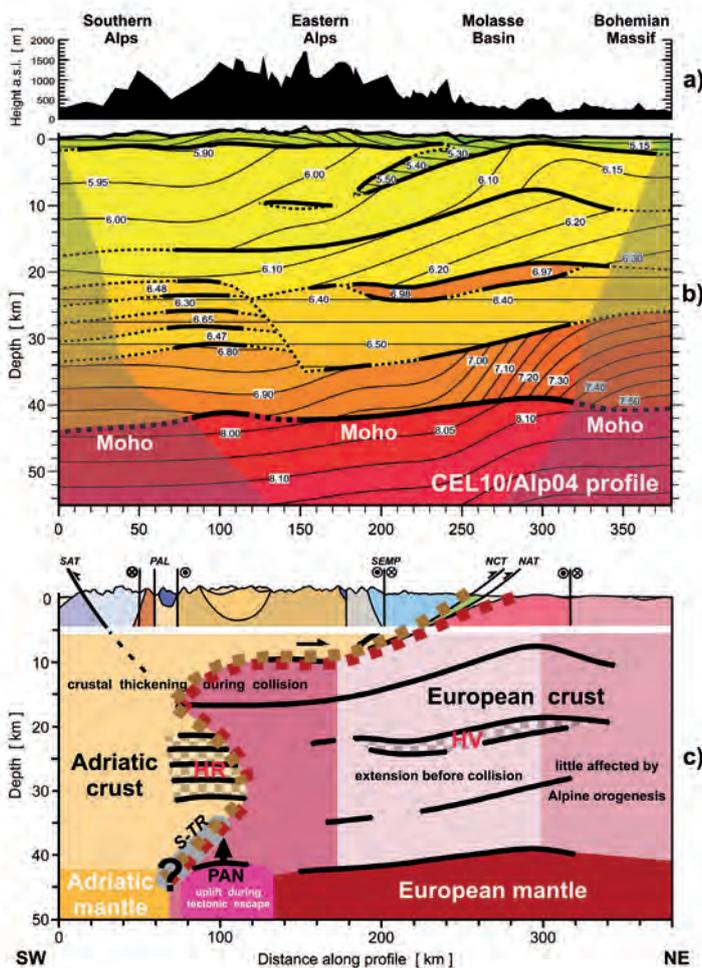


Fig. 4. Seismic model of the Earth’s crust along the CEL10/ALP04 profile (upper figure) and tectonic interpretation of the profile (lower figure). At the top, topography along the profile is shown; vertical exaggeration is 4:1 for seismic model and 25:1 for topography; depth in models relative to sea level. The thick solid lines are well-documented layer boundaries and dashed lines are continuations of boundaries needed in ray-tracing model; thin lines are R wave iso-velocity contours in km s^{-1} . Areas of missing ray coverage are marked by grey overlay. Solid lines show seismic boundary elements or significant velocity structures mapped by reflected and/or refracted waves; chessboard areas are HR or HV zones; bold dashed lines separate European and Adriatic plates; PAN marks Pannonian fragment; S-TR marks the Sub-Tauren ramp

(7.3 km/s) body. We interpret this body as serpentinized peridotites, i.e. exhumed mantle. The magmatic portion of the ocean crust accreted along the Knipovich Ridge from continental breakup at approx. 35 Ma until approx. 20 Ma has an average thickness of 8 km, which is 3-5 km thicker than normal. We interpret the increased magmatism as a passive response to the (extensional) bending of the southernmost part of the Knipovich Ridge. The thickness of the magmatic portion of the crust formed along the Mohns Ridge at approx. 20 Ma decreases gradually to approx. 3 km, which is normal for ultra slow spreading ridges. The normal thickness of the crust along this part of Mohn Ridge, strongly suggest that the larger thickness of the crust formed along the southernmost part of the Knipovich Ridge was unrelated to influence from the Icelandic Plume.

During the last decade, Central Europe has been covered by a series of large seismic refraction and wide-angle reflection experiments (POLONAISE'97, CELEBRATION 2000, ALP 2002 and SUDETES 2003) to obtain better knowledge of the lithospheric structure of this area. Here we look at the two overlapping profiles CEL10 and ALP04, from the CELEBRATION 2000 and ALP 2002 experiments. The CEL10/ALP04 profile crosses the triple point of the European plate, the Adriatic microplate, and the recently identified Pannonian fragment (Fig. 4). The area of the CEL10/ALP04 profile is characterized by a complex tectonic setting. The profile begins in the Po plain near the north-western corner of the External Dinarides and continues northeastwards over the Southern and Eastern Alps to the Flysch belt and Molasse basin. The suture between the European plate and the Adriatic microplate was interpreted on the basis of a 170-km long, coherent upper crustal velocity structure in the European crust and an HV zone in the Adriatic crust. An HV body in the middle Eu-

ropean crust and an HV lower crust under the Bohemian massif correlate with an HV zone derived from the 3-D (3-dimensional) seismic model.

Acronyms of the seismic experiments:

POLONAISE'97 – Polish Lithospheric Onsets – An International Seismic Experiment; CELEBRATION 2000 – Central European Lithospheric Experiment Based on Refraction; ALP 2002 – Eastern Alps and adjacent regions; SUDETES 2003 – Sudetes Mountains and adjacent regions.

References

- Grad M., Tiira T., European Seismological Commission Working Group. (2009). The Moho depth map of the European Plate. *Geophysical Journal International*, 176, 279-292, doi: 10.1111/j.1365-246X.2008.03919.x
- Grad M., Brückl E., Majdański M., Behm M., Guterch A., CELEBRATION 2000 and ALP 2002 Working Groups. (2009). Crustal structure of the Eastern Alps and their foreland: seismic model beneath the CEL10/Alp04 profile and tectonic implications. *Geophysical Journal International*, 177, 279-295, doi: 10.1111/j.1365-246X.2008.04074.x
- Czuba W., Grad M., Mjelde R., Guterch A., Libak A., Krüger F., Murai Y., Schweitzer J., the IPY Project Group. (2010, submitted). Continent-ocean-transmission across a rifted shear-margin: off Bear Island, Barents Sea. *Geophysical Journal International*.

Institute of Geophysics
ul. Ks. Janusza 64, 01-452 Warszawa
phone: 48 (22) 691 59 50
fax: 48 (22) 691 59 15
e-mail: office@igf.edu.pl
www.igf.edu.pl

Habitat mapping in Polish Marine Areas

J.M. Węśławski | Institute of Oceanology | Polish Academy of Sciences

Biological diversity, according to the definition from the World Summit in Rio, covers all organizational levels – from genes through species to

habitats and landscapes. Experience from Marine Protected Areas management shows that habitats are a key element for successful nature protection.

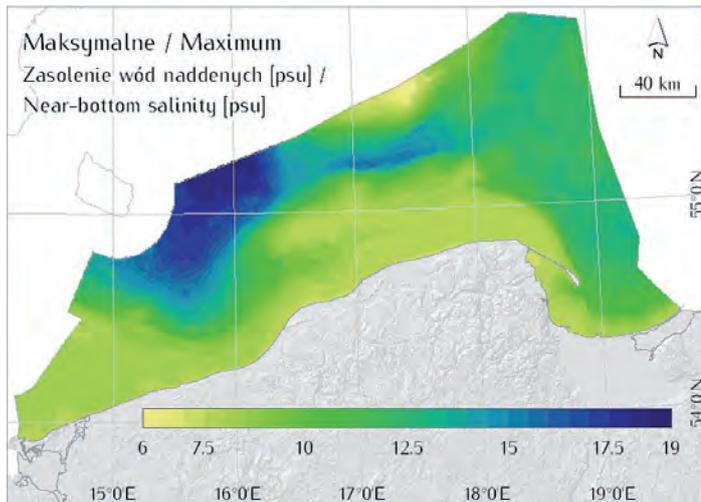


Fig. 1. Mean annual distribution of salinity in near-bottom waters

All other levels of biodiversity are linked to habitats, making habitat maps and inventories of key importance for maritime management.

The perception and valuation of the landscape around us is something common for us all – we do not hesitate to recognize a forest or meadow as in nice condition or degraded. Having such an emotional link to the landscape is natural, and one person may prefer forests over meadows, another may be more partial to river plains, etc. Such perceptions and opinions assist in making the managerial decisions that are typical for democratic society, whereby citizens have a right to prioritize forest preservation over meadows, for instance, or to throw their support behind a property development option. These

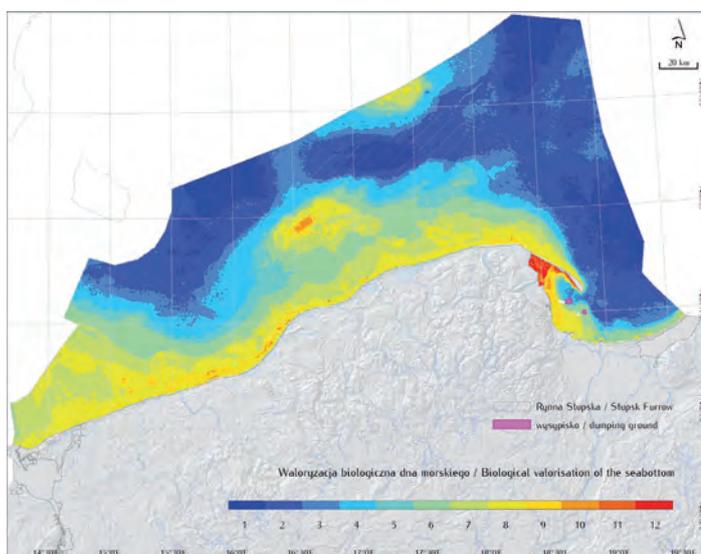


Fig. 2. Biological valorization of the sea bottom (Polish Exclusive Economic Zone)

mechanisms may be facilitated by opinion polls, the collection of questionnaires, the initiation of public discourse.

However, the above experience fails when the seascape is concerned. Who can formulate an opinion about whether they prefer a seagrass meadow of *Zostera* species over a meadow of *Chara*? What esthetic values could be linked to a bush of *Furcellaria* red algae at 10m depth? The truth is that for the average citizen the sea is just a grey surface occasionally good for bathing, whereas the seabed is generally unknown if not simply uninteresting.

But it turns out that as the space on land becomes short, human pressure on the shallow sea space is increasing in Europe in general as well as in Poland in specific. Investors are developing large infrastructure projects, cables, pipelines, harbors, windmill farms, etc. Traditional “users” of the sea (fishermen and sailors) are therefore facing new competitors, each in conflict for space with the others. For any given site, there is often an either/or choice to be made, with one of the options necessarily ruled out because both will not work: e.g. a windmill farm or sea gravel mining, fishing grounds or space for cables and pipelines, a recreational or industrial area. Sorting out such options requires solid knowledge about the sea bed. Such knowledge was generated by our project, funded by the Norwegian Financial Mechanism.

Our team of six major Polish research institutes plus one from Norway developed a detailed natural environment atlas to demonstrate Poland’s responsibility for the proper management of the Baltic Sea. Besides series of maps that present the occurrence of particular physical properties of the area, we have included a map that somehow summarizes our work – a seabed biological valuation map.

Biological valuation means the assessment of an ecosystem or area based on its intrinsic value, ecosystem integrity, naturalness, and presence of rare and keystone species, without reference to its human uses (the latter constituting its socioeconomic valuation). The map shows 12 degree scale of less to more biologically valuable seabed areas. One can see that the Bay of Puck, an area commonly regarded as the most degraded, is still the most biologically valuable along the Polish sea coast. However, biological valuation maps are not the same as “ecosystem health” maps – e.g. this contaminated and disturbed Bay of Puck would be classified

very low on a map of “ecosystem health” yet it ranks very high on the biological value list. Another example can be found in the open coast of the southern Baltic Sea. The seabed is rather poor in life and monotonous (mobile sands, with few species), but on the other hand it is the healthiest and cleanest part of our marine areas, the least disturbed by man. The maps in the atlas are review material, prepared on a rough scale. Any kind of investment like a cable or windmill park will require precise scale maps, just as good as are needed on land when planning a new building.

References

- Węśławski J.M., Warzocha J., Wiktor J., Urbański J., Bradtke K., Kryła L., Tatarek A., Kotwicki L., Piwowarczyk J., (2009). Biological valorisation of the southern Baltic Sea (Polish Exclusive Economic Zone). *Oceanologia*, 51(3), 415-435.
- Węśławski J.M., Gic-Grusza G., Urbański J., Kryła-Staszewska L., Warzocha J. (2009). *Atlas of Polish marine area bottom habitats – environmental valorization of marine habitats*, Gdynia, Broker Innowacji, 179.

