

Report on
29th International Symposium on Chromatography (ISC Toruń '12)
and
18th International Symposium on Separation Sciences (ISSS '2012)
in Toruń, September 9-13, 2012

The twenty-ninth world gathering of the users of chromatography and the whole spectrum of separation methods took place in Toruń, Poland. It was possible due to the efforts of all the European chromatographers' associations and their individual members. Nicolaus Copernicus University (UMK) hosted both the theoreticians and practical chromatography users, working for universities, research institutes and various branches of industry in 58 countries. The motto of the 29th International Symposium on Chromatography (29'ISC-Toruń'12) and the 18th International Symposium on Separation Sciences (ISSS'2012) was *Chromatography and Separation Science: Past, Today, Future*. The organization body included: Permanent Scientific Committee of ISC, Polish Chemical Society (PTChem), the Committee on Analytical Chemistry of the Polish Academy of Sciences, European Society for Separation Science (EuSSS), Central European Group for Separation Sciences (CEGSS), and Nicolaus Copernicus University. The honorary patronage over this important event was taken by the Minister of Science and Higher Education, Professor Barbara Kudrycka. The International Science Committee and Organization Committee was chaired by Prof. Bogusław Buszewski of UMK Toruń, the President of EuSSS, CEGSS and PTChem, supported by his co-workers, doctoral students and graduate student volunteers from the Chair of Environmental Chemistry and Bioanalytics UMK. The leading sponsors of the 29thISC were *Agilent Technology, Shimadzu, Thermo, LECO* and *Waters*. Media patronage was provided by periodicals *LC-GC, Chromatography Today, Analityka* and *Laboratorium*.

The meeting commenced with a piano concerto performance by Paweł Wakarecy, a Toruń finalist of the 2011 International Chopin Piano Competition, followed by a brief presentation by Dr Michał Targowski on the history and current significance of Toruń in culture and science. The symposium was ceremonially opened by Prof. Jacek Guliński, Deputy Minister of Science and Higher Education, Piotr Całbecki, the Marshal of the Kuyavian-Pomeranian Voivodeship; Zbigniew Rasielowski, the Deputy Mayor of Toruń, and Prof. Andrzej Tretyn, Rector Magnificus of the UMK. After the occasional speeches the award ceremony took place and laureates have received their awards: EuSSS – Prof. Pat Sandra of Research Institute for Chromatography, Kortrijk, Belgium; CEGSS – Dr. Virginia Coman of Babeş-Bolyai University, Cluj-Napoca, Romania; the Committee on

Chromatographic Analysis of Polish Academy of Sciences (PAS) – Prof. Attila Felinger of the University of Pecs, Hungary and Prof. Jacek Nawrocki of Adam Mickiewicz University, Poznań, Poland.

639 participants could enjoy 15 plenary lectures, 6 thematic presentations, 45 presentations arranged in thematic sections, and 15 reports by young researchers (young scientists from different countries constituted as many as 42% of the participants). There were also 609 poster presentations, reviewed by 44 international specialists; the person responsible for the poster session was Dr. Gerard Rozing from Waldbronn, Germany. The topics of the particular sessions included fundamentals (with retention mechanism description); developing new stationary phases and columns, sample preparation methods; modern liquid chromatography (column and thin-layer) involving electrochromatography, gas chromatography and multidimensional chromatography (GC x GC, LC x LC); mixed methods, combined methods and electromigration methods (ITP, 2D and 3D CE); miniaturization (microcolumns, nanocolumns and chips); robotics and automatization (Lab-on-a-Chip, μ -TAS). An important topic was analytical methods' validation applying among others chemometrics and molecular modeling. The leading topics were issues where chemistry, biology and medicine overlap, classified within biochemistry by the -omic suffix. They are crucial for state-of-the-art technology, biochemistry and pharmacy, especially where new modes of separation (e.g. HILIC) are introduced. The scientific program of the 29thISC and the 18thISSS can certainly be described as extremely rich and varied, including topics of interest for every participant. This was of particular importance for us, the organizing committee, as it resulted in fascinating debates between the people working out theories and those dealing with their practical applications, between the experienced and the newcomers – which is the aim of these meetings.

The opening lecture by a Nobel Prize Laureate Prof. Ada Yonath of Weizmann Institute of Science, Tel-Aviv (Israel), concerning recent achievements in research on ribosomes, delineated the topics dominating ISC&ISSS. Practical aspects arising from introduction of a new generation of columns and packing in biomolecule analysis were presented by Prof. Gunther Bonn from the University of Innsbruck, Austria, while Prof. Vadim Davankov from Russian Academy of Sciences in Moscow described the developments in chromatography of polymers and biopolymers, particularly in synthesis of superporous packing.

The second day of the conference started with three lectures introducing sessions devoted to electromigration methods, biomarkers and new solutions in determining phospholipids and fatty acids. Prof. Pat Sandra presented a new approach to determining lipids and phospholipids by combined chromatography methods, suggesting *lipidomica* as a new name for this group of compounds. Prof. Yoshinobu Baba from Nagoya University,

Japan, described an original approach to determining cell elements by utilizing chip technology and nanodevices, which can have diagnostic applications. Prof. Frantisek Švec from Lawrence Berkeley National Laboratory, USA, spoke on a new technology in preparation of polymer monolithic columns for HPLC, particularly suited for separating low-weight biomolecules.

New theoretical concepts and new applications of electromigration methods in the field of determining biologically active substances (e.g. medicines, amino-acids, proteins and peptides) were the subject of a series of presentations by Dr. Vaclav Kasicka from the Academy of Sciences of the Czech Republic in Prague, Prof. Douglas Westerlund from Uppsala University in Sweden and Prof. Danilo Corradini from Italian National Research Council in Rome. A parallel session was devoted to discussing the search for markers and biomarkers used in early cancer detection (Prof. Ziad El-Rassi from Oklahoma State University, USA, Prof. Coral Barbas from San Pablo-CEU University in Madrid, Spain, and Prof. Anton Amman from Innsbruck Medical University, Austria). These developments became possible thanks to introduction of new selective packing (such as core-shell) and columns (e.g. HILIC) in medical and pharmaceutical analysis as well as in environmental monitoring. The lectures presented by Prof. Tyge Greibrokk from the University of Oslo (Norway), Prof. John Lough from the University of Sunderland (UK), Prof. Jeremy Glennon from University College Cork, (Ireland) and Prof. Matthew R. Linford from Brigham Young University (USA) also focused on these issues.

As an experiment, the organizers introduced “tutorial lectures”, given by authorities on separation sciences, the creators of original solutions and techniques widely applied in separation. The first speaker was Prof. Klaus. K. Unger from Johannes Gutenberg University of Mainz, Germany, on silica chemistry and its possible uses in liquid chromatography; the second was Prof. Stellan Hjerten from Uppsala University, Sweden, on a new approach to the interaction theory in interpretation of phenomena occurring during separation of analytes with varied structure and properties

Every ISC series symposium includes a session devoted to the present and future of gas chromatography and its industrial applications, so another set of presentations focused on this important issue. Many innovative solutions could be found in the papers by Prof. Tadeusz Górecki from University of Waterloo in Canada (a new approach to two-dimensional gas chromatography), Prof. Jacek A. Koziel from Iowa State University, USA (multidimensional gas chromatography) and Prof. Adam Voelkel from Poznań University of Technology, Poland (inverse gas chromatography). This type of chromatography was also discussed by Prof. Jacek Namieśnik from Gdańsk University of Technology, Poland (green chromatography), Prof. Antonius A. Kettrup from Technical University of Munich, Germany (chromatography perceived in terms of sustainability and application in industry control),

Prof. Waldemar Wardencki from Gdańsk University of Technology, Poland (applications of gas chromatography in food industry) and Dr. S.K. Panda from EXPEC Advanced Research Center, Saudi Arabia (application of GC to control petrochemical processes).

Issues, which attracted a lot of interest of participants were connected with food analysis. In this section lectures were presented by Prof. Y. Pico from Valencia University, Spain (perfluorinated compounds in food and environment); Prof. S. Fanali from the Institute of Chromatography in Rome, Italy (drug residues analysis in food); Prof. H. Jeleń from Poznan University of Life Sciences, Poland (haloanisoles analysis in wine) and Prof. F. Cacciola from University of Messina, Italy (analysis of food lipids).

Another important topic discussed during the conference was sample preparation and the development of a new generation of materials and equipment utilizing miniaturization and automatization. The overview of achievements in food processing control and in isolation and enriching of biological samples was offered by Prof. Valerie Pichon and Dr. F. Brothier from ESPCI ParisTech (France), Dr. Luke Chimuka from Wits University in Johannesburg (South Africa), Prof. Jozef Lehotay from Slovak University of Technology in Bratislava and Małgorzata Szultka from UMK Toruń. Their presentations mostly concentrated on development and application of a new generation of sorption materials for SPE of the *Molecular Imprinted Polymer type*.

This topic was continued the following day, beginning with a lecture by Prof. Janusz Pawliszyn from University of Waterloo, Canada, who presented a new approach to *in-vivo* sample preparation methodology. Bioseparation of selected DNA forms was the subject of a paper by Prof Michael Lämmerhofer from the University of Tuebingen, Germany, and an original concept of multidimensional LC HYPERformat was described both in its theoretical and practical aspect by Prof. Peter J. Schoenmakers from the University of Amsterdam, the Netherlands.

New theoretical and practical solutions emerged also in presentations on usefulness of multidimensional methods in determining biologically active substances (blood components, drugs or microorganisms) by Prof. Karl-Siegfried. Boos from the University of Munich (Germany), Prof. Imre Klebovich from Semmelweis University in Budapest (Hungary), Prof. Tadeusz Dzido from the Medical University of Lublin (Poland) and Dr Jan Petr from the Palacky University of Olomouc (the Czech Republic). Determining such substances often requires application of specific, sensitive detectors, described by Prof. Thomas Welsch from the Ulm University (Germany), Prof. Mihkel Kaljurand from Tallinn University of Technology (Estonia), Prof. Ewa Cukrowska from Wits University in Johannesburg (South Africa), Prof. Frantisek Foret from the Institute of Analytical Chemistry in Brno (the Czech Republic), Prof. Mirek Macka from University of Tasmania (Australia) and Prof. Wolfgang Buchberger from Johannes Kepler University in Linz (Austria).

The next two topical lectures were devoted to determining polymers and biopolymers and were given by Prof. Pier Giorgio Righetti from Politecnico di Milano (Italy) and Prof. Dusan Berek from Slovak Academy of Sciences in Bratislava (Slovakia). Prof. Righetti expressively presented issues concerning application of biopolymers as potential cancer markers, while Prof. Berek spoke on thermodynamics of polymers and methods of their determination.

A new theoretical concept regarding the question of supercritical fluid chromatography applications was offered by Prof. Georges Guiochon from the University of Tennessee, Knoxville (USA). Prof. Roman Kaliszan from the Medical University of Gdańsk presented a thermodynamic approach to retention mechanisms in liquid chromatography, and Prof. Pavel Jandera from the University of Pardubice (the Czech Republic) outlined the developments in programming different types of multidimensional liquid chromatography (HPLC, UPLC). Subsequently, the theoretical aspects of solvation processes and their influence on retention mechanism in RP and HILIC mode were presented by Prof. Attila Felinger from University of Pecs (Hungary), Prof. Ulrich Tallarek from the Philipp-University of Marburg (Germany), Dr. Szymon Bocian from UMK Toruń and Dr. Georg Schuster from the University of Vienna (Austria).

The influence of stationary phase properties on the selectivity of separation process was described in the presentations of Joseph J. Pesek from San Jose State University (USA), Prof. Bezhan Chankvetadze from Tbilisi State University (Georgia), Prof. Masami Shibukawa from Saitama University (Japan) and Prof. Gregorio R. Meira from the National University of the Littoral (Argentina).

Introduction of new methods and procedures as a way of searching for new directions in determining again formed a bridge between theory and practice and opened new possibilities in electromigration methods (Prof. Ewa Dąbek- Złotorzyńska, Environment Canada, Ottawa), ion-exchange (Prof. Rajmund S. Dybczyński, Institute of Nuclear Chemistry and Technology, Warsaw, Poland) or supercritical fluid chromatography (Prof. Donald P. Poe, University of Minnesota Duluth, USA, and Prof. Krzysztof Kaczmarski, Rzeszów University of Technology). Each of these methods requires visualization and modeling to facilitate understanding of diffusion, adsorption and mass transport during separation process, as presented by Prof. Beata Walczak from University of Silesia in Katowice; her presentation concentrated on chemometrics and modeling. The next topical lecture, by Prof. Hartmut Frank from the University of Bayreuth, Germany, focused on uses of combined chromatographic techniques in environment monitoring.

The closing session of the 29thISC included the lecture of Prof. Bingcheng Lin from the Chinese Academy of Sciences, Dalian, devoted to miniaturization and nanotechnology in determining biofluids, and a theoretical description of applying stochastic theory to describing dynamic processes in chromatography by Prof. Francesco Dondi from the University of Ferrara, Italy. A new approach to separation of chiral analytes (potential medicines) by supercritical fluid chromatography was outlined by Prof. Wolfgang Lindner from the University of Vienna, Austria. The session was both the summary of the three days of this conference and a promise of the next symposium.

As mentioned above, an important part complement of lectures and presentations were poster presentations. After a thorough analysis, the experts selected the best of the best. Sponsors of them were as follow:

- one award of European Society for Separation Science
- one award of HPLC2013 in Amsterdam
- one award of Central European Group for Separation Sciences
- five awards of Shimadzu Corporation
- three awards of the publishing house Taylor & Francis
- three awards of the publishing house Springer
- five awards of the magazine *Laboratorium - Przegląd Ogólnopolski*

During the closing ceremony the winners in particular categories received their awards and diplomas, and the Chairman of the Organizing Committee expressed his gratitude towards all those who contributed to the success of this event. The Organizing Committee of 29thISC also purchased an ASTROLABIUM statuette, marked with the locations and times of all the twenty nine symposiums to date. This symbol of our cooperation for chromatography was handed to Prof. Wolfgang Buchberger, the Chairman of the Scientific Committee of the 30thISC, which will be held in Salzburg, Austria, in 2014.

The conference was accompanied by meetings of the following institutions working towards popularizing analytic chemistry and development of separation methods: ISC Permanent Committee, EuSSS, CEGSS and IUPAC, which summarized their previous activities and formulated future plans. Yet chromatography did not solely occupy the minds of the participants: besides learning and debating, there was time set aside for resting and socializing. The organizers provided a variety of attractions, ranging from Mr. Wakarecy's recital and Multicamerata, String Quartet of the Torunian Symphony Orchestra concert directed by Henryk Giza to performances of bands playing Polish and Gypsy folk music. A

boat trip on the Vistula River gave the lecturers a chance to tighten bonds. The gala dinner, sponsored by the Mayor of Toruń Michał Zalewski and hosted in the beautiful walls of Artus Mansion, was accompanied by performances by Mariusz Lubomski and an excellent swing band of Józef Eliasz. The conference program included guided trips through Toruń to look at the Gothic Old Town; watch gingerbread making technique; follow the steps of Nicholas Copernicus; visit old castles of the Teutonic Knights in the area; and see the places where Poland, its history and tradition were shaped by historical events.

Prof. dr hab. B. Buszewski (UMK Toruń)

Chairman of the Organizing Committee