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Gallium

A newsletter published for IUPAC's 2005 General Assembly
13-21 August 2005, Beijing, China

Metrological Traceability

Can ambiguous terminology create a barrier to trade? The Analytical Chemistry Division's Interdivisional Working Party on the Harmonization of Quality Assurance will explore this important question in a workshop on "Metrological Traceability of Measurement Results in Chemistry: Working towards an IUPAC View." Join the project team—Paul De Bièvre, Renè Dybkaer, Ales Fajgelj, and David Brynn Hibbert—on **Sunday 14 August at 16:00** in Hall 10 (BICC level 3) for the presentation of a first-draft report on this timely topic. The workshop will be followed by a discussion session.

See related preprint by Paul De Bièvre, on page 8.

Why Gallium?

Chris and I are having so much fun every other month producing *Chemistry International* that we decided to treat ourselves with a special newsletter just in time for the GA—it is *Gallium*. Why *Gallium* you might ask? In short, the symbol for gallium is Ga . . . and GA stands for General Assembly.

continued on page 13

President's Address

Saturday 13 August at 19:00, Hall 2 (BICC level 2)

An important part of every IUPAC General Assembly is the State of the Union Address in which the president reports on the overall health of the organization. This year, President Leiv K. Sydnes will address the assembly twice. He will deliver his first talk in a convivial manner to all IUPAC Members on **Saturday 13 August at 19:00**. Then, one week later, on Saturday 20 August, he will present his more formal statutory report to the Council assembly.

In his address, the president will highlight how the Union has to be sensitive and responsive to the following:

- formal requests and expectations from its members
- professional expectations from the scientific community
- adequate requests and questions from practicing chemists
- regulations and legal aspects in societies at different levels of development
- curious as well as biased questions from lay people and the general public

continued on page 2

Introducing the Young Observers

This year, Young Observers will again participate in sessions of the General Assembly. Following the same model used in 2003, IUPAC and the Canadian, USA, and UK National Adhering Organizations have selected 24 chemists, with varied backgrounds and interests, from 9 countries: Brazil, Canada, Chile, India, France, Russia, Turkey, UK, and the USA. Their participation is likely to add vitality and a valuable perspective to the committee work in which they will participate. In the past, several younger chemists have become directly involved in IUPAC. Please welcome them and let's show them what IUPAC is all about. For a brief review and presentation of these Young Observers, see page 4.

The Project Place

The International Union of Pure and Applied Chemistry exists to advance worldwide chemistry. Just what does this mean? A snapshot of IUPAC activity at various times in the past would indeed reveal quite different—but entirely legitimate—interpretations of this mission. Some people think of nomenclature, the chemistry students' necessary evil; some think of the naming of new elements, a tight and rigorous, but important, process; some think of the ratification of units and accuracy of measurements, all essential for efficient chemical progress; some think of research conferences, the

continued on page 12

Inside

Safety Training Program

Wednesday 17 August at 10:00 in Hall 17b

A complementary IUPAC activity, operated jointly with UNESCO and UNIDO, is the Training Program for Safety and Environmental Protection. Individuals responsible for safety and environmental protection in chemical plant operations in developing countries are given free training at a major chemical facility. In recent years, the program supported trainees from China, India, Nigeria, Kenya, and Uruguay, and coordinated their visits to host companies located in the USA, South Africa, Japan, Sweden, and Belgium.

On **Wednesday 17 August at 10:00** in Hall 17b, a workshop of the Congress, organized by the Committee on Chemistry and Industry (COCI), will bring together eight of the recent Fellows to share their experiences and plans. The workshop will also include speakers from IUPAC and Sinopec, who will participate in a round-table discussion with the Fellows. Join them in their discussion!

The workshop is supported by UNESCO, SINOPEC, BP, Bristol-Myers Squibb, Sankyo, Sasol, and Mitsui.

President's Address

continued from page 1

- unarticulated needs caused by natural processes, accidents, and disasters involving chemicals

According to Sydnes, the general state of the Union should be judged on the basis of the organization's ability to accomplish the following:

- maintain an active, fruitful, and democratic interaction between its leadership (at all levels) and its membership
- disseminate the results of the scientific and educational activities as well as conclusions reached in discussions related to science policy
- address and get engaged in important global issues, which involve application of chemistry in the service of mankind

On Saturday 13 August, after the President's first address, the recipients of the 2004 and 2005 IUPAC Prizes for Young Chemists will be introduced and Recognition Awards will be presented to retiring IUPAC officers. Everyone is invited to the address and the reception that will follow. See you there at 19:00 in Hall 2!

World Chemistry Leadership Meeting: *Chemistry in Asia*

Friday 19 August at 14:00 in Hall 17a

At each IUPAC General Assembly meeting, it has been the practice to hold a World Chemistry Leadership Meeting (WCLM). The purpose of this meeting is to bring together national and regional leaders from chemical societies, chemical industry federations, and other organizations that are attending the GA and Congress, to discuss current issues in chemistry that may have a potential international impact. These discussions are intended to provide a stimulus for future IUPAC involvement in issues where this organization is in a unique position to provide support to the chemical community.

For this year's WCLM, appropriately, the theme will be *Chemistry in Asia*. The rapid growth of chemical research, development, and industry in Asia during the past decade is bringing both opportunities and challenges to this region. However, it is also having an impact throughout the rest of world on employment, education, and the manner in which work is carried out. These developments have obvious implications for the future work of IUPAC, and the WCLM discussion is intended to identify what challenges it should be addressing.

To stimulate the discussion, **Professor Goverdhan Mehta** of the Indian Institute of Science, Bangalore, India, has accepted IUPAC's invitation to give a presentation on the topic of *Chemistry in Asia*. He will discuss the developments and challenges of the past decade.

Council Meeting

Saturday 20 and Sunday 21 August in Hall 17 (BICC level 2)

At this General Assembly, Council delegates will assemble as they do once every two years and review an agenda of more than 380 pages. They will mostly discuss "normal" business matters. Over the course of the day-and-a-half meeting, delegates will be briefed on progress made during the two-year period since the last meeting in Ottawa. This will include a series of reports from the various officers and committees, and from all divisions and standing committees.

The Council will debate issues of relevance to the future of the Union, including review of a proposal to replace the Executive Committee and Bureau with an Executive Board. Also this year, three chemical societies or national academies have applied to be new members of the Union. The Council will vote on whether or not to accept Jamaica, Jordan, and Ukraine as National Adhering Organizations (NAOs). Finally, the Council will vote to elect a new vice president and members of the Bureau.

Division and standing committee members often are not aware of the issues debated by the Council. Similarly, some of the NAOs are not well informed about the work of committees. Nevetheless, for the Union to function properly, all members should provide feedback to their respective NAOs on what is happening in their groups. The GA is a good time to meet, share ideas and concerns, and resolve problems. Take advantage of it while you are here!

IUPAC Elections

Nominations for the various positions that fall vacant on the Bureau at the end of 2005 were received by the secretary general two months before the start of the IUPAC Council Meeting. **Bryan R. Henry** (Canada), vice president and president-elect, becomes president on 1 January 2006. On that date, **Leiv K. Sydnes** (Norway), current president, will become past president and remain an officer and a member of the Bureau for a period of two years. **Pieter S. Steyn** (South Africa) will retire from office. Other continuing officers include **David StC. Black** (Australia) as secretary general and **Christoph F. Buxtorf** (Switzerland) as treasurer. Elected members of the Bureau who were elected until 2007 are Anders Kallner (Sweden), Werner Klein (Germany), Nicole J. Moreau (France), and Oleg M. Nefedov (Russia).

This year, the candidates for Bureau Member are as follows:

Elections Ballot

Vice President

- Srinivasan Chandrasekaran (India)
- Kazuko Matsumoto (Japan)
- Nicole Moreau (France)

Bureau

- Chunli Bai (China)
- Dušan Berek (Slovakia)
- Paul De Bièvre (Belgium)
- Srinivasan Chandrasekaran (India)
- Abu Mahmood (Bangladesh)
- Kazuko Matsumoto (Japan)
- Stanislaw Penczek (Poland)
- Elsa Reichmanis (USA)
- Ivan Schopov (Bulgaria)
- Alan Smith (UK)
- Maria van Dam-Mieras (The Netherlands)

Meet the officers of IUPAC (L to R): **David StC. Black**, Secretary General; **Leiv K. Sydnes**, President; **Pieter S. Steyn**, Past President; **Bryan R. Henry**, Vice President; and **Christoph F. Buxtorf**, Treasurer.

They are all here and looking forward to meeting you!

Introducing the Young Observers

continued from page 1

David Barden (UK) received his Master of Natural Sciences degree in 1999 from Cambridge University, UK, with an emphasis on organic chemistry. His Ph.D. research, which was carried out at Cambridge under the guidance of Prof. Ian Fleming, was concerned with the application of organosilicon chemistry to total synthesis. Since 2004, he has been a technical editor at the Royal Society of Chemistry, where he works on *Organic Biomolecular Chemistry*, *Journal of Material Chemistry*, and three of the society's abstracting journals. He also coordinates the editing and production of *Natural Product Reports*. Previously, he worked at Wiley-VCH in Weinheim, Germany, as an assistant editor for *European Journal of Organic Chemistry* and the *European Journal of Inorganic Chemistry*.

Philippè Barthelèmy (France) is an associate professor in the Chemistry Department of the University of Avignon, France, where he specializes in surfactant chemistry. Barthelèmy received his Ph.D. in organic chemistry in 1993 from the University of Montpellier II, France. His thesis, produced under the supervision of Prof. J. P. Roque, was on the synthesis and characterization of polymerizable surfactants, including using polyanions as potential anti-HIV drugs. In 2003, Barthelèmy obtained the qualifications to become full professor. His research interests involve the synthesis and study of amphiphiles derived from natural nucleosides, the synthesis and study of new nonionic surfactants, and new antioxidants derived from gallic acids. Additionally, he is in charge of international relations for the Faculty of Sciences, which is developing student and staff exchanges with several European (Socrates) and non-European Universities.

Tamara Basova (Russia) has been a senior research scientist since 1992 at the Nikolaev Institute of Inorganic Chemistry of the Siberian Branch of Russian Academy of Sciences in Novosibirsk. Over the last five years, Basova's research has involved the investigation of structural features of new phthalocyanine films; investigation of sensor properties of new phthalocyanine films on NO_2, H_2S gases and the vapour of organic compounds; and the development of new approaches and techniques for the analysis of different systems by Raman spectroscopy. After receiving her Ph.D. in 1999, she was a postdoctoral fellow at the School of Engineering at Sheffield Hallam University in Sheffield, South Yorkshire, UK, and the TUBITAK-Marmara Research Centre, Gebze, Turkey.

Aicheng Chen (Canada) is an associate professor in the Department of Chemistry at Lakehead University, Thunder Bay, Ontario, Canada. Since 2004, Chen has been an associated graduate faculty at the Department of Chemistry, University of Guelph, Ontario. From 2002–2005 he was an assistant professor at Lakehead University. Chen's recent research interest focuses on the fabrication and electrochemical properties of novel nanoporous platinum network electrodes. In September 2004, his work on super-hydrophobic tin oxide nanoflowers was reported by *C&EN*. Previously he was a senior scientist and anode specialist at FINNCHEM Canada Inc. and a research scientist at Huron Tech Canada Inc., both of which are in Kingston, Ontario. Chen received his Ph.D. from the University of Guelph in 1998.

Shaowei Chen (USA) is an assistant professor in the Department of Chemistry and Biochemistry at the University of California at Santa Cruz. He completed his undergraduate education in China with a B.S. in Chemical Physics from the University of Science and Technology. He received his M.S. and Ph.D. in Chemistry from Cornell University. Following a postdoctoral appointment at the University of North Carolina at Chapel Hill, Chen joined the faculty of Southern Illinois University at Carbondale. His research interests focus on novel functional nanomaterials and nanoscale electron transfer.

Victoria Cornelius (UK) is a lecturer in formulation technologies at the University of Greenwich in Chatham Maritime in Kent. A graduate in applied chemistry, Cornelius did her Ph.D. in the use of reactive microgels in mimicking biologically important molecules. After spending 18 months at a consultancy/spin-off company as a senior scientist doing work for Pfizer, Glaxo SmithKline, and ISP International, she returned to Greenwich to take up her lectureship. She is a member of the university's prestigious Medway Sciences research team that supports 8 Ph.D. students and 10 postdoctoral research fellows in the areas of formulation and preformulation. Her current research interests include development of novel polymers with specific characteristics, anti-solvent technologies, excipient engineering, and intelligent wound dressings. Cornelius has close research links with industry (e.g., Pfizer, BP Amoco, and Glaxo SmithKline) and academia, including the University of Huddersfield.

Christopher Gorman (USA) is a professor at North Carolina State University. He received a B.A. in chemistry and computer science from Drew University in 1987 and a Ph.D. in

Chemistry from the California Institute of Technology in 1991 with Prof. Robert H. Grubbs. Gorman undertook postdoctoral work with Dr. Seth Marder at the NASA Jet Propulsion Laboratory and with Professor George Whitesides at Harvard University. His present research interests include the design and synthesis of new macromolecules with interesting and useful electronic properties at nanometer length scales, and the use of scanned probe microscopies in nanoscience to establish molecular structure-property relationships for single-molecule electronic behaviors.

Robert Hinde (USA) is an associate professor at the University of Tennessee in Knoxville. He received his B.S. in chemistry from Rensselaer Polytechnic Institute and his Ph.D. in physical chemistry from the University of Chicago. Hinde performed postdoctoral research at Cornell University before joining the faculty at the University of Tennessee. His research focuses on quantum chemical studies of weak intermolecular interactions and on quantum Monte Carlo methods for studying cryogenic condensed phase materials. He is also interested in learning how chemists can raise awareness about the negative effects of barriers that impede international collaboration among scientists, such as those preventing travel or the flow of information across national borders.

Katherine Holt (UK) holds the prestigious Ramsay Fellowship in Chemical Research at the Department of Chemistry, University College London, where she carries out independent research in the field of electrochemistry. Presently she is using scanning electrochemical microscopy (SECM) to study the properties of model biological systems, such as lipid bilayer membranes and living *E. coli* cells. She also has research interests in new applications for novel diamond-based electrode materials. Her doctoral work on the characterization of boron-doped diamond electrodes was carried out at the University of Oxford under the supervision of Prof. John S. Foord. More recently, Holt did postdoctoral research work in the Laboratory of Electrochemistry at the University of Texas at Austin under the supervision of Prof. Allen J. Bard. There, she worked on several projects using SECM.

Andrea Jackson (UK) is a lecturer in the Institute of Atmospheric Science at the University of Leeds and has been based within the School of Earth and Environment since 1997. Jackson graduated from Lancaster University in 1993 with a B.Sc. Environmental Science degree and obtained her Ph.D. from the same institute in 1996. She has over 10 years of active research in atmospheric chemistry, with particular interest in the chemical and physical factors affecting the presence of oxidants such as hydrogen peroxide and organic hydroperoxides. This has involved the development of field-based liquid chromatography instrumentation for the measurement of atmospheric peroxide species, and participation in many international collaborative field campaigns at locations in Europe, North America, and Australia. Jackson is presently involved in the Natural Environment Research Council funded CHABLIS (Chemistry of the Antarctic Boundary Layer and Interface with Snow) project, involving collaboration between several UK Universities and the British Antarctic Survey. She is currently the deputy director of learning and teaching within the School of Earth and Environment and has been responsible for the design of new programs in the field of environmental science/chemistry that have particular emphasis on practical teaching approaches.

Sevgi Kocaoba (Turkey) is an assistant professor in the Department of Analytical Chemistry at Yildiz Technical University in Istanbul, Turkey. Kocaoba received his Ph.D. from Yildiz in 1999. His research interests include analytical chemistry, environmental chemistry, ion exchange and kinetics, removal and recovery of heavy metals, speciation, and water and wastewater technology. In terms of international activities, Kocaoba has been working on a project with the Karlsruhe Research Center in Germany on the removal and recovery of chromium from tannery wastewaters. He also coordinates the Socrates Student and Staff Exchange Programme at his university.

Igor Kozlov (USA) is a senior scientist at Illumina, Inc. in San Diego, California. Illumina is developing next-generation tools for the large-scale analysis of genetic variation and function. Kozlov is one of the contributors to the development of BeadArray™ technology that is now used in leading genome centers around the world. The technology enables researchers in the life sciences and pharmaceutical industries to perform the multitude of tests necessary to extract medically valuable information from advances in genomics and proteomics. Prior to joining Illumina, Kozlov conducted postdoctoral research in chemical biology at the Scripps Research Institute and postdoctoral research in chemical evolution at the Salk Institute for Biological Studies. Kozlov received a Diploma in Chemistry and a Ph.D. in Bioorganic Chemistry at MV Lomonosov Moscow State University, Russia.

Richard Layfield (UK) graduated from the University of Leeds in 1999 and took his Ph.D. in inorganic chemistry from the University of Cambridge in 2002 working under the supervision of Dr. D.S. Wright. He

is currently a university lecturer in inorganic chemistry at the Cambridge University Chemical Laboratory, and a fellow of Clare College, where his research interests embrace the organometallic chemistry of the elements. In particular Layfield's group is concerned with the coordination chemistry of metal allyl complexes, both from a fundamental standpoint and with a view to their potential applications in metal-mediated olefin polymerisation catalysis. His group also studies the applications of manganese(II) organometallics in the synthesis of polynuclear clusters and the synthesis of highly-functionalised cyclopentadienyl ligands from polar cyclopentadienides. Layfield has an interest in the philosophy and practice of chemical education, with particular emphasis on the teaching of inorganic chemistry and its supposed "image problem."

Yi Lu (USA) is a professor in the Departments of Chemistry, Biochemistry, and Materials Science and Engineering at the University of Illinois at Urbana-Champaign. He received his Ph.D. from the University of California at Los Angeles in 1992. After two years of postdoctoral research at the California Institute of Technology, he joined the faculty of the Department of Chemistry at the University of Illinois at Urbana-Champaign. His research interests are in bioinorganic chemistry, including design and engineering of artificial metalloproteins as environmentally benign biocatalysts for asymmetric transformations and for bioremediation of aromatic pollutants; design of sensitive and selective metal ion sensors and its application to environmental monitoring, developmental biology, clinical toxicology, and industrial process monitoring; and genetic control of directed assembly of inorganic nanomaterials using catalytic DNA.

Eduardo D Pereira Ulloa (Chile) is an assistant professor in the Analytical and Inorganic Chemistry Department at the University of Concepción in Concepción, Chile. Ulloa's research interests include polymeric surfactants as pseudostationary phases in electrokinetic chromathography, solid and liquid phase micro-extraction of PCBs and PHAs from natural waters for GC determination, and the synthesis and properties of water-soluble polymers and non water-soluble polymers, polymer-metal ion interactions, and environmental applications. He has supervised 10 undergraduate theses, including chemistry and marine chemistry students. Ullola received his Ph.D. in chemistry in 2000 from the University of Concepción.

Salete Queiroz (Brazil) is a professor at the University of São Paulo, São Carlos, Brazil. After receiving her Ph.D. in 1993, Queiroz completed postdoctoral fellowships at the State University of Campinas, Brazil (2001–2002), and at Griffith University, Australia, (1999–2000). Her two main areas of research involve development of improved pedagogy in university chemistry and in science generally, and studying ruthenium phosphine complexes. From 1991 to the present, Queiroz has had 26 publications in international scientific journals and 51 posters in scientific meetings.

Daniel Rabinovich (USA) is an associate professor at the University of North Carolina at Charlotte. After graduating from the Catholic University in Lima, Peru, with a B.S. in chemistry, he moved in 1989 to New York City to pursue graduate studies in inorganic chemistry at Columbia University. Rabinovich went on to do postdoctoral work at Los Alamos National Laboratory. His research interests are in synthetic and structural inorganic and organometallic chemistry, including the coordination chemistry of multidentate sulfur-donor ligands and the synthesis of model compounds for the active sites in nickel hydrogenases and other sulfur-rich metallobiomolecules.

Mark H. Schoenfisch (USA) is an assistant professor of chemistry at the University of North Carolina at Chapel Hill. He began his post in Chapel Hill in January 2000 following studies at the University of Kansas where he received a B.A. in chemistry and a B.A. in Germanic languages and literature. In 1997 he received his Ph.D. in chemistry at the University of Arizona. From 1997–1999 he was an NIH Postdoctoral Fellow at the University of Michigan. His research interests include solid-phase immunoassays, scanning probe microscopy of proteins, nitric oxide release, and in vivo chemical sensors. Schoenfisch is also interested in chemical education and international activities involving analytical chemistry.

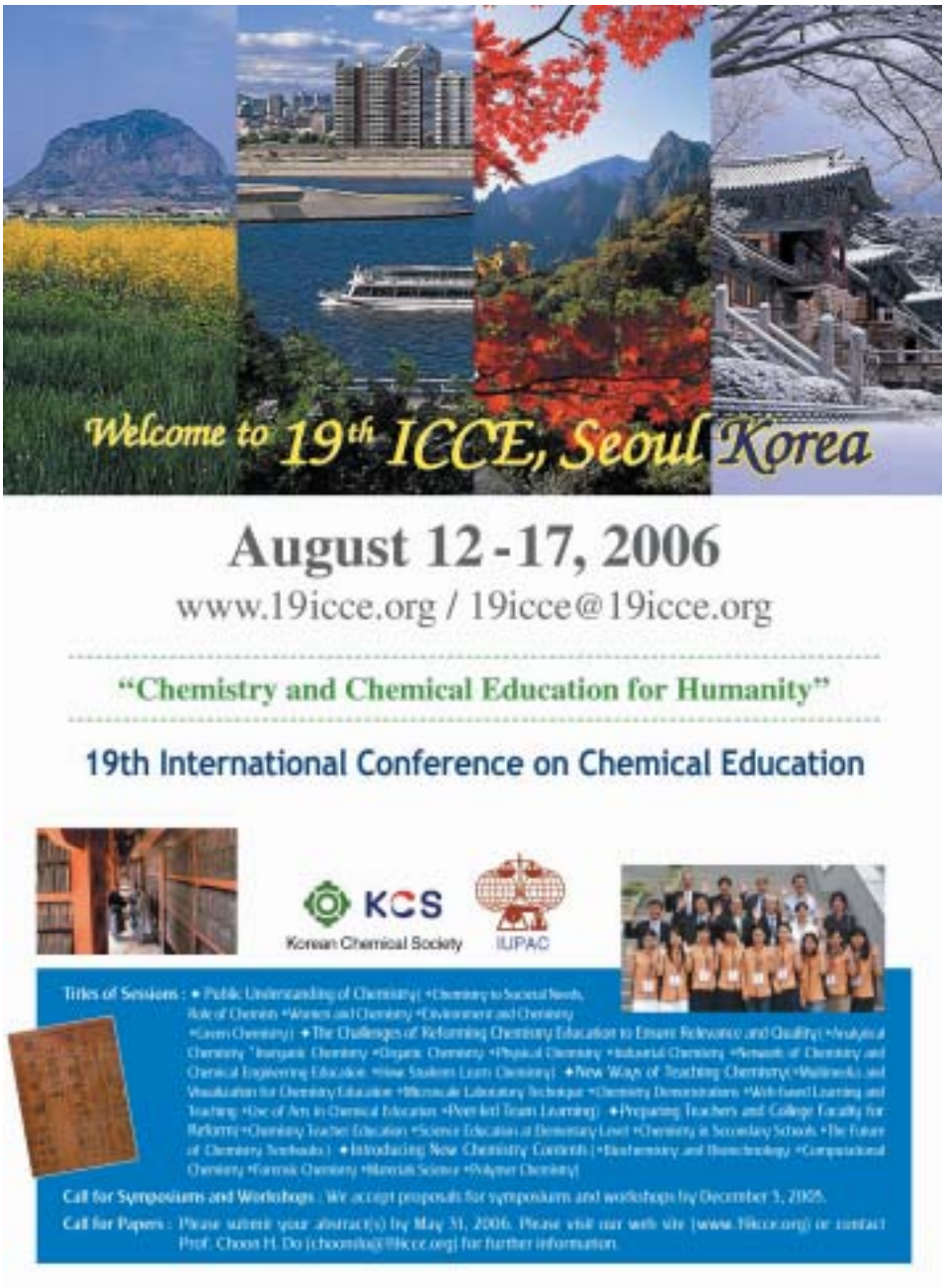
Sandeep Verma (India) is an associate professor in the Department of Chemistry at the Indian Institute of Technology-Kanpur, where he is involved in undergraduate and graduate teaching and research. His group focuses mainly on the problems of chemico-biological interest, such as nucleobase polymers in chemical and biochemical catalysis and chemical approaches towards the modeling of amyloidic diseases. His research involves the design and application of metalated nucleobase polymers, which are intended to mimic ribozyme catalysis. Verma's group has been able to demonstrate the ability of these polymers to effect phosphate ester hydrolysis, relaxation of supercoiled plasmids, C-H bond activation and oxidation of neurotransmitters, to name a few. Verma received his Ph.D. in chem-

istry from the Department of Medicinal Chemistry of the University of Illinois Medical Center, Chicago, USA.

Nick Walker (UK) graduated from the University of Sussex in 1996 with a first class B.Sc. honors degree in chemical physics. Prof. Tony Stace supervised his Ph.D. study at the same university, where postgraduate work involved experiments on the stability of gas phase, multiply-charged transition metal complexes. This work included the first observation of aqueous Cu^{2+} in the gas phase. He performed postdoctoral work at the University of British Columbia with Prof. Michael Gerry. In 2002, he moved to the University of Georgia to work with Prof. Michael Duncan. Walker was awarded a Royal Society University Research Fellowship that commenced at the University of Bristol in November 2003. His independent research will be directed toward establishing a microscopic picture of solvation processes and catalysis through further studies of metal-containing cluster ions.

Angela K. Wilson (USA) is an associate professor in the Department of Chemistry at the University of North Texas. She received her Ph.D. in chemical physics from the University of Minnesota and was a DOE Postdoctoral Fellow at Pacific Northwest National Laboratory. Her research interests focus on the development of computational chemistry methodology and the use of this methodology in numerous areas including transition metal chemistry and atmospheric chemistry. Honors include a National Science Foundation (NSF) CAREER Award, an NSF POWRE Award, an IJQC Young Investigator Award, and an American Chemical Society YCC Leadership Award. She has worked as a visiting scientist at Pacific Northwest National Laboratory, Oak Ridge National Laboratory, and the University of Sydney, and has served as a Science Advisory Board Consultant to the Environmental Protection Agency.

Zhiping Zheng (USA) is an associate professor of chemistry at the University of Arizona. He received his B.S. and M.S. degrees in chemistry from Peking University, China, and his Ph.D. from UCLA in 1995, under the supervision of Prof. M. Frederick Hawthorne. Zheng conducted postdoctoral research with Prof. Richard H. Holm at Harvard University. His current research is focused on supramolecular chemistry and materials, which involves the elaboration of polynuclear lanthanide complexes and transition metal clusters. In 2003, he received a CAREER Award from the US National Science Foundation and the International Junior Award from the European Rare Earth and Actinide Society. He also received a China Bridge International Teaching and Research Fellowship from 1999–2002, and a Research Corporation Research Innovation Award from 1998–2003.



Emerging Issues in Developing Countries

This series, coordinated by Jan-Åke Jönsson, seeks to inform readers, explore new ideas, and promote discussion on themes related to developing countries and emerging analytical communities. If you wish to contribute to this series, please contact Jan-Åke Jönsson <jan_ake.jonsson@analykem.lu.se>. Articles in this series are available from <www.iupac.org/publications/ci/indexes>.

Can Ambiguous Terminology Cause a Barrier to Trade?

by Paul De Bièvre

Trading in and between developed and developing countries is an exchange process in which both parties must have a clear understanding about the value of the goods being traded. A primary means of establishing the quality of goods is through measurement. However, there should be mutual trust in the measurement results to sustain a successful trading partnership. This obvious requirement can often cause problems for developing countries when they are trying to export raw materials, food products, or manufactured or processed goods that have to satisfy high import standards in order to "protect the consumers." This is especially true in trade with developed countries that may believe, rightly or wrongly, that they have more sophisticated measurement methods and better trained staff.

Analytical laboratories in countries trading with one another must be able to express their measurement results using concepts and terms that are identical and unambiguous, irrespective of language. This requires a common, globally accepted, vocabulary in measurement, such as the ISO "International Vocabulary of Basic and General Terms in Metrology" (VIM),[1] which is used in physics and engineering. Such a rigorous approach has not yet been fully followed in chemical terms, although a highly laudable initial work using English as the medium has already been done by IUPAC in its "Color Books."[2] Dybkaer also produced a more fundamental approach for measurements in clinical chemistry and clinical biochemistry.[3]

The end goal must be to have the definitions of all basic concepts in all major languages of the world. For that, there must be worldwide agreement on chemical measurement concepts and terms in a single language because terms are in reality labels for underlying concepts. Thus, the concept must be unambiguously defined first, then a term must be allocated to the concept.

The need for agreed terms in chemical measurement results has now arrived in full at the analytical chemist's doorstep, in both developing and developed countries. Any ambiguity can have commercial and financial consequences in intercontinental trade. Additionally, lives may depend on clinical measurement results in case they are obtained from laboratories in different countries. For example, what if from one lab to another the glucose level of a diabetic patient reads differently. Identical understanding of the same concepts must be ensured at the time that chemical measurements are entering the VIM in its ongoing revision.[1]

Typical Examples of Technical Barriers to Understanding

A few typical terms causing problems are quantity, measurand, concentration, measurement result, and traceability.[4]

"Quantity" is defined as "attribute of a phenomenon, body or substance that may be distinguished qualitatively and determined quantitatively."[1] Thus, in chemical measurement, "quantity" is "concentration," "content," "amount-of-substance fraction," or "mass fraction." But "quantity" is also used by chemists colloquially to mean "amount." Thus we often talk ambiguously about a "quantity of sample." If we want to express "how much of a substance there is," then the term "amount" should be used to avoid confusion.

The definition of **"measurand"** is "quantity subject to measurement."[1] This could be interpreted in many chemical measurements as meaning "electric current" because that is the output of the instrument. It has been proposed in VIM3 that measurand should be defined as "quantity intended to be measured." This will be more suitable for chemical measurements as the analytical chemist aims to determine a "concentration," not just the electric current from the spectrometer.

"Measurement result" poses particular problems. Is it a numerical value times a unit? Is the inherent uncertainty of the measurement result also part of that

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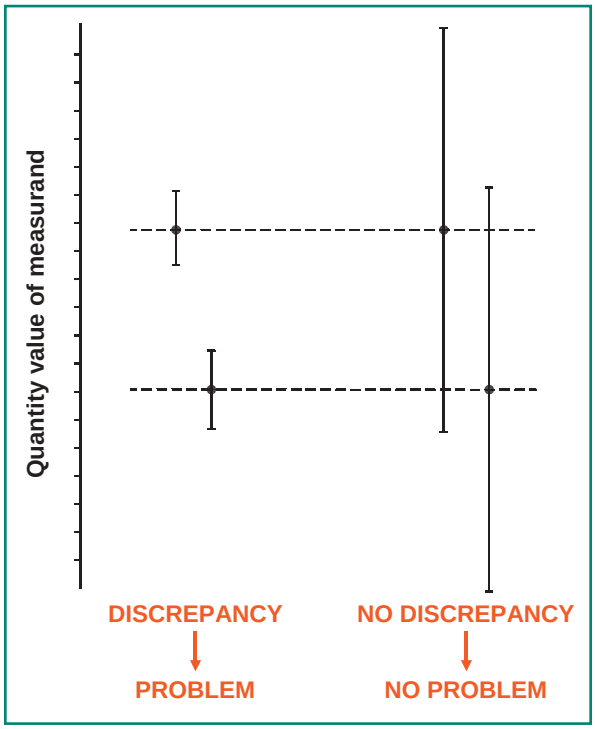
September-October 2005, pp. 18–21

result? If a measurement result contributes to an important decision, its definition is very important. Discrepancy problems are mostly caused by lack of full evaluation of measurement uncertainty. It is important when comparing measurement results from developed and developing countries, that the measurement uncertainty associated with each result is evaluated in the same way. Otherwise results that are equivalent may appear to differ, casting doubt on the reliability of one of the laboratories. That may lead, in the worst case, to customs officials refusing the entry of what should be acceptable goods or produce. Common evaluation procedures (according to the ISO Guide on the Expression of Uncertainty in Measurement, i.e., GUM) should be used in the evaluation of all measurement results by all laboratories, whether located in developed or developing countries.

The term **"traceability"** was almost unheard of several years ago, but it has dramatically invaded oral and written language as one of the newer buzzwords. However, what does it really mean? Does it refer to traceability of the sample, of the accompanying document, of the accompanying certificate, or of a measurement result, the really important feature in measurement? "Metrological traceability" is proposed in VIM3 as a more specific term for the traceability to a common metrological reference: to a value embodied in a certified reference material, to a common measurement unit, or to an internationally agreed measurement procedure.



Importance of measurement uncertainty when reporting and comparing measurement results: (left) measurements claimed with a small but incomplete measurement uncertainty, leading to the incorrect conclusion of "discrepancy"; and (right) better measurement results claimed with larger but complete measurement uncertainty, and leading to the correct conclusion of "no discrepancy."

This relationship is important when a comparison between measurement results from different countries is made, as measurement results are only comparable when their metrological traceability has been established beforehand. Only then can we decide if the results obtained on one sample from a material batch indicate a larger concentration of a given substance than the results obtained on a sample from another similar material batch. For example, is one used-car exhaust catalyst revealed to contain a larger concentration of a valuable platinum metal (Rh or Pt) than that concentration in another car-exhaust catalyst, and can the first material therefore be priced higher? Similarly, the concentration of cholesterol for a person traveling in different countries may seem to be different, but is not (see figure). This can lead to incorrect treatment.

The difficulty for developing countries is also that they can be at a disadvantage in trade as their measurement results may be considered dissimilar to those from other countries because even the term "comparability" is used ambiguously: Most of the time it means "being of the same size" rather than "can be compared because traceable to the same reference," regardless of size.

All of this generates confusion, and even more so for the non-native English-speaking person.

Certified reference materials required for the comparisons may also be prohibitively expensive in developing economies and, hence, difficult to justify. Worse, commercial organizations may offer reference materials embodying values that are "traceable to an institute," but that does not show by itself that these values are metrologically traceable to a common, internationally agreed metrological reference needed for any scientifically valid, intercontinental comparison of measurement results.

Although the UK and the USA are often said to be countries "*divided* by a common language," this is no

continued on page 10

continued from page 9

longer acceptable in the analytical chemistry laboratories of developed and developing countries. In order to have "fair trade," they must be *united* by a common [measurement] language and by common understanding of the concepts and terms labeling these concepts in that language. Only after this is accomplished is it worth putting time and effort into translating these terms into 30–40 (or more?) of the world's other languages, an obvious necessity.

Acknowledgements

Useful comments are gratefully acknowledged by René Dybkaer. The author also thanks the series editor Jan Åke Jönsson, as well as Roger M. Smith, secretary of the IUPAC Analytical Chemistry Division, for their comments and input. This contribution was approved for publication on 20 May 2005, World Metrology Day—a salute to all interested in Metrology!

References

1 BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, *International Vocabulary of Basic and General Terms in Metrology*, 2nd edition, VIM2, ISO Genève (1993); a revised edition (leading up to VIM3) is expected shortly.

2 The IUPAC Color Books is a series of references on IUPAC nomenclature, terminology, and symbols. For instance, the so-called "Gold Book" is the *Compendium of Chemical Terminology*, the "Green Book" is the *Quantities, Units, and Symbols in Physical Chemistry*, the "Orange Book" is the *Compendium of Analytical Nomenclature*, etc. References to this collection are available online at www.iupac.org/publications/books/seriestitles/nomenclature.html.

3 R. Dybkaer, *Eur J Clin Chem Clin Biochem* 35 (1997) 141–173

4 P. De Bièvre, "The Terms We Use and the Words We Choose: International Terminology Needed for Measurements in Chemistry," *VAM Bulletin*, LGC, Teddington, 2004

Paul De Bièvre <paul.de.bievre@skynet.be>, a long-time member of IUPAC, is an independent consultant on metrology in chemistry based in Belgium. He is currently a member of the Interdivisional Working Party for Harmonization of Quality Assurance of the IUPAC Analytical Chemistry Division.

Congress Lookup

One very practical innovation for the General Assembly and Congress this year is that both events are being held in the very same building. It is hoped that this convenient joint location will facilitate interaction among scientists attending the two events. Following this year's Congress theme, "**Innovation in Chemistry**," the following plenary lecturers will open each morning session (see Congress schedule for details):

Plenary Lectures

Prof. Akira Fujishima
University of Tokyo, Japan
"Water Photolysis and Photocatalysis—How to Extend Fundamental Findings to Actual Applications"

Prof. Alan J. Heeger
Nobel Laureate, University of California at Santa Barbara, USA
"Semiconducting and Metallic Polymers: From 'Plastic Electronics' to Novel Biosensors"

Prof. Jianguo Hou
University of Science and Technology of China, China
"Study of Single Molecules and their Assembly by Scanning Tunneling Microscopy"

Prof. Charles M. Lieber
Harvard University, USA
"Nanoscience and the Pathway to Nanotechnologies"

Prof. William N. Lipscomb
Nobel Laureate, Harvard University, USA
"Structure and Functions in Chemistry and Biology: Experimental and Computational Studies"

Prof. Yuri Oganessian
Joint Institute of Nuclear Research, Russia
"Synthesis and Decay Properties of Superheavy Elements"

Prof. John E. Walker
Nobel Laureate, University of Cambridge, UK
"The Swings and Roundabouts of F- and V-Atpases"

Prof. Jiming Wang
SINOPEC, China
"Petrochemical Technology of China in a New Century"

Prof. Kurt Wüthrich
Nobel Laureate, ETH, Switzerland
"The NMR View of Proteins—From Structural Biology to Structural Genomics"

The Congress Welcome Reception, including the Award Ceremony for the winners of the IUPAC Prize for Young Chemists, will be held **Sunday 14 August at 18:30** in Hall 1 (BICC level 2).

GDCh
Gesellschaft Deutscher Chemiker

IUPAC

INCA

International IUPAC Conference on Green Chemistry

SEPTEMBER 10-15, 2006 • DRESDEN, GERMANY

TOPICS:

- Benign Syntheses Routes
- Future Green Energy Sources
- Use of Renewables
- Benign Process Technology
- Education in Green Chemistry

CHAIRMEN:

Prof. Dr. P. Tundo, Venice
(Chairman)
Prof. Dr. W. Hölderich, Aachen
(Co-Chairman)
Prof. Dr. W. Reschetilowski, Dresden
(Co-Chairman)

INFORMATION:

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www.gdch.de/vas/tagungen/tagungen2006/5559.htm

The Project Place

continued from page 1

engine rooms for idea exchange at the threshold of discovery.

All of these are important, but IUPAC is about much more. IUPAC is taking a much broader role to promote all aspects of chemistry, not just among the members of the profession, but increasingly to the worldwide community. The work of IUPAC addresses international issues in the chemical sciences and is largely channeled through the project system, which utilizes expert volunteers all over the world.

Through its projects, IUPAC takes a leadership role in addressing global issues involving every aspect of chemistry. IUPAC facilitates research advancement and contributes to industrial development. It fosters communication between individual chemists and scientific organizations, particularly those in scientifically emerging regions. IUPAC uses its global perspective to expand and diversify the international chemical network, which enhances chemistry education and opportunity, especially for young chemists.

I invite you to sample the flavor of IUPAC activities displayed in 40 posters set up on **level 2** of the Convention Center. If you thought IUPAC was just about nomenclature, think again!

David StC. Black
IUPAC Secretary General

Following is a listing of the project posters on display.

1. Evaluated Kinetic Data for Atmospheric Chemistry
R.A. Cox, R. Atkinson, J.N. Crowley, R.F. Hampson, R.G. Hynes, M.E. Jenkin, M. J. Rossi, and J. Troe

2. The Thermochemistry of Free Radicals of Importance to Combustion and the Atmosphere
Branko Ruscic, Tibor Bérces, J. E. Boggs, A. Burcat, A. Császár, J. Demaison, R. Janoschek, J.M.L. Martin, M.J. Rossi, J. Stanton, P. Szalay, P.R. Westmoreland, and F. Zabel

3. Standard Potentials of Radicals
David M. Stanbury, D. Armstrong, J. Butler, R.E. Huie, W.H. Koppenol, Sergei V. Lymar, G. Merényi, Pedi Neta, S. Steenken, and P. Wardman

4. Determination of Atomic Weights Using New Analytical Techniques
Michael Wieser, et al.

5. Post-Genomic Chemistry—Achievements and Prognosis
Sergey Varfolomeyev, I. Beletskaya, I. Bertini, G.M. Blackburn, R. Cunin, E. Efremenko, J. Eichler, I. Galaev, V. Gladyshev, T. Haertle, A. Karyakin, I. Kurochkin, M. Mikolajczyk, V. Poroikov, I. Sakharov, F. Spener, N. Voyer, and J. Wild

6. Chemical Actinometry
Hans Jochen Kuhn, Silvia E. Braslavsky, and Reinert Schmidt

7. Fighting Microbial Resistance through Development of New Antimicrobial Agents, Directed Against New Specific Targets
G.J. Koomen, S. Mobashery, T. den Blaauwen, K. Hellingwerf, R. Ungaro, and H. Verheij

8. Establishment of International Centre for Natural Product Research