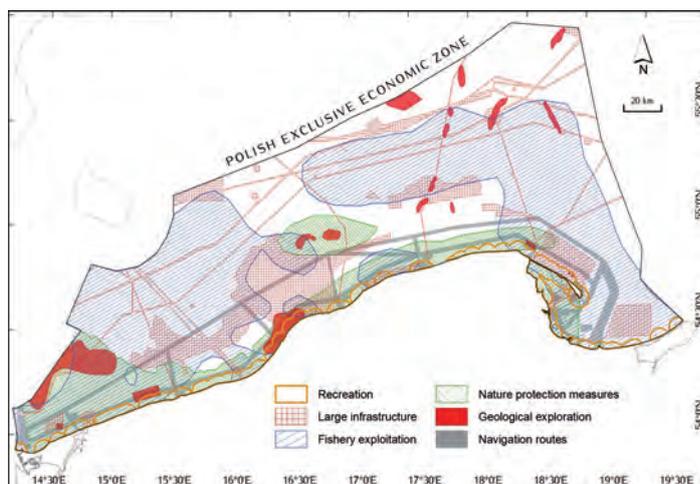


Fig. 3. Users of Polish marine area bottom habitats – map prepared by the GIScience Laboratory, Institute of Oceanography, University of Gdańsk, for a joint paper on “Conflicts over space in Polish Marine Areas” to be submitted to *Oceanologia* in 2010

Institute of Oceanology
ul. Powstańców Warszawy 55, 81-712 Sopot
phone: 48 (58) 551 72 81
fax: 48 (58) 551 21 30
e-mail: office@iopan.gda.pl
www.iopan.gda.pl

Assessment of possibilities for underground neutrino detector location in evaporates of LGOM

J. Ślizowski | K. Urbańczyk | L. Lankof | K. Serbin | Mineral and Energy Economy Research Institute | Polish Academy of Sciences

Since 2009 the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences has participated in the EU LAGUNA project (*Design of a Pan-European Infrastructure for Large Apparatus studying Grand Unification and Neutrino Astrophysics*). The aim of the project is site selection and technical-economic analysis to prepare for the construction of a laboratory for conducting astrophysical research. The main part of the laboratory is to be a chamber with a volume of approximately 100 thousand cubic meters to house a detector for registering solar and supernovae relic neutrinos. Seven potential locations are being considered in the project, presented in Fig. 1: the Boulby potash mine in the UK, Frejus tunnel in

France, Gran Sasso in Italy, Canfranc tunnel in Spain, the Pyhäsalmi metal mine in Finland, the Polkowice-Sieroszowice mine which is part of the LGOM (Legnica-Głogów Copper Area) in Poland and the Unirea salt mine in Romania. The final site selection will depend on the cost of the investment, on a safety assessment for the planned period of 50 years the laboratory will be operational, and on physics-related reasons like the distance from CERN in Geneva and the background of natural radioactivity.

The aim of the contribution performed by the Mineral and Energy Economy Research Institute was to evaluate the possibilities for the excavation of a chamber for a Glacier detector, a cylin-



Fig. 1. Seven potential sites for the subterranean laboratory



Fig. 2. Fracture along a gallery wall – rock salt/anhydrite contact zone

der 74 m in diameter and 38 meters high filled with 100 kT of liquid argon. Two types of geological structures were considered: rock salt and anhydrite layers deposited above the copper ore in the Sieroszowice mine at about 1 km depth. Such large-scale chambers have not yet been excavated at this depth and the proposed work would be an innovative project.

A preliminary study has shown that the excavation of such a chamber is possible only in a homogeneous and tectonically stable layer of rock salt or anhydrite, while maintaining sufficient distance

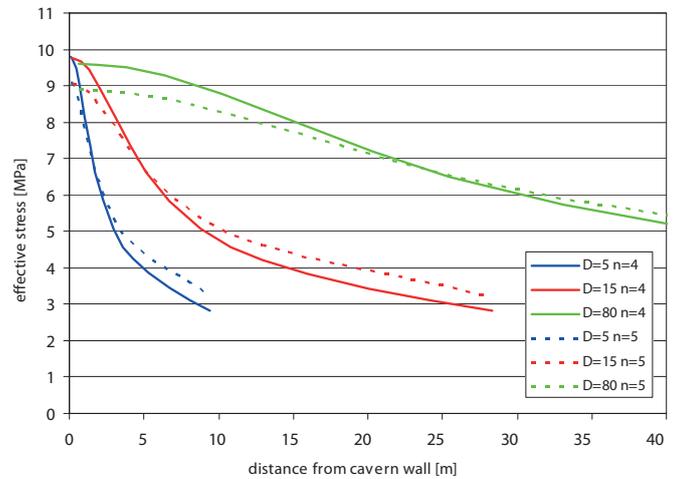


Fig. 3. Effective stress in rock salt massif – the range of chamber impact

from the border. An example of rock destruction at the border of layers is shown in Fig. 2.

A rock salt location for the chamber was considered first. Numerical calculations were carried out (a parametrical study) to determine how the size of excavation will affect the range of the chamber's impact on the rock massif in its vicinity. In the case of rock salt the impact range is very large due to its strong rheological properties, causing a reduction in effective stress at the chamber wall (as compared to elastic bodies) and an increase at the chamber bottom. Figure 3 shows the comparison of chamber impact ranges for the three sizes of chambers.

However, the main problem involved in detector construction in a rock salt layer is associated with convergence, i.e. the loss of chamber volume over time. This issue was analyzed based on numerical calculations that simulate the behavior of rock salt in the chamber's vicinity using two and three-dimensional numerical models. It was found that the high convergence of the chamber will be a significant problem for any location in rock salt. Although anhydrite layers restrict the movement of rock salt massif, considering the 50-year period of chamber operation, one may envision several meters of chamber wall displacement as shown in Fig. 4. Similar conclusions were deduced from an extrapolation of the wall displacements measured at mine galleries to a chamber of larger dimensions. The results of the research showed a lack of a sufficient margin of safety for such a costly investment.

The second location considered was a layer of anhydrite above the rock salt. The main advantages of this location are: elasticity of the anhydrite rock

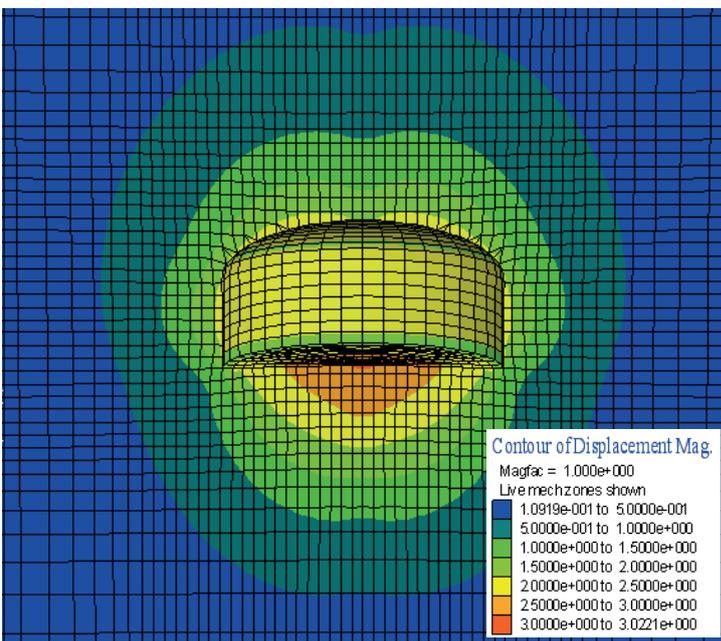


Fig. 4. Contour of displacement magnitude for chamber located in rock salt

(minimum elasto-plastic properties) and a smaller depth, allowing the detector to be placed at a depth of 650 m b.g.l. Disadvantages of such a location are the wide variety of anhydrite properties in the rock massif and the water hazard. Numerical calculations were performed adopting much less favorable properties of anhydrite rock in comparison with the results obtained from laboratory tests of rock samples. For example, the adopted value of the uniax-

ial strength was 27.5 MPa while the uniaxial strength obtained from the laboratory tests was about 90 MPa. Despite such pessimistic assumptions the calculations showed that situating the chamber in a layer of anhydrite is acceptable from the geomechanical point of view. The area of the ventilation shaft of the Polkowice mine was selected as a most promising location. Nevertheless, confirmation of this location requires excavation of access galleries and detailed geophysical surveys.

References

- Ślizowski J., Walaszczyk J. (2008). Long term stability evaluation of natural gas storage caverns. *Gospodarka Surowcami Mineralnymi*, vol. 24, 4/1. IGSMiE PAN, Kraków.
- Ślizowski J., Wiśniewska M., Wojtuszczyńska K. (2009). Pojemność komór magazynowych gazu w pokładzie soli na monoklinie przedsudeckiej [Natural gas storage chambers in a salt layer in the Presudeteten Monocline]. *Zeszyty Naukowe IGSMiE-PAN*, no. 75, 5-11.

Mineral and Energy Economy
Research Institute
ul. Wybickiego 7, 30-261 Kraków
phone: 48 (12) 632 33 00
fax: 48 (12) 632 35 24
e-mail: centrum@min-pan.krakow.pl
www.min-pan.krakow.pl

Present-day evolution of the Himalayan piedmont

L. Starkel | R. Soja | P. Prokop | Stanisław Leszczycki Institute of Geography and Spatial Organization | Polish Academy of Sciences
S. Sarkar | North Bengal University

It was 42 years ago that Polish investigations began on the evolution of relief and present-day erosion in the Darjeeling Himalaya, which in the last decade have extended to the foreland of the Sikkimese-Bhutanese Himalaya. The mountain front rises with steep scarp 1000-2000 m high over the Ganga-Brahmaputra Plain, blocking the advection of humid air masses during the summer monsoon. This part of the Himalayan piedmont probably experiences the greatest transformations

on the whole length of the Himalayan front, rising 1-5 mm annually (Fig. 1). The fan belt of this sector of the Himalayan piedmont covered by sandy soils frequently with coarser gravel fraction is mainly occupied by tea plantations which try to be protected against floods and channel avulsions by embankments, as well as by extensive forest complexes in the eastern part. To the south lower gradients and loamy soils dominate. This is a density populated belt of traditional agriculture with rice fields. This

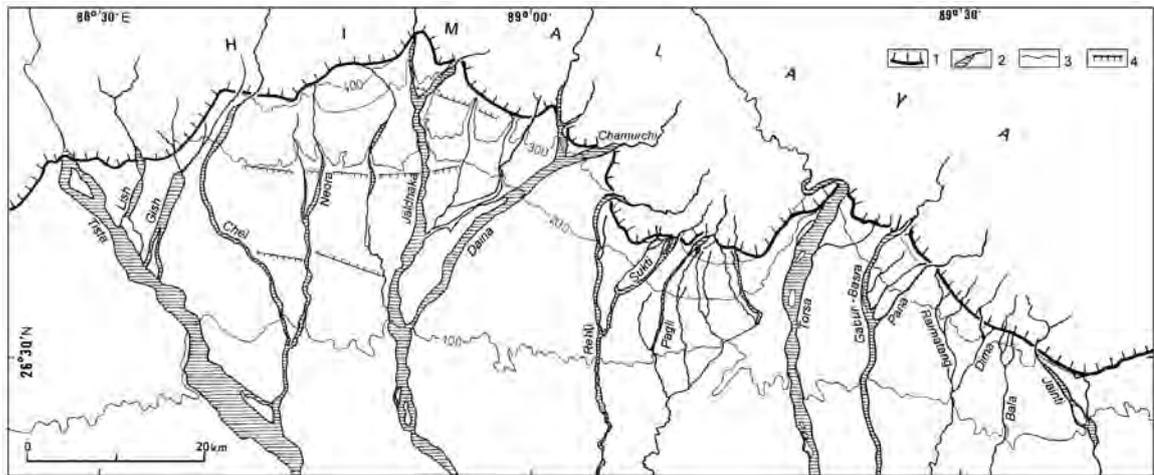


Fig. 1. The Himalayan margin and its foredeep between the Tista and Jainti river
1 – mountain front, 2 – river channel, 3 – contours (m a.s.l.), 4 – tectonic escarpment

region is of special strategic importance for the Indian state. Located in the narrow pass between the Himalayan scarp and the Bangladesh border, it is used by the only railway and road track to join Assam and other north-eastern states with the main Indian territory.

Our research was carried out under the bilateral agreement between the Polish Academy of Sciences and the Indian National Science Academy (INSA) within the framework of the Department of Geomorphology and Hydrology in Kraków of the Institute of Geography and Spatial Organization (Polish Academy of Sciences) and the Department of Geography of North Bengal University.

The aim of study was to identify the role of various creative factors: high mountain relief, differentiated active tectonic movements, extreme rainfalls and floods as well as variegated human interventions in the present-day evolution of this extensive piedmont platform. We concentrated on the accelerated aggradation and channel avulsion over extensive alluvial fans during the phase of frequent heavy rains and floods between 1993 and 2000. To recognize the changes of channel pattern over the piedmont belt we conducted a field survey of river channels, their avulsions and the overgrowth of abandoned branches, during field visits between 2000 and 2007. In parallel we analyzed old topographic maps from the 1920s and 1960s and especially satellite images from 1990 and 2001. We



Photo 1. Outlet of the Jainti river from the Himalaya. On the right, a forest partly buried by debris flow from a small tributary (R. Soja)



Photo 2. Remains of an old bridge over the Chel river damaged by flood and replaced due to channel floor raising, November 2007 (L. Starkel)

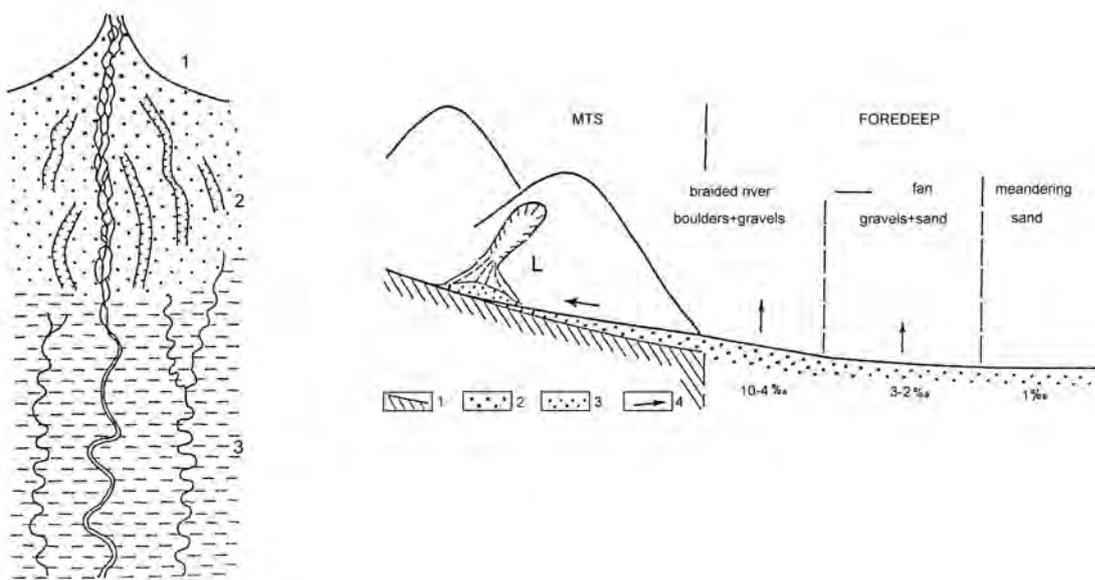


Fig. 2. Old general models of alluvial fans in the piedmont of Sikkimese-Bhutanese Himalaya. On the left spatial model (Starkel et al. 2008): 1 – steep root section, 2 – middle section with braided pattern and paleochannels, 3 – flat lower section with meandering channel and new rivers. On the right longitudinal profile (Starkel, Sarkar 2002): 1 – bedrock, 2 – gravels and boulders, 3 – sands, 4 – tendency of aggradation (vertical and progressing upstream), L – landslide supplying river in colluvia

collected rainfall records for extreme rains from rainfall stations located mainly at tea gardens as well as records on river discharges, water level, and suspended sediment load for two main rivers, the Torsa and Jaldhaka.

The sharp mountains front is dissected by a dense network of rivers and valleys of various size, which in the piedmont zone have deposited extensive fans mainly of torrential character. In the foreland of this part of the Himalaya the differentiated tectonic movements still continue. Therefore, aside from the growing fans in the subsiding foredeep there exist several blocks rising on the routes of rivers, which pass them in incised gorges.

This area is characterized by the highest rainfalls along the whole Himalayan front. The mean annual precipitation at the mountain edge and on the direct foreland reach 4000-6000 mm (in extreme years up to 8000 mm), rapidly decreasing deeper in the mountains. In the years 1993-2001 several continuous rains (2-4 days) bringing 1000-1500 mm (highest daily rainfall 838 mm) were recorded. In the exceptional year 1998 as many as 3 such continuous rains were registered, causing heavy floods, debris flows, widenings and avulsions of channels.

Four types of catchments and rivers characterized by different hydrological regime and geomorphic

effects may be distinguished among the catchments and rivers passing the piedmont zone.

Great transit rivers (like the Tista and Torsa) flowing from the high Himalaya, fed by melting glaciers and snow with more leveled discharges, with deeply incised braided channels, are building the largest alluvial fans.

The smaller rivers like the Jaldhaka, draining lower mountain belts fed by summer rains, register much greater fluctuations of discharge. The smallest catchments of the marginal part of the Himalaya (like the Lish, Daina, Rehti, etc.) with highest rainfalls are characterized by seasonal creeks, carrying heavy bedload. Their fans have the steepest gradient and at the mountain front they build a bank up to 10 km wide inclined up to 30‰ (Fig. 1). Their water infiltrates the ground. In many cases the aggradation enters upstream in the mountains (Photo 1), especially in the catchments partly deforested due to exploitation of coal or dolomite. Such episodic channels are rising at speeds up to 2-3 meters per 10 years (Photo 2).

The last type consists of the meandering rivers, which originate in the lower parts of alluvial fans, fed by the ground water throughout the whole year but rising during summer heavy rains. The meandering pattern is also typical for lower sections of some

Himalayan streams which, at a distance of several tens of kilometers from the mountains with the declining gradient, deposit most coarser sediment load on their way.

On the basis of the presented typology of river channels and alluvial fans, models of fans and profiles of piedmont were developed (Fig. 2). These models take into consideration not only the differences in hydrological regime of their catchments but also the diversity connected with varying activity of present-day tectonic movements and human impact. All of them distinguish this section of Himalayan piedmont from other parts in the Ganga catchment, much better studied by Indian scientists.

References

Soja R., Starkel L. (2007). Extreme rainfalls in Eastern Himalaya and southern slope of Meghalaya Plateau

and their geomorphological impacts. *Geomorphology*, 84, 170-180.

Starkel L., Sarkar S. (2002). Different frequency of threshold rainfalls transforming the margin of Sikkimese and Bhutanese Himalaya. *Studia Geomorphologica Carpatho-Balcanica*, 36, 51-67.

Starkel L., Sarkar S., Soja R., Prokop P. (2008). *Present-day evolution of the Sikkimese-Bhutanese Himalayan piedmont*. Prace Geograficzne, 219, Warszawa, IGiPZ PAN.

Stanisław Leszczycki Institute of Geography
and Spatial Organization
ul. Twarda 51/55, 00-818 Warszawa
phone: 48 (22) 697 88 41
fax: 48 (22) 620 62 21
e-mail: igipzpan@twarda.pan.pl
www.igipz.pan.pl

The International Relations of the Polish Academy of Sciences

The Committee on Energy

T. Chmielniak | Committee on Energy | Polish Academy of Sciences

The Committee comprises 39 people, including 5 members of the Polish Academy of Sciences. The chairman is Prof. Tadeusz Chmielniak, corresponding member of the Polish Academy of Sciences and former Rector of the Silesian University of Technology. The other 20 members of the Committee also work at a number of universities, while 6 members work at institutes within the Polish Academy of Sciences. The remaining members represent business institutions and companies that are closely associated with the power generation industry. This broad range of professions among Committee members facilitates the excellent exchange of opinions and the presentation of power engineering problems from a variety of different points of view.

The current term of office has involved a unique period of activity in the Polish power industry and especially the electric power plant industry. This is due to the new energy policy introduced in the EU that aims to *counteract climate changes, develop the labor market, intensify economic growth, and restrict*



Prof. Tadeusz Chmielniak, chairman of the Committee on Energy

dependency on external power sources. The main tasks to be completed before the year 2020 are:

- 20% lower emissions of greenhouse gases compared to emission levels in 1990,
- 20% of renewable energy sources in the balance of primary power generation,
- 20% lower global consumption of primary energy (higher power generation efficiency; higher power receiver efficiency; improvement in power economy, etc.).

These tasks are crucial, and promise to stabilize climate changes over a longer time period. As the Polish power industry is almost exclusively based on coal, which is burnt directly in power plant boilers in order to generate 93% of total electric power, it is clear that these tasks are particularly onerous for Poland. One of the fundamental questions is whether the existing power generation system can be transformed in order to achieve the CO₂ reduction goals stated in EU Energy Policy for the year 2020 and, further, in the Polish Energy Policy through 2030. In other words, is it possible to eliminate the divergence between the political premises regarding emissions and the current state of development in the technology?

Coal's dominant position in power generation increases current and future ecological problems in the Polish power industry. Despite many initiatives launched to diversify fuel consumption and develop the nuclear power industry, Poland still remains a country with a significant coal share in power generation. Therefore, the development of clean coal technologies is essential in Polish power generation policy, especially considering the level of lifetime deterioration in existing power plants.

One important task is improving energy consumption (including reducing the power-source and electricity consumption required for generating national income) and increasing power generation from renewable sources. Another significant issue regarding further social and economic growth is the

increase in *per capita* electricity consumption. Electricity consumption per citizen in Poland is relatively low. A comparison with the vast majority of EU countries is very unfavorable for Poland. Electricity consumption per citizen is significantly higher in our southern neighbors, Greece, Italy, Spain, and even Portugal, not to mention Germany. Further social and economic growth in Poland is only possible if electricity consumption increases, even despite the launch of other activities that lead to more rational and economical electricity consumption.

In order to overcome the present difficulties and force further rational development in the Polish power industry, new scientific research must be conducted. In some aspects of power generation, research should even be made a priority. The Committee on Energy of the Polish Academy of Sciences strongly supports such activities and evidence of this is its sponsorship of strategic research issues in power generation, especially including the **Advanced Technologies for Obtaining Energy** strategic project. This project comprises the following tasks prepared and led by the members of the Committee:

- Task 1. *Development of technologies for high-efficiency zero-emissions coal power units with CO₂ removal from exhaust gases* – project leader: Prof. Tadeusz Chmielniak, corresponding member of the Polish Academy of Sciences,

- Task 2. *Development of an oxygen combustion technology for pulverized-fuel and fluidized-bed boilers integrated with CO₂ removal* – project leader: Prof. Wojciech Nowak,

- Task 3. *Development of integrated technologies for fuel and energy production from biomass, agricultural wastes and other sources* – project leader: Prof. Jarosław Mikielewicz, corresponding member of the Polish Academy of Sciences.

Moreover, Dr. Marek Ściążko leads many research assignments in a fourth task (mainly) and the first task of the *Development of coal gasification technology for high-effective fuel and electric power generation* project.

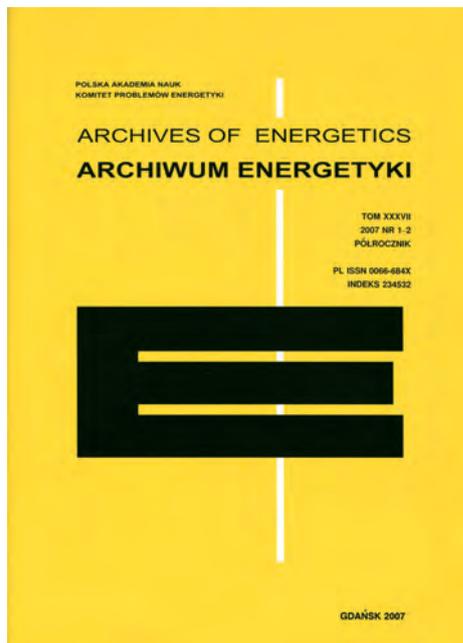
This project integrates a major part of the research potential in power engineering concentrated in universities, institutes within the Polish Academy of Sciences, and industrial sector institutes. Its tasks have been discussed during numerous meetings of Committee members and conferences or research seminars organized by the Committee: *Zero-emissions technologies – oxy-combustion*, Częstochowa, 1-2 April 2008; *Stabilization of Polish power generation safety in the years 2008-2020 (regarding the period up*

to 2050) by means of market mechanisms (economy) and advanced technologies – various scenarios for power generation growth, Serock / Warsaw, 16-17 June 2008; *Development strategies for power generation machines and equipment*, Gliwice, 28-29 September 2009.

One of the fundamental forms the Committee's activities take is plenary meetings often organized with other institutions, such as the Ministry of the Economy, the Council for Atomic Energy Matters of the National Atomic Energy Agency, the Polish National Energy Conservation Agency, and the Polish Member Committee of the World Energy Council. These meetings usually involve very intense discussions after the introductory presentations. The results of the discussions have been included, for example, in the opinions sent to the presidium of the Polish Academy of Sciences and government institutions. There have been three opinions on the government document **Polish Energy Policy through 2030** (2007, 2008, 2009) and one opinion on the development of the nuclear power industry in Poland. This last opinion emphasizes the crucial importance of this branch of the power generation industry, especially given the situation where CO₂ emissions must be restricted and sources of electricity in Poland must be diversified. Currently the review on **Fuel, technological, and ecological challenges for the Polish power industry** is in its final stage of preparation. This is a comprehensive document that fundamentally analyzes the current state of the Polish power generation sector, its perspectives and possibilities for development, and provides an opinion on the strategic project of ensuring more rational energy consumption.

Another form of Committee activity is partnership in the organization of conferences and sponsorship of research or research and technical conferences on power generation problems. Partners in these activities have included Warsaw University of Technology, Kraków University of Technology, Silesian University of Technology, Poznań University of Technology, Częstochowa University of Technology, Opole University of Technology, the Committee on Mineral and Energy Economy of the Polish Academy of Sciences, the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences, the Society of Polish Power Engineers, and the Economy Chamber of Energy and Environmental Protection.

The Committee supported the launch of a new scientific discipline – **Power Engineering** – in 2008.



The Committee also supervises the journal *Archives of Energetics*, which has been published since 1972 and has been an integrated part of the Committee since 1975. *Archives of Energetics* publishes original research papers in the field of power engineering that involve the following groups of problems: development in the power industry, optimization of power generation systems and machinery design

and operation, fundamentals of power generation systems and machinery design, and new power generation technologies. Until now the journal has been published biannually, but this year it is scheduled to become a quarterly.

During the current term of office, the Committee has continued its cooperation with the International Institute for Applied System Analysis (IIASA) in Laxenburg (Austria) and the Polish Member Committee of the World Energy Council (WEC). The Committee also cooperates with the European Turbomachinery Conference. Committee members are involved in many other commissions, committees and international research organizations, and cooperate with local authority representatives in Poland. The Committee cooperates with the Parliamentary Committee on Power Engineering and the Society of Polish Power Plants. Many Committee members are also members of other Polish Academy of Sciences committees, chiefly including the Committee on Thermodynamics and Combustion.

Committee on Energy
ul. Konarskiego 18, 44-100 Gliwice
phone: 48 (32) 237 11 15
e-mail: tadeusz.chmielniak@polsl.pl
www.kprobleen.pan.pl

The First Polish-German Workshop on Research Cooperation in Computer Science

A. Borkowski | Institute of Fundamental Technological Research | Polish Academy of Sciences

The First Polish-German Workshop on Research Cooperation in Computer Science (PGCS'09) took place in Kraków on 15 June 2009. Organized by the Polish Academy of Sciences' Division of Technical Sciences and Institute of Computer Science, the event gathered 28 prominent scientists from both countries. The aim of the meeting was to create an overview of current bilateral projects and to discuss how Polish-German cooperation in this important field can be made more active in the future.

21 papers covering such diverse areas as decision support, genetic optimization, analysis and synthesis of natural language, applying computer vision techniques in surgery, etc., were presented during the meeting. Members of the Division of Technical Sciences, J. Kacprzyk, J. Klamka, R. Słowiński and



Participants of the PGCS'09 meeting taking a farewell picture after the final discussion (courtesy of Prof. G. Rudolph)

R. Tadeusiewicz, took active part in the Workshop, either contributing papers or participating in the final discussion. A report on Intelligent Decision Support Systems was published as a result of the meeting, announcing a joint call for papers in this research area. The report was sent to potential funding bodies, the Ministry of Science and Higher Education in Poland, and the German Research Foundation (DFG).

Institute of Fundamental
Technological Research
ul. Pawińskiego 5B, 02-106 Warszawa
phone: 48 (22) 826 12 81
fax: 48 (22) 826 98 15
e-mail: director@ippt.gov.pl
www.ippt.gov.pl

Forging Contacts with the German Academy of Sciences Leopoldina

W. Włosiński | Polish Academy of Sciences

On March 31, 2009, a working meeting took place in Halle between representatives of the Polish Academy of Sciences, led by its President Prof. M. Kleiber, and representatives of the German Academy of Sciences Leopoldina, headed by Prof. V. ter Meulen.

For the Polish Academy, the aim of the meeting was to learn about the challenges faced by the Leopoldina, recently granted the status of Germany's national academy, and to discuss prospects of collaboration.

The Leopoldina's main objective – outlined in its statute from 1991 – is to support the development of science through organizing various scientific events, publishing research results, keeping a scientific archive and library, and awarding distinctions and prizes. In fulfilling its statutory tasks, the Leopoldina collaborates with scientific institutions in Germany and abroad.

The Leopoldina plays an advisory role on issues faced by science within politics and society, and collaborates with the German Academy of Science and Engineering (acatech) and with the academies of science in individual German states. Its official policies are defined by *ad hoc* commissions and advisory groups. The Leopoldina also acts to improve collaboration between researchers and supports young scientists. As a national science academy, the Leopoldina currently represents German scientists on international scientific committees, including academies of science from G8 countries, the European Academies' Science Advisory Council (EASAC), the Federation of European Academies of Medicine (FEAM), the European Federation of National Academies of Sciences and Humanities (ALLEA), the InterAcademy Medical Panel (IAMP), and the InterAcademy Panel (IAP).

In the fall of 2007, Germany's Federal Minister of Education and Research, Dr. Annette Schavan, initiated proceedings to grant the Leopoldina the function of Germany's national academy of sciences; the newly formed Joint Science Conference of the Federal and State Governments (*Gemeinsame Wissenschaftskonferenz von Bund und Ländern*) passed a resolution to this effect in February 2008. The ceremony awarding the Leopoldina the function of Germany's National Academy of Sciences took place in Halle on 14 July 2008.

The discussions led to the adoption of the following forms of collaboration: a lecture exchange program by leading researchers (1-2 per year), supporting joint applications for EC funds, sharing information on scientific events, exchanging information on published expert reports and recommendations, issuing joint statements or joining



Meeting of the representatives of the Polish Academy of Sciences and the German Academy of Sciences Leopoldina. From left: Prof. Bärbel Friedrich, Prof. Michał Kleiber, and Prof. Jörg Hacker (A. Jaskot)

those put forward by another academy, reinforcing the Polish Academy's participation in the works of EASAC; and popularizing EASAC's reports among authorities on all levels, as well as suggesting new topics for EASAC.

German Academy of Sciences Leopoldina
Postfach 110543
D-06019 Halle (Saale)
phone: 49 (0) 345 4 72 39 0
fax: 49 (0) 345 4 72 39 19
e-mail: leopoldina@leopoldina.org
www.leopoldina-halle.de

Educational and Promotional Activity within the Polish Academy of Sciences

Scholarships of the President of the Polish Academy of Sciences

The scholarships of the president of the Polish Academy of Sciences are awarded to young researchers studying in the doctorate programs of the Academy's research establishments. Their objective is to promote some of Poland's most talented young individuals and to offer them the possibility of bet-

ter conditions for doing research. Great hopes and expectations are pinned upon the most talented young researchers selected in this competition. Here we have the pleasure to present the laureates of the president's scholarships from 2007, who finalized their research projects this year.

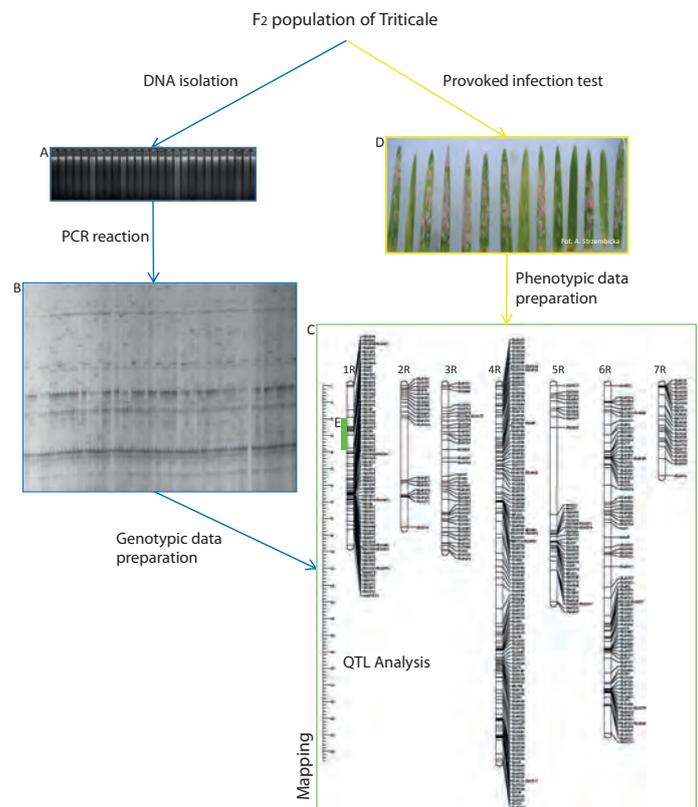
Molecular markers associated with resistance to powdery mildew (*Blumeria graminis*) in triticale (*x Triticosecale* Wittm.)

M. Chrupek | Franciszek Górski Institute of Plant Physiology | Polish Academy of Sciences

The PhD project of Małgorzata Chrupek under the supervision of Prof. Maria Wędzony (Institute of Plant Physiology, Polish Academy of Sciences) in cooperation with Prof. Mirosław Tyrka (Rzeszów University of Technology) sought to identify QTLs (Quantitative Trait Loci) that control the resistance/tolerance of triticale (*x Triticosecale* Wittm.) to the infection of powdery mildew (*Blumeria graminis*). This problem is a vivid one, since the fungus has recently become an important factor limiting triti-



Małgorzata Chrupek at work (J. Nizioł)



Project scheme: (A) Fragment of agarose gel after DNA isolation – white bands indicate high concentration of DNA, (B) Fragment of silver staining polyacrylamide gel after PCR – dark bands indicate polymorphism between F2 lines, (C) genetic map of R genome after linkage analysis of 908 markers, (D) Triticale leaves after *Blumeria graminis* infection, (E) QTL region on chromosome 1R

cale yield. A genetic linkage map based on genotyping of the populations with SSR, RGA and DArT markers was constructed for the segregating population of susceptible × resistance cultivars. Reaction to pathogen was field tested in provoked infection conditions. QTL analysis revealed 3 main, stable QTLs on chromosomes 7A, 4B and 1R. Further analysis will indicate markers useful in the breeding process. Plans call for the markers to be validated on Polish triticale cultivars in cooperation with

DANKO Plant Breeders Ltd.; the company is interested in practical application of the research results.

Franciszek Górski Institute of Plant Physiology
ul. Niezapominajek 21, 30-349 Kraków
phone: 48 (12) 425 18 33, 48 (12) 425 18 34
fax: 48 (12) 425 18 44
e-mail: ifr@ifr-pan.krakow.pl
www.ifr-pan.krakow.pl

Innovative mixed oxide catalysts for CO₂ utilization

J. Plona | Institute of Catalysis and Surface Chemistry | Polish Academy of Sciences

One of the most attractive methods of carbon dioxide utilization is its catalytic conversion to methanol, an important chemical with a wide range of applications. The aim of this PhD project was to design, prepare, and characterize Cu/ZnO/Al₂O₃ mixed oxide catalysts derived from layered double hydroxide (LDH) precursors. LDHs, upon thermal decomposition, yield solids with unique properties, such as high specific surface area and homogeneous dispersion of metal ions. CuZnAl-LDH, CuZnAlZr-LDH and CuZnAlGa-LDH precursors, free of crystalline impurities, were successfully synthesized and transformed by heat treatment into nanocrystalline CuO dispersed in amorphous mixed oxide matrix. All the catalysts were active in methanol synthesis from CO₂/H₂ – most of them exhibited higher activity than the industrial catalyst for methanol synthesis from syngas. The best LDH-derived catalysts gave higher methanol yields than those described to date in the literature for similar catalytic conditions.



Justyna Plona in the lab (R. Vit)



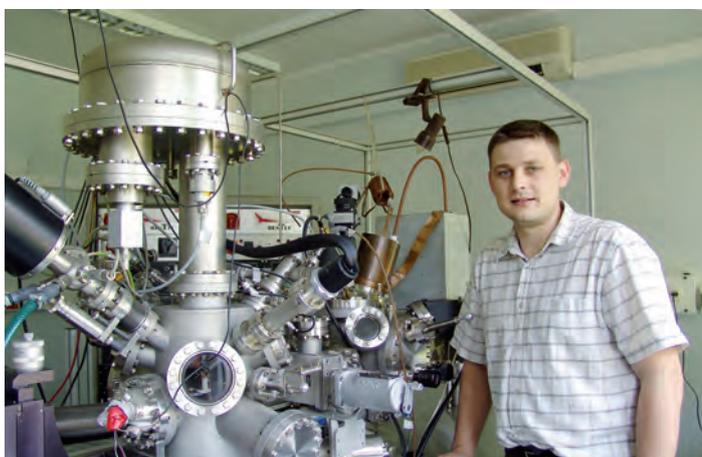
High pressure fixed-bed flow reactor connected online to gas chromatograph for catalytic tests (J. Plona)

Institute of Catalysis and Surface Chemistry
ul. Niezapominajek 8, 30-239 Kraków
phone: 48 (12) 639 51 01
fax: 48 (12) 425 19 23
e-mail: ncikifp@cyf-kr.edu.pl
www.ik-pan.krakow.pl

Colloidal domain lithography for regularly arranged artificial magnetic out-of-plane monodomains in NiFe/Au/Co/Au layers

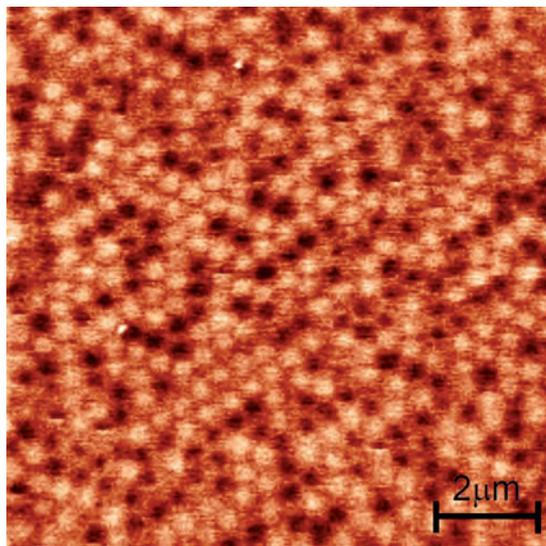
P. Kuświk | Institute of Molecular Physics | Polish Academy of Sciences

Regularly arranged magnetic out-of-plane patterns are promising for applications in data storage technology (bit patterned media) and magnetic particle transport. For both fields, the final goal is to fabricate patterns of individually switchable monodomain areas with negligible mutual interac-



Piotr Kuświk at work (B. Cicha)

tions and thermally stable remanent magnetizations. To achieve this was the aim of Piotr Kuświk's PhD project, carried out at the Institute of Molecular Physics, Polish Academy of Sciences, under the supervision of Prof. Feliks Stobiecki. Using magnetic force microscopy, it was demonstrated that domain lithography can be done by light ion bombardment of NiFe/Au/Co/Au layer system through a colloidal mask of hexagonally arranged spherical polystyrene beads. This new technique enables magnetic patterning of regularly arranged cylindrical magnetic



Artificial magnetic domains in NiFe/Au/Co/Au layer system obtained by 10 keV He⁺ ion bombardment through a colloidal mask, imaged by magnetic force microscopy

monodomains with out-of-plane magnetization embedded in a ferromagnetic matrix with easy-plane anisotropy. The physical origin of the creation of artificial monodomains is the formation of periodic lateral anisotropy variations induced by ion bombardment.

Institute of Molecular Physics
ul. Smoluchowskiego 17, 60-179 Poznań
phone: 48 (61) 869 51 00
fax: 48 (61) 868 45 24
e-mail: director@ifmpan.poznan.pl
www.ifmpan.poznan.pl

Center for Preclinical Research and Technology (CePT) in Warsaw

S. Majewski | Polish Academy of Sciences | Medical University of Warsaw

The Center for Preclinical Research and Technology (CePT) project is the largest biomedical and biotechnological undertaking in Central and Eastern Europe. The aim of this project is to create a dynamic scientific center in Warsaw consisting of closely cooperating research laboratories – core

facilities, conducting research on the most common civilization-related diseases (especially neoplastic, neurological, and vascular diseases), as well as ageing and age-related diseases. On 7 June 2010 the official decision on financing the CePT project was signed by European Commissioner Johannes Hahn. The

total budget of the project is nearly 100 million euro.

The CePT consortium was established in November 2008 by: the Medical University of Warsaw (WUM), being the coordinator of the project, University of Warsaw (UW), Warsaw University of Technology (PW) and seven institutes of the Polish Academy of Sciences: the Nencki Institute of Experimental Biology (IBD PAN), Institute of Biochemistry and Biophysics (IBB PAN), Mossakowski Medical Research Center (IMDiK PAN), International Institute of Molecular and Cell Biology (MIBMiK), Institute of Fundamental Technological Research (IPPT PAN), Institute of High Pressure Physics (IWC PAN), and Nałęcz Institute of Biocybernetics and Biomedical Engineering (IBiB PAN).

The following CePT Laboratories – core facilities will be created:

- The Center for Neurobiology (CN) at IBD PAN;
- The Center of Preclinical Studies (CPS) at WUM;
- The Center of Experimental Medicine (CEM) at IMDiK PAN;
- The Center of the Analysis of the Structure and Function of Proteins (CASFP) at MIBMiK;
- The Center for the Physicochemical Research of Biologically Significant Systems and Materials (CPR-BSSM) at UW;
- The Center for Molecular Biotechnology (CMB) at IBB PAN;
- The Center for Large-Scale Modeling and Processing of Biomedical Data (MODEL) at the Interdisciplinary Center for Mathematical and Computational Modeling at UW;
- The Radiopharmaceuticals Production Center. 11C and 15O Chemistry Laboratory (LIKPET) at UW;
- The Center for Bionanomaterials (CB) at IWC PAN, IPPT PAN and PW;
- The Center for Biomedical Technologies and Medical Physics (BIOFIM) at PW.

The main goal and at the same time the chief asset of the CePT project is to bring together the potential of outstanding scientists and the opportunities provided by the infrastructure of well equipped state-of-the-art core-facility research laboratories: physical and chemical laboratories (UW), biomolecular and biotechnological facilities (UW,



Center of Preclinical Studies at the Medical University of Warsaw

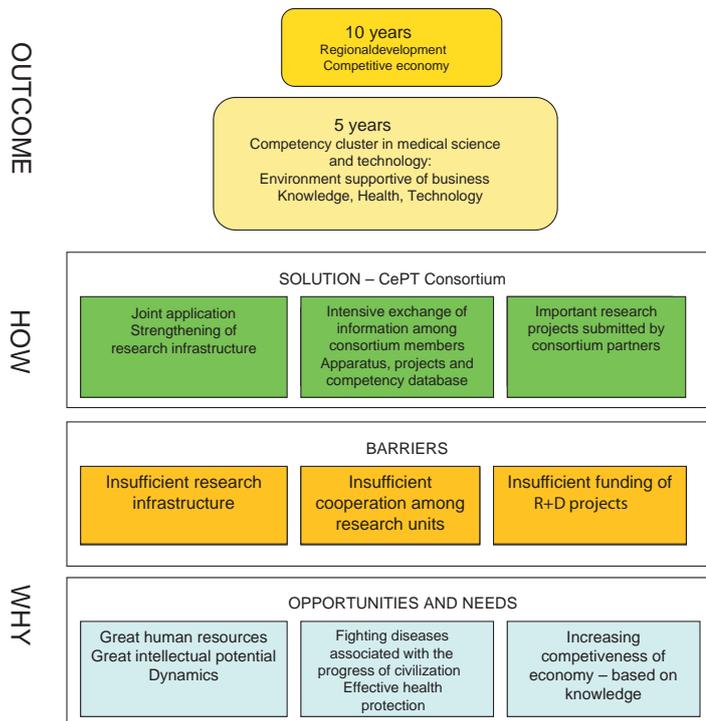


Center of Neurobiology at the Nencki Institute of Experimental Biology, Polish Academy of Sciences

PAN, WUM), biomedical engineering and biomaterial technology laboratories (PW, PAN), units conducting preclinical research on animal models of diseases associated with the progress of civilization (PAN, WUM), as well as the specialized base for clinical research provided by the Medical University of Warsaw.

The great value of the CePT project is the interdisciplinary and systemic approach to the investigated problem: from gene and protein to cell and whole organism. The CePT project is becoming an integrated part of the dynamic development of world translational medicine, aimed at urgently putting the latest achievements in preclinical research into practical medicine.

The research project, which at present consists of over 100 conceptual projects, does not consti-



tute a rigid action plan but rather a navigation tool that will dynamically evolve along with research and technological progress. It should be assumed that execution of the CePT investment will only begin the undertaking of new research challenges supported by significant national and international funding. Many individual research projects which will be performed under the CePT Research Program expect to involve cooperation with more than 10 other projects covered by the program. This is the best evidence of close collaboration among the members of the Consortium already at the level of implementation. The project will be located in the center of Warsaw, within the Śródmieście, Ochota, and Mokotów districts. Such a concentration of laboratories within a few square kilometers shall facilitate cooperation between research units

and increase the functionality of the whole CePT initiative.

The involvement of young scientists and PhD candidates in CePT activities will help educate a new generation of experienced Polish scientists. An open structure of the Center following best-practice examples in Europe (e.g. the European Molecular Biology Laboratory) will facilitate the inflow of world class scientists and qualified technical personnel from abroad. Combining the potential of several hundred leading scientists in the fields of biology and medicine with opportunities created by newly purchased high-tech research equipment, the CePT project will surely contribute to the increasing competitiveness of Polish science, thus supporting implementation of the second priority axis of the Innovative Economy Operational Program.

An integral part of the CePT project concept is creating technology platform transfer in accordance with the best models in Europe, taking into account the developing innovative pharmaceutical industry and the health needs of society. The main technology transfer platform set-up best practices will include: a) improved communication and interaction between public and private sector, b) procedures and incentive schemes to disseminate and effectively exploit research results to translate them into new products and technologies, c) proper management of intellectual property, d) engagement in academia-industry collaboration, e) creating spin-offs, and f) licensing research results to industry.

Center for Preclinical Research and Technology
 ul. Ks. Trojdena 2a, 02-109 Warszawa
 phone: 48 (22) 572 01 15
 fax: 48 (22) 572 04 86
 e-mail: cept@wum.edu.pl
 www.cept.wum.edu.pl

The “Polish Nobel Prizes” for 2009

This year’s prizes of the Foundation for Polish Science (FNP) were won by Prof. Jerzy Strzelczyk, Prof. Andrzej Koliński, Prof. Józef Barnaś, and Prof. Bogdan Marciniak. Informally known as the “Polish Nobel Prizes,” 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.



D. Żołądź-Strzelczyk

Prof. Jerzy Strzelczyk is a historian specializing in the medieval history of Poland and Europe, especially the political, social, ethnic, and intellectual development of the early and high Middle Ages, the history of Western Slavs and Slavo-Germanic relations, geographical lore and the expansion of geographical knowledge in Antiquity and the Middle Ages, and the participation of women in the history of European and non-European culture. He is a full professor at the Institute of History of the University of Poznań (PhD 1968, *habilitation* 1975, professor 1984) and head of the Department of Medieval History. He served as vice-president of the University of Poznań in 1989-1991, and as director of Institute of History in 1991-1996. Winner of Alexander von Humboldt scholarships in 1977-1978 and 1984. Full member of the Polish Academy of Arts and Sciences (PAU) in Kraków, a corresponding mem-

ber of the Polish Academy of Sciences (PAN) and of Historische Kommission in Berlin. Author of several hundred research works, including the books: *Odkrywanie Europy* [Discovery of Europe] (1970, 2000, Slovak translation 1975), *Słowianie i Germanie w Niemczech środkowych we wczesnym średniowieczu* [Slavs and Germans in Central Germany in the Early Middle Ages] (1976), *Goci – rzeczywistość i legenda* [Goths – Reality and Legend] (1984), *Iroszkoci w kulturze średniowiecznej Europy* [Hiberno-Scots and Their Impact on European Civilization] (1987, 2008), *Wandalowie i ich afrykańskie państwo* [Vandals and their African State] (1992, 2005), *Mieszko Pierwszy* [Mieszko the First] (1992, 1999), *Bolesław Chrobry* [Bolesław the Brave] (1999, 2003), *Otto III* (2000), *“Klucz do poznania nieba”: z dziejów myśli racjonalistycznej w średniowieczu* [The Key to Understanding Heaven: From the History of Rationalistic Thought in the Middle Ages] (2003), *Średniowieczny obraz świata* [The Medieval View of the World] (2004), *Apostołowie Europy* [Apostles of Europe] (1997), *Mity, podania i wierzenia dawnych Słowian* [Myths, Legends and Beliefs of the Ancient Slavs] (1998, 2007), *W poszukiwaniu królestwa kapłana Jana* [In Search of Prester John’s Kingdom] (2006), *Zapomniane narody Europy*, [Forgotten Peoples in Europe] (2006, Jan Długosz Award 2007). The 2009 prize of the Foundation for Polish Science in the field of humanities and social science was awarded to Prof. Strzelczyk for his monograph *Pióro w wątpliwych dłoniach. O twórczości kobiet w dawnych wiekach* [Pen in Delicate Hands: About the Writings of Women in Past Centuries], Vol. I: The Origins (from Sappho to Hroswith) (2007). The next volume, Vol. II: The Zenith (from Murasaki Shikibu to Marguerite Porete), was published in December 2009.

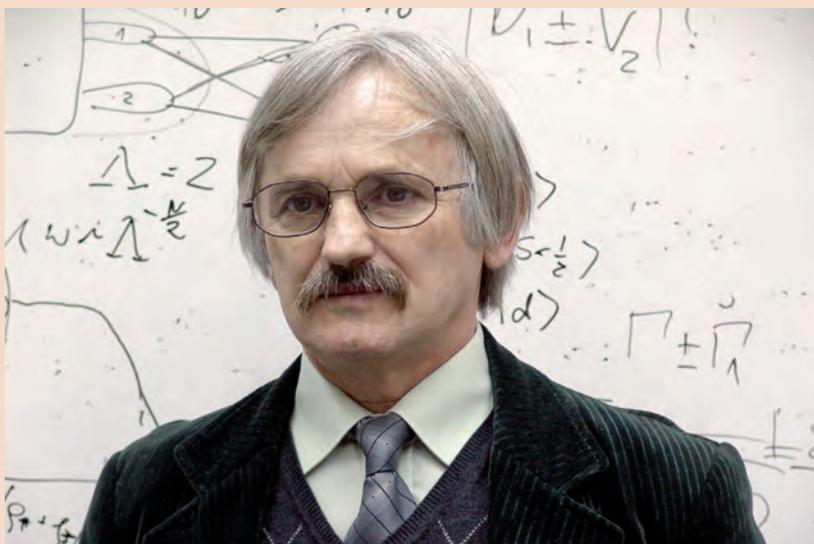


A. Kloczkowski

Prof. Andrzej Koliński developed a new unique approach to large scale protein modeling, based on combinations of coarse-grained Monte Carlo simulations with classical molecular mechanics. Numerous genomic projects provide an enormous number of proteins' amino acid sequences. Specialized databases contain millions of protein sequences. The number of experimentally solved protein structures is about a thousand times smaller and now stands at slightly over 60,000. This is because the sequencing is relatively simple, inexpensive,

and to a large extent automated, while structure determination is time-consuming, expensive, and requires the participation of highly-educated personnel. Knowledge of the three-dimensional protein structures is essential for the understanding of the molecular basis of life and, on a more practical level, is crucial for new drug discovery, the design of new biomaterials, etc. Due to the gap between the number of known sequences and the number of already determined structures, the theoretical prediction of protein structures, protein interactions, dynamics and thermodynamics of biomacromolecular processes represents the most important challenge in contemporary theoretical molecular biology.

Thanks to a significant reduction in the number of explicitly treated degrees of freedom and properly designed knowledge-based interaction schemes, it became possible to model the entire folding pathways of proteins and the mechanisms of macromolecular assembly of multiprotein complexes. Prof. Koliński has authored nearly 200 scientific publications, which have received over 5000 citations from other scientists. In the past he conducted his research at several prestigious institutes, including the Scripps Research Institute in San Diego, the Donald Danforth Plant Science Center in Saint Louis, and the Center for Excellence in Bioinformatics at Buffalo. Now he is the head of Theory of Biopolymers Laboratory at the Faculty of Chemistry, University of Warsaw.



Prof. Józef Barnaś is head of the Mesoscopic Physics Division at Adam Mickiewicz University in Poznań. His main scientific achievements are related to the theoretical foundations of spin electronics. In the mid-1980s he was working on the theoretical description of spin waves in magnetic multilayered systems. This experience proved very useful when he joined the Jülich Research Center in 1988. Using Brillouin spin wave spectra obtained by Peter Grunberg, he determined the parameter of interlayer exchange coupling. He also accounted for certain features of the coupling parameter, especially its dependence on the thickness of magnetic layers due to interference effects. Together with R.E. Camley from Colorado State University he explained the physics and mechanism of the giant magnetoresistance (GMR) effect. The proposed mechanism, based on spin dependent scattering of electrons on interface roughness and other defects, initiated extensive theoretical research in spin electronics. Later, he continued working on GMR in collaboration with Albert Fert, dealing mainly

with transport perpendicular to plane and the so-called interface (contact) resistance. The important contributions made by Prof. Barnaś to the physics of magnetic mesoscopic systems include spin polarized transport and magnetic control of Coulomb blockade effects in magnetic double tunnel junctions. This also includes systems based on quantum dots, where together with Jan Martinek and others he predicted suppression of the Kondo effect by the ferromagnetism of electrodes, confirmed later in several experiments. Other important achievements concern the phenomenon of current induced magnetic switching due to spin transfer. The model of magnetic switching in the diffuse transport regime, developed in collaboration with Albert Fert and other coworkers, showed the possibility of transition to precessional states without external magnetic field. In several recent papers with young collaborators he showed that current pulse through a magnetic molecule can reverse its spin orientation.



Bogdan Marciniec is a professor at the Faculty of Chemistry, Adam Mickiewicz University. To date he has served as head of the Department of Organometallic Chemistry (1987), president of Adam Mickiewicz University (1988/1990), member of the Presidium of the Polish Academy of Sciences, chairman of the Committee on Chemistry, Polish Academy of Sciences (1996-2007) and chairman of the National Committee of the IUPAC (1996-2007), a representative of Polish Government to the Mirror Group of SusChem (2005), and coor-

dinator of Wielkopolska Center of Advanced Technologies (2006). He received his MSc (1963), PhD (1970), and DSc *habilitation* (1975) degrees from Adam Mickiewicz University. He is currently chairman of the board of the Adam Mickiewicz University Foundation and director of the Poznań Science and Technology Park.

He is the author or co-author of 340 publications, 120 patents, 11 licenses and 42 technologies as well as 22 book chapters. He is also an editor and co-author of 14 books, including *Comprehensive Handbook on Hydrosilylation* (Pergamon Press, 1992), considered by many to be the “bible” on hydrosilylation. A new book *Hydrosilylation – A Comprehensive Review on Recent Advances* was issued by Springer, 2009 (B. Marciniec, ed.).

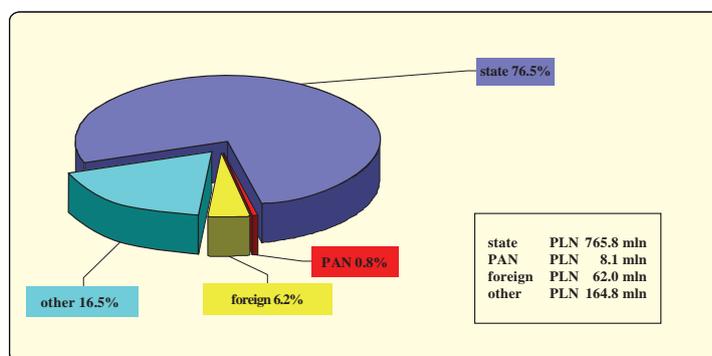
The year 2009 was rich in awards bestowed on Professor Marciniec in appreciation of his achievements. The Foundation for Polish Science gave its 2009 award to Professor Marciniec in the field of technical sciences for his discovery of new reactions and new catalysts of processes employed in the production of organosilicon materials. He also won the award of the Polish Ministry of Science and Higher Education for research on behalf of development of science. He was elected (2009) a member of European Academy of Arts, Sciences, and Humanities (Paris). He was also awarded an Honorary Pearl in the category of science in the 7th edition of the “Pearls of the Polish Economy” competition as well as the “Organic Work Award” commending outstanding inhabitants of the Wielkopolska Region.

Polish Academy of Sciences in 2009

Sources of financing for the Academy and its scientific institutions

The primary source of funding for the Polish Academy of Sciences and its institutions in 2009 came from the state budget. This funding, PLN 56.8 mln, was allocated for the Academy's corporate activity as well as for maintaining centers constituting the infrastructure of the scientific community. Funds for the Academy's scientific institutions were allocated to their statutory activities and research projects completed through the end of 2009.

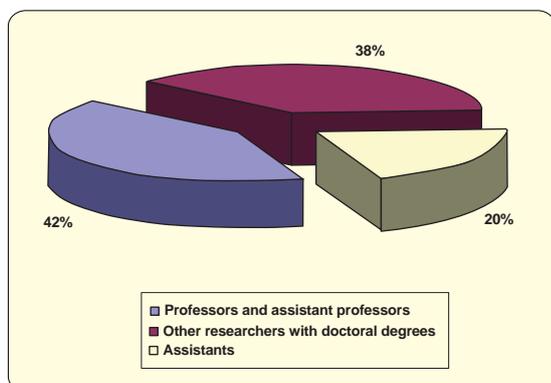
Sources of financing for the Academy's institutions in 2009



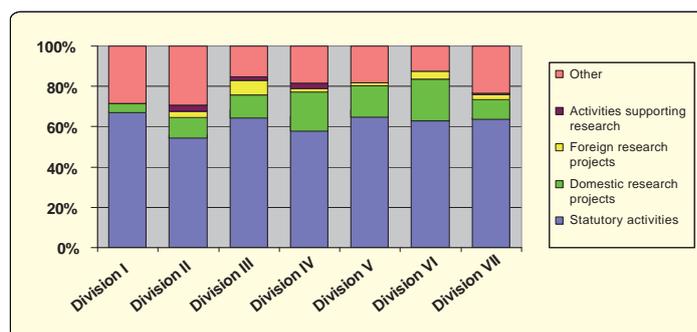
Staff

In 2009 the Polish Academy of Sciences employed a staff of ca. 8,800 individuals, almost 8,000 (91%) of them in scientific units. The remaining staff, i.e. 800 individuals (9%) were employed in its supporting institutions – independent libraries, archives, the Museum of the Earth, experimental stations, etc.

Research staff in the Academy's scientific units in 2009



Breakdown of funding by type of activity pursued by the Academy's institutions in 2009



Activities of the PAN committees in 2009

Conferences	406
Conference participants	56 847
Lectures, conference reports, articles	15 400
Expert reports and opinions	20
Journal titles	254

Scientific degrees and titles granted in the units of PAN in 2009 (by PAN division)

	Scientific degrees and titles		
	Doctorate degrees	DSc (<i>habilitation</i>) degrees	Professorship nominations
Division I	28	10	15
Division II	30	12	6
Division III	40	18	8
Division IV	25	5	6
Division V	25	5	5
Division VI	17	4	2
Division VII	10	7	4
Total	175	61	46

Didactic activity of PAN scholars in institutions of higher education in 2009 (by PAN division)

	The number of people teaching in universities
Division I	460
Division II	120
Division III	259
Division IV	176
Division V	59
Division VI	57
Division VII	84
Total	1 215

Foreign Scientific Centers

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

ZENTRUM FÜR HISTORISCHE
FORSCHUNG BERLIN DER POLNISCHEN
AKADEMIE DER WISSENSCHAFTEN

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

■ SCIENTIFIC CENTER OF THE POLISH ACADEMY OF SCIENCES IN MOSCOW

ПОСТОЯННЫЙ ПРЕДСТАВИТЕЛЬ
ПОЛЬСКОЙ АКАДЕМИИ НАУК
В МОСКВЕ

Klimaszkina 4, 123557 Moskwa
phone: 7 495 23 11 710
fax: 7 495 23 11 711
e-mail: PAN.Moskwa@mail.ru
www.panmoskwa.pl
Director: Mariusz Wołos

■ SCIENTIFIC CENTER OF THE POLISH ACADEMY OF SCIENCES IN PARIS

CENTRE SCIENTIFIQUE DE L'ACADÉMIE
POLONAISE DES SCIENCES 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: Jerzy Pielaszek

■ SCIENTIFIC CENTER OF THE POLISH ACADEMY OF SCIENCES IN ROME

ACCADEMIA POLACCA DELLE SCIENZE
– BIBLIOTECA E CENTRO DI STUDI
A ROMA

vicolo Doria 2, Palazzo Doria, 00187 Roma
phone: 39 06 679 21 70
fax: 39 06 679 40 87
e-mail: accademia@accademiapolacca.it
www.accademiapolacca.it
Director: Leszek Kuk

■ SCIENTIFIC CENTER OF THE POLISH ACADEMY OF SCIENCES IN VIENNA

WISSENSCHAFTLICHES ZENTRUM
DER POLNISCHEN AKADEMIE
DER WISSENSCHAFTEN IN WIEN

Boerhaavegasse 25, 1030 Wien
phone: 431 713 59 29
fax: 431 713 59 29 550
e-mail: office@viennapan.org
www.viennapan.org
Director: Bogusław Dybaś

■ POLSCA – POLISH SCIENCE CONTACT AGENCY

Rue du Trône 98, B-1050 Bruxelles
phone: 32 022134160
fax: 32 022134169
e-mail: polsca@skynet.be
www.polsca.be
Director: Jan Krzysztof Frąckowiak

Scientific Institutes and Branches of the Polish Academy of Sciences



Scientific Units

Division I Social Sciences

- **Institute of Archaeology and Ethnology** (Warszawa)
e-mail: director@iaepan.edu.pl
www.iaepan.edu.pl, www.archaeology.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: ibadlit@ibl.waw.pl
www.ibl.waw.pl
- **Institute of Mediterranean and Oriental Cultures** (Warszawa)¹
e-mail: zaspan@zaspan.waw.pl
www.zaspan.waw.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: jana@psychpan.waw.pl
www.psychpan.waw.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 History of Science** (Warszawa)
e-mail: ihn@ihnpan.waw.pl
www.ihnpan.waw.pl
- **Institute of the Polish Language** (Kraków)
e-mail: ijp@ijp-pan.krakow.pl
www.ijp-pan.krakow.pl
- **Tadeusz Manteuffel Institute of History** (Warszawa)
e-mail: ihpan@ihpan.edu.pl
www.ihpan.edu.pl

¹ The Research Center for Mediterranean Archaeology and the Center for Studies on Non-European Countries of the Polish Academy of Sciences were dissolved on August 31, 2010. The two centers formed the basis for establishing the new Institute of Mediterranean and Oriental Cultures, which began operations on September 1, 2010.

Division II Biological Sciences

- **Center for Ecological Research**
(Dziekanów Leśny)
e-mail: cbe@cbe-pan.pl
www.cbe-pan.pl
- **Department of Antarctic Biology**
(Warszawa)
e-mail: zba@arctowski.pl
www.arctowski.pl
- **Institute of Anthropology** (Wrocław)
e-mail: zapan@antro.pan.wroc.pl
www.antro.pan.wroc.pl
- **Institute of Biochemistry and Biophysics**
(Warszawa)
e-mail: sekretariat@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 Ichthyobiology and Aquaculture**
(Gołysz)
e-mail: zigr@bb.onet.pl
www.fish.com.pl
- **Institute of Nature Conservation** (Kraków)
e-mail: sekretariat@iop.krakow.pl
www.iop.krakow.pl
- **Institute of Systematics and Evolution of Animals** (Kraków)
e-mail: office@isez.pan.krakow.pl
www.isez.pan.krakow.pl
- **International Institute of Polish Academy of Sciences – European Regional Centre for Ecohydrology** (Łódź)
e-mail: erce@erce.unesco.lodz.pl
www.erce.unesco.lodz.pl
- **Mammal Research Institute** (Białowieża)
e-mail: mripas@bison.zbs.bialowieza.pl
www.zbs.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: iboffice@ib-pan.krakow.pl
www.ib-pan.krakow.pl

Division III Mathematical, Physical, and Chemical Sciences

- **Center for Molecular and Macromolecular Studies** (Łódź)
e-mail: cbmm@bilbo.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** (Gliwice)
e-mail: sekretariat@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
- **High Pressure Research Center** (Warszawa)
e-mail: sylvek@unipress.waw.pl
www.unipress.waw.pl
- **Institute of Catalysis and Surface Chemistry** (Kraków)
e-mail: ncwitko@cyf-kr.edu.pl
www.ik-pan.krakow.pl
- **Institute of Mathematics** (Warszawa)
e-mail: im@impan.gov.pl
www.impan.gov.pl
- **Institute of Molecular Physics** (Poznań)
e-mail: office@ifmpan.poznan.pl
www.ifmpan.poznan.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
- **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@int.pan.wroc.pl
www.int.pan.wroc.pl

Division IV Technical Sciences

- **Aleksander Krupkowski Institute of Metallurgy and Materials Science** (Kraków)
e-mail: office@imim-pan.krakow.pl
www.imim.pl
- **Institute of Chemical Engineering** (Gliwice)
e-mail: sekret@iich.gliwice.pl
www.iich.gliwice.pl
- **Institute of Computer Science** (Warszawa)
e-mail: ipi@ipipan.waw.pl
www.ipipan.waw.pl, www.ipipan.eu
- **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.gliwice.pl
www.iitis.gliwice.pl
- **Maciej Nałęcz Institute of Biocybernetics and Biomedical Engineering** (Warszawa)
e-mail: ibib@ibib.waw.pl
www.ibib.waw.pl
- **Robert Szwalski Institute of Fluid-Flow Machinery** (Gdańsk)
e-mail: imp@imp.gda.pl
www.imp.gda.pl
- **Systems Research Institute** (Warszawa)
e-mail: ibs@ibspan.waw.pl
www.ibspan.waw.pl

Division V Agricultural, Forestry, and Veterinary Sciences

- **Bohdan Dobrzański Institute of Agrophysics** (Lublin)
e-mail: sekretariat@ipan.lublin.pl
www.ipan.lublin.pl
- **Institute of Genetics and Animal Breeding** (Jastrzębiec)
e-mail: E.Dymnicki@ighz.edu.pl
www.ighz.edu.pl
- **Botanical Garden – Center for Biological Diversity Conservation** (Warszawa)
e-mail: ob.sekr@obpan.pl
www.ogrod-powsin.pl
- **Institute of Plant Genetics** (Poznań)
e-mail: office@igr.poznan.pl
www.igr.poznan.pl
- **Franciszek Górski Institute of Plant Physiology** (Kraków)
e-mail: ifr@ifr-pan.krakow.pl
www.ifr-pan.krakow.pl
- **Jan Kielanowski Institute of Animal Physiology and Nutrition** (Jabłonna)
e-mail: office@ifzz.pan.pl
www.ifzz.pl
- **Institute of Agricultural and Forest Environmental** (Poznań)
e-mail: zbsril@man.poznan.pl
www.zbsril.poznan.pl
- **Research Station for Ecological Agriculture and Preservation of Native Breeds** (Popielno)
e-mail: sbpan@wp.pl
www.popielno.pl
- **Institute of Animal Reproduction and Food Research** (Olsztyn)
e-mail: instytut@pan.olsztyn.pl
www.pan.olsztyn.pl

Division VI Medical Sciences

- **Institute of Human Genetics** (Poznań)
e-mail: igcz@rose.man.poznan.pl
www.igcz.poznan.pl
- **Ludwik Hirsfeld Institute of Immunology and Experimental Therapy** (Wrocław)
e-mail: secretary@iitd.pan.wroc.pl
www.iitd.pan.wroc.pl
- **Institute of Medical Biology** (Łódź)
e-mail: aobidowska@cbm.pan.pl
www.cbm.pan.pl
- **Mirosław Mossakowski Medical Research Center** (Warszawa)
e-mail: sekretariat@cmdik.pan.pl
www.cmdik.pan.pl
- **Institute of Pharmacology** (Kraków)
e-mail: ifpan@if-pan.krakow.pl
www.if-pan.krakow.pl

Division VII Earth and Mining Sciences

- **Institute of Environmental Engineering** (Zabrze)
e-mail: kanc@ipis.zabrze.pl
www.ipis.zabrze.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 Oceanology** (Sopot)
e-mail: office@iopan.gda.pl
www.iopan.gda.pl
- **Mineral and Energy Economy Research Institute** (Kraków)
e-mail: centrum@min-pan.krakow.pl
www.min-pan.krakow.pl
- **Museum of the Earth** (Warszawa)
e-mail: sekretariat@mz-pan.pl
www.mz-pan.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

Branches

- **The Gdańsk Branch of the Polish Academy of Sciences** (Gdańsk)
e-mail: office@opan.gda.pl
- **The Katowice Branch of the Polish Academy of Sciences** (Katowice)
e-mail: opankatowice@interia.pl
- **The Kraków Branch of the Polish Academy of Sciences** (Kraków)
e-mail: paniec@zdp.pan.krakow.pl
www.pan-krakow.pl
- **The Lublin Branch of the Polish Academy of Sciences** (Lublin)
e-mail: pan-ol@hektor.umcs.lublin.pl
www.pan-ol.lublin.pl
- **The Łódź Branch of the Polish Academy of Sciences** (Łódź)
e-mail: oddzial@pan.lodz.pl
www.pan.lodz.pl
- **The Poznań Branch of the Polish Academy of Sciences** (Poznań)
e-mail: opan@man.poznan.pl
www.pan.poznan.pl
- **The Wrocław Branch of the Polish Academy of Sciences** (Wrocław)
e-mail: kontakt@oddz.pan.wroc.pl
www.pan.wroc.pl

Shared scientific units

- **Henryk Frąckiewicz Center for Laser Technology of Metals of Kielce University of Technology and the Polish Academy of Sciences** (Kielce)
e-mail: mskiba@eden.tu.kielce.pl
www.tu.kielce.pl
- **International Institute of Molecular and Cell Biology** (Warszawa)¹
e-mail: sekretariat@iimcb.gov.pl
www.iimcb.gov.pl
- **International Laboratory of High Magnetic Fields and Low Temperatures** (Wrocław)
e-mail: intl@ml.pan.wroc.pl
www.alpha.mlspmint.pan.wroc.pl

¹ The Institute was established pursuant to the act passed by the Parliament on June 26, 1997. It has been functioning as an independent scientific unit since January 1999. In accordance with a decision by the president of the Academy, the Institute is supervised by the chairman of Division II Biological Sciences.

Scientific and Task Force Committees

Task Force Committees

Committees affiliated with the Presidium of the Academy

- **The Committee on Biotechnology**
ul. Stefanowskiego 4/10, 90-924 Łódź,
Instytut Biochemii Technicznej, Politechnika
Łódzka
e-mail: STANB@p.lodz.pl
- **The Committee on Energy**
ul. Konarskiego 18, 44-100 Gliwice,
Instytut Maszyn i Urządzeń Energetycznych,
Politechnika Śląska
e-mail: tadeusz.chmielniak@polsl.pl
- **The Committee on Ergonomics**
ul. Grzegorzeczka 20, 31-531 Kraków,
Collegium Medicum, Uniwersytet Jagielloński
e-mail: mmpokors@cyf-kr.edu.pl
- **The Committee on Ethics in Science**
ul. Krakowskie Przedmieście 3,
00-047 Warszawa,
Instytut Filozofii, Uniwersytet Warszawski
e-mail: kenpan.wfs@uw.edu.pl
- **The Committee on Polar Research**
ul. Księcia Janusza 64, 01-452 Warszawa,
Instytut Geofizyki PAN
e-mail: adgip@igf.edu.pl
- **The Research Committee on Human
Migrations and on Polish Diaspora**
ul. Jodłowa 13, 30-252 Kraków-Przegorzały,
Instytut Studiów Polonijnych,
Uniwersytet Jagielloński
e-mail: gbabinski@interia.pl
- **The Committee for Research on Threats**
ul. Chodakowska 19/31, 03-815 Warszawa,
Wydział Psychologii, Szkoła Wyższa
Psychologii Społecznej
e-mail: kbz@swps.edu.pl
- **The Committee on Space and Satellite
Research**
ul. Bartycka 18A, 00-716 Warszawa,
Centrum Badań Kosmicznych PAN
e-mail: bpop@cbk.waw.pl
- **The Committee on Spatial Economy and
Regional Planning**
Pałac Kultury i Nauki, 00-901 Warszawa
e-mail: kpzk@pan.pl
- **The Committee on Water Management**
ul. Podleśna 61, 01-673 Warszawa,
Instytut Meteorologii i Gospodarki Wodnej
e-mail: maciej.maciejewski@imgw.pl
- **The “Poland 2000 Plus” Forecast
Committee**
Pałac Kultury i Nauki, 00-901 Warszawa
e-mail: komprog@pan.pl
- **The Council for Scientific Societies**
Pałac Kultury i Nauki, 00-901 Warszawa
e-mail: rtn@pan.pl
- **The Council for the Polish Language**
ul. Nowy Świat 72, 00-330 Warszawa
e-mail: rjp@rjp.pl
- **The Council for the Promotion of the
Public Understanding of Science**
ul. Pawińskiego 5a, 02-106 Warszawa,
Instytut Biochemii i Biofizyki PAN
e-mail: m.fikus@ibb.waw.pl

Committee affiliated with Division IV

- **The Committee on Production Engineering**
ul. Ozimska 75, 45-370 Opole,
Politechnika Opolska
e-mail: r.knosala@po.opole.pl

Scientific Committees at the Divisions of the Academy

Division I Social Sciences

- **The Committee on Art Studies**
ul. Długa 26/28, 00-950 Warszawa,
Instytut Sztuki PAN
e-mail: tadeuszlub@poczta.onet.pl
- **The Committee on Cultural Studies**
Pałac Kultury i Nauki, 00-901 Warszawa,
skr. poczt. 24
e-mail: l.kolankiewicz@uw.edu.pl
- **The Committee on Demographic Studies**
al. Niepodległości 162, 02-554 Warszawa,
Instytut Statystyki i Demografii,
Szkoła Główna Handlowa
e-mail: ewaf@sgh.waw.pl
- **The Committee on Economic Sciences**
Pałac Kultury i Nauki, 00-901 Warszawa,
skr. poczt. 24
e-mail: emil.panek@ac.poznan.pl
- **The Committee on Ethnological Sciences**
ul. Św. Marcina 78, 61-803 Poznań,
Uniwersytet im. A. Mickiewicza
e-mail: vorbrich@amu.edu.pl
- **The Committee on Financial Sciences**
Pałac Kultury i Nauki, 00-901 Warszawa,
skr. poczt. 24
e-mail: Andrzej.Gospodarowicz@ae.wroc.pl
- **The Committee on Historical Sciences**
Rynek Starego Miasta 29/31,
00-272 Warszawa,
Instytut Historii im. T. Manteuffla PAN
e-mail: j.rudzinska@hotmail.pl
- **The Committee on History of Science and Technology**
ul. Nowy Świat 72, 00-330 Warszawa,
Instytut Historii Nauki PAN
e-mail: ihn@ihnpan.waw.pl
- **The Committee on Labor and Social Policy Sciences**
ul. Bellottiego 3b, 01-022 Warszawa,
Instytut Pracy i Spraw Socjalnych
e-mail: lucma@it.com.pl
- **The Committee on Legal Sciences**
Pałac Kultury i Nauki, 00-901 Warszawa,
skr. poczt. 24
e-mail: zbyslaw@amu.edu.pl
- **The Committee on Linguistics**
Pałac Kultury i Nauki, 00-901 Warszawa,
skr. poczt. 24
e-mail: magro@umk.pl
- **The Committee on Literature Studies**
ul. Nowy Świat 72, 00-330 Warszawa,
Instytut Badań Literackich PAN
e-mail: sobieska@o2.pl
- **The Committee on Organizational and Management Sciences**
ul. Madalińskiego 31/33, 02-544 Warszawa,
Katedra Zarządzania w Gospodarce,
Szkoła Główna Handlowa
e-mail: ispan@mercury.ci.uw.edu.pl
- **The Committee on Oriental Studies**
ul. Krakowskie Przedmieście 26/28,
00-927 Warszawa,
Instytut Orientalistyczny,
Uniwersytet Warszawski
e-mail: m.kozłowska@uw.edu.pl
- **The Committee on Pedagogical Sciences**
ul. Mokotowska 16/20, 01-561 Warszawa,
Wydział Pedagogiczny,
Uniwersytet Warszawski
e-mail: wydzial1@pan.pl
- **The Committee on Philosophical Sciences**
ul. Nowy Świat 72, 00-330 Warszawa
e-mail: Adam_Grobler@interia.pl

- **The Committee on Political Sciences**
ul. Polna 18/20, 00-625 Warszawa,
Instytut Studiów Politycznych PAN
e-mail: politic@isppan.waw.pl
- **The Committee on Prehistoric and Protohistoric Sciences**
al. Solidarności 105, 00-140 Warszawa,
Instytut Archeologii i Etnologii PAN
e-mail: director@iaepan.edu.pl
- **The Committee on Psychological Sciences**
ul. Chodakowska 19/31, 03-815 Warszawa,
Instytut Psychologii PAN
e-mail: dariusz.dolinski@swps.edu.pl
- **The Committee on Science Studies**
ul. Fosa Staromiejska 1a, 87-100 Toruń,
Instytut Filozofii,
Uniwersytet Mikołaja Kopernika
e-mail: zeglen@uni.torun.pl
- **The Committee on Slavic Studies**
Pałac Kultury i Nauki, 00-901 Warszawa,
skr. poczt. 24
e-mail: zkarwat@ifispan.waw.pl
- **The Committee on Sociology**
ul. Nowy Świat 72, 00-330 Warszawa,
e-mail: akojder@venus.ci.uw.edu.pl
- **The Committee on Statistics and Econometrics**
ul. Bogucicka 14, 40-226 Katowice,
Uniwersytet Ekonomiczny w Katowicach
e-mail: abar@ae.katowice.pl
- **The Committee on Theological Sciences**
al. Raclawickie 14, 20-950 Lublin,
Instytut Teologii Fundamentalnej,
Katolicki Uniwersytet Lubelski Jana Pawła II
e-mail: mrusecki@kul.lublin.pl
- **The Scientific Committee on Ancient Culture**
ul. Nowy Świat 72, 00-330 Warszawa,
Instytut Historii Nauki PAN
e-mail: Jerzy_Danielewicz@poczta.onet.pl

Division II Biological Sciences

- **The Committee on Anthropology**
ul. Ingardena 6, 30-060 Kraków,
Instytut Zoologii, Uniwersytet Jagielloński
e-mail: kacz@zuk.iz.uj.edu.pl
- **The Committee of Biochemistry and Biophysics**
ul. Mazowiecka 6/8, 92-215 Łódź,
Zakład Biofizyki Medycznej i Molekularnej,
Uniwersytet Medyczny w Łodzi
e-mail: cciern@zdn.am.lodz.pl
- **The Committee on Botany**
ul. Lubicz 46, 31-512 Kraków,
Instytut Botaniki PAN
e-mail: ibmirek@ib-pan.krakow.pl
- **The Committee on Cell Biology**
ul. Pasteura 3, 02-093 Warszawa,
Instytut Biologii Doświadczalnej
im. M. Nenckiego PAN
e-mail: wyroba@nencki.gov.pl
- **The Committee on Ecology**
al. Marszałka Piłsudskiego 46, 81-378 Gdynia,
Instytut Oceanografii, Uniwersytet Gdański
e-mail: ocomp@univ.gda.pl
- **The Committee on Evolutionary and Theoretical Biology**
ul. Gronostajowa 7, 30-387 Kraków,
Instytut Nauk o Środowisku,
Uniwersytet Jagielloński
e-mail: kozlo@eko.uj.edu.pl
- **The Committee on Microbiology**
ul. Ciszewskiego 8, 02-786 Warszawa,
Wydział Medycyny Weterynaryjnej,
Szkoła Główna Gospodarstwa Wiejskiego
e-mail: marek_niemialtowski@sggw.pl
- **The Committee on Nature Conservation**
ul. Lubicz 46, 31-512 Kraków,
Instytut Botaniki PAN
e-mail: ibmirek@ib-pan.krakow.pl

■ **The Committee on Neurobiology**

ul. Smętna 12, 31-343 Kraków,
Instytut Farmakologii PAN
e-mail: nfvetula@cyf-kr.edu.pl

■ **The Committee on Parasitology**

pl. Gen. Hallera 1, 90-647 Łódź,
Katedra Biologii i Genetyki Medycznej,
Uniwersytet Medyczny w Łodzi
e-mail: pkurnatowski@wp.pl

■ **The Committee on Zoology**

ul. Sienkiewicza 21, 50-335 Wrocław,
Muzeum Przyrodnicze,
Uniwersytet Wrocławski
e-mail: a.witkowski@biol.uni.wroc.pl

Division III Mathematical, Physical, and Chemical Sciences

■ **The Committee on Analytical Chemistry**

ul. Pasteura 1, 02-093 Warszawa,
Wydział Chemii, Uniwersytet Warszawski
e-mail: kryspyrz@chem.uw.edu.pl

■ **The Committee on Astronomy**

ul. Bartycka 18, 00-716 Warszawa,
Centrum Astronomiczne
im. M. Kopernika PAN
e-mail: moderski@camk.edu.pl

■ **The Committee on Chemistry**

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

■ **The Committee on Crystallography**

ul. Okólna 2, 50-950 Wrocław,
skr. poczt. 1410,
Instytut Niskich Temperatur i Badań
Strukturalnych im. W. Trzebiatowskiego PAN
e-mail: M.Wolczyn@int.pan.wroc.pl

■ **The Committee on Mathematics**

ul. Śniadeckich 8, 00-956 Warszawa,
Instytut Matematyczny PAN
e-mail: s.spiez@impan.gov.pl

■ **The Committee on Physics**

al. Lotników 32/46, 02-668 Warszawa,
Instytut Fizyki PAN
e-mail: kozana@ifpan.edu.pl

Division IV Technical Sciences

■ **The Committee on Acoustics**

ul. Czerniakowska 16, 00-701 Warszawa,
Centralny Instytut Ochrony Pracy
e-mail: engel@agh.edu.pl

■ **The Committee on Architecture
and Urban Planning**

ul. Prusa 53/55, 50-317 Wrocław,
Politechnika Wrocławska
e-mail: zbigniew.bac@pwr.wroc.pl

■ **The Committee on Automatic Control
and Robotics**

ul. Nowowiejska 15/19, 00-665 Warszawa,
Instytut Automatyki i Informatyki Stosowanej,
Politechnika Warszawska
e-mail: k.malinowski@ia.pw.edu.pl

■ **The Committee on Biocybernetics
and Biomedical Engineering**

ul. Trojdena 4, 02-019 Warszawa,
Instytut Biocybernetyki
i Inżynierii Biomedycznej PAN
e-mail: andwer@ibib.waw.pl

■ **The Committee on Chemical and Process
Engineering**

ul. Wólczańska 213/215, 90-924 Łódź,
Politechnika Łódzka
e-mail: stanleda@mail.p.lodz.pl

■ **The Committee on Civil Engineering
and Hydroengineering**

ul. Armii Ludowej 16, 00-637 Warszawa,
Instytut Dróg i Mostów,
Politechnika Warszawska
e-mail: W.Radomski@il.pw.edu.pl

- **The Committee on Electrical Engineering**
ul. Stefanowskiego 18/22, 90-924 Łódź,
Politechnika Łódzka
e-mail: kzakrzew@moden.p.lodz.pl
- **The Committee on Electronics and Telecommunication**
ul. Nowowiejska 15/19, 00-665 Warszawa,
Instytut Radioelektroniki,
Politechnika Warszawska
e-mail: j.modelski@ire.pw.edu.pl
- **The Committee of Informatics**
ul. Piotrowo 2, 60-965 Poznań,
Politechnika Poznańska
e-mail: Jan.Weglarz@cs.put.poznan.pl
- **The Committee on Machine Building**
ul. Warszawska 24, 31-155 Kraków,
Politechnika Krakowska
e-mail: sladek@mech.pk.edu.pl
- **The Committee on Materials Science**
ul. Krasińskiego 8, 40-019 Katowice,
Katedra Nauki o Materiałach,
Politechnika Śląska
e-mail: marek.hetmanczyk@polsl.pl
- **The Committee on Mechanics**
ul. Pawińskiego 5b, 02-106 Warszawa,
Instytut Podstawowych Problemów
Techniki PAN
e-mail: bblach@ippt.gov.pl
- **The Committee on Metallurgy**
al. Mickiewicza 30, 30-059 Kraków,
Akademia Górniczo-Hutnicza im. S. Staszica
e-mail: fitzner@uci.agh.edu.pl
- **The Committee on Metrology and Research Equipment**
ul. Prusa 53/55, 50-317 Wrocław,
Politechnika Wrocławska
e-mail: janusz.mrocza@pwr.wroc.pl
- **The Committee on Thermodynamics and Combustion**
al. Armii Krajowej 19 C, 42-218 Częstochowa,
Katedra Kotłów i Termodynamiki,
Politechnika Częstochowska
e-mail: kostowska@kkt.pcz.czyst.pl
- **The Committee on Transport**
ul. Koszykowa 75, 00-662 Warszawa,
Politechnika Warszawska
e-mail: mna@it.pw.edu.pl

Division V Agricultural, Forestry, and Veterinary Sciences

- **The Committee on Agricultural Economics**
ul. Nowoursynowska 166, 02-787 Warszawa,
Szkoła Główna Gospodarstwa Wiejskiego
e-mail: bogdan_klepacki@sggw.pl
- **The Committee on Agricultural Engineering**
ul. Balicka 104, 30-149 Kraków,
Akademia Rolnicza im. H. Kołłątaja
e-mail: jkowlanski@ar.krakow.pl
- **The Committee on Agrophysics**
ul. Doświadczalna 4, 20-290 Lublin,
Instytut Agrofizyki
im. B. Dobrzańskiego PAN
e-mail: bdob@ipan.lublin.pl
- **The Committee on Animal Sciences**
ul. Chełmońskiego 38d, 51-630 Wrocław,
Uniwersytet Przyrodniczy we Wrocławiu
e-mail: djamroz@zoo.ar.wroc.pl
- **The Committee on Biology of Domestic Animal Reproduction**
ul. Oczapowskiego 1A, 10-719 Olsztyn,
Uniwersytet Warmińsko-Mazurski w Olsztynie
e-mail: luizad@uwm.edu.pl
- **The Committee on Food Sciences**
ul. Heweliusza 1, 10-724 Olsztyn,
Uniwersytet Warmińsko-Mazurski w Olsztynie
e-mail: wbed@uwm.edu.pl
- **The Committee on Forestry Sciences**
ul. Braci Leśnej 3, 05-090 Raszyn,
Instytut Badawczy Leśnictwa
e-mail: z.sierota@ibles.waw.pl
- **The Committee on Horticultural Sciences**
ul. Pomologiczna 18, 96-100 Skierniewice,
Instytut Sadownictwa i Kwiaciarnictwa
e-mail: edward.zurawicz@insad.pl

- **The Committee on Land Reclamation and Agricultural Environment Engineering**
ul. Nowoursynowska 166, 02-787 Warszawa,
Szkoła Główna Gospodarstwa Wiejskiego
e-mail: edward_pierzgalski@sggw.pl
- **The Committee on Management of Mountain Regions**
ul. Ćwiklińskiej 2, 35-601 Rzeszów,
Uniwersytet Rzeszowski
e-mail: aczudec@univ.rzeszow.pl
- **The Committee on Physiology, Genetics and Plant Breeding**
ul. Platanowa 19, 05-831 Młochów,
Instytut Hodowli i Aklimatyzacji Roślin
e-mail: e.zimnoch-guzowska@ihar.edu.pl
- **The Committee on Plant Cultivation**
ul. Ks. Kordeckiego 20, 85-225 Bydgoszcz,
Uniwersytet Technologiczno-Przyrodniczy
im. J. i J. Śniadeckich w Bydgoszczy
e-mail: rudnicki@utp.edu.pl
- **The Committee on Plant Protection**
ul. Miczurina 20, 60-318 Poznań,
Instytut Ochrony Roślin
e-mail: s.pruszynski@ior.poznan.pl
- **The Committee on Soil Science and Agricultural Chemistry**
Plac Łódzki 3, 10-727 Olsztyn,
Uniwersytet Warmińsko-Mazurski w Olsztynie
e-mail: jan.kucharski@uwm.edu.pl
- **The Committee on Veterinary Sciences**
ul. Nowoursynowska 159, 02-766 Warszawa,
Szkoła Główna Gospodarstwa Wiejskiego
e-mail: dwmw@sggw.pl
- **The Committee on Wood Technology**
ul. Wojska Polskiego 38/42, 60-627 Poznań,
Akademia Rolnicza im. A. Cieszkowskiego
e-mail: wpradzynski@au.poznan.pl

Division VI Medical Sciences

- **The Committee on Clinical Pathophysiology**
ul. Zgrupowania AK „Kampinos” 1,
01-943 Warszawa,
Instytut Fizjologii i Patologii Słuchu
e-mail: sekretariat@ifps.org.pl
- **The Committee on Human Nutrition Science**
ul. Nowoursynowska 159c, 02-776 Warszawa,
Szkoła Główna Gospodarstwa Wiejskiego
e-mail: anna_gronowska_senger@sggw.pl
- **The Committee on Epidemiology and Public Health**
ul. Medyków 18, 40-752 Katowice,
Katedra Zdrowia Publicznego,
Śląski Uniwersytet Medyczny w Katowicach
e-mail: jzejda@slam.katowice.pl
- **The Committee on Immunology and Etiology of Human Infections**
ul. Rzgowska 281/289, 93-338 Łódź,
Zakład Immunologii Klinicznej, Instytut
Centrum Zdrowia Matki Polki
e-mail: zimk.iczmp@wp.pl
- **The Committee on Human Development**
al. Dzieci Polskich 20, 04-730 Warszawa,
Klinika Kardiologii, Instytut-Pomnik
Centrum Zdrowia Dziecka
e-mail: w.kawalec@czd.pl
- **The Committee on Medical Physics, Radiobiology, and X-Ray Imaging**
ul. Wołoska 137, 02-507 Warszawa,
Centralny Szpital Kliniczny MSWiA
e-mail: rtg@cskmswia.pl
- **The Committee on Human Genetics and Molecular Pathology**
ul. Strzeszyńska 32, 60-479 Poznań,
Instytut Genetyki Człowieka PAN
e-mail: slomski@au.poznan.pl
- **The Committee on Neurological Sciences**
ul. Jaczewskiego 8, 20-950 Lublin,
Katedra i Klinika Neurochirurgii
i Neurochirurgii Dziecięcej,
Uniwersytet Medyczny w Lublinie
e-mail: t.trojanowski@am.lublin.pl

- **The Committee on Physiological Sciences**
ul. Krakowskie Przedmieście 26/28,
00-927 Warszawa,
Katedra i Zakład Fizjologii
Doświadczalnej i Klinicznej,
Warszawski Uniwersytet Medyczny
e-mail: eszs@amwaw.edu.pl
- **The Committee on Rehabilitation,
Physical Education and Social Integration**
ul. Rzeźbiarska 4, 51-629 Wrocław,
Katedra Fizjoterapii w Medycynie
Zachowawczej i Zabiegowej,
Akademia Wychowania Fizycznego
e-mail: marek.wozniewski@awf.wroc.pl
- **The Committee on Therapy and Drug
Research**
ul. Banacha 1, 02-097 Warszawa,
Katedra i Zakład Biologii i Botaniki
Farmaceutycznej,
Warszawski Uniwersytet Medyczny
e-mail: mfurmanowa@wp.pl

Division VII Earth and Mining Sciences

- **The Committee on Environmental
Engineering**
ul. Curie-Skłodowskiej 34, 41-819 Zabrze,
Instytut Podstaw Inżynierii Środowiska PAN
e-mail: kanc@ipis.zabrze.pl
- **The Committee on Geodesy**
ul. Modzelewskiego 27, 02-679 Warszawa,
Instytut Geodezji i Kartografii
e-mail: ewa.wysocka@igik.edu.pl
- **The Committee on Geographical Sciences**
ul. Dziegiełowa 27, 61-680 Poznań,
Instytut Paleogeografii i Geoekologii,
Uniwersytet im. A. Mickiewicza
e-mail: anko@amu.edu.pl
- **The Committee on Geological Sciences**
ul. Podwale 75, 50-449 Wrocław,
Zakład Geologii Sudetów,
Instytut Nauk Geologicznych PAN
e-mail: pansudet@pwr.wroc.pl
- **The Committee on Geophysics**
al. Mickiewicza 30, 30-059 Kraków,
Wydział Geologii, Geofizyki
i Ochrony Środowiska,
Akademia Górniczo-Hutnicza
e-mail: pietsch@geol.agh.edu.pl
- **The Committee on Management of Mineral
Resources**
ul. Wybickiego 7, 31-261 Kraków,
Instytut Gospodarki Surowcami Mineralnymi
i Energią PAN
e-mail: mark@min-pan.krakow.pl
- **The Committee on Maritime Research**
al. Marszałka Piłsudskiego 46,
81-378 Gdynia,
Uniwersytet Gdański
e-mail: ocomp@univ.gda.pl
- **The Committee on Mineralogical Sciences**
ul. Będzińska 60, 41-200 Sosnowiec,
Zakład Mineralogii, Wydział Nauk o Ziemi
Uniwersytet Śląski
e-mail: janeczek@us.edu.pl
- **The Committee on Mining**
al. Mickiewicza 30, 30-059 Kraków,
Akademia Górniczo-Hutnicza
e-mail: tajdus@agh.edu.pl
- **The Committee on Quaternary Research**
ul. Twarda 51/55, 00-818 Warszawa,
Instytut Nauk Geologicznych PAN
e-mail: kbcz@kbcz.pan.pl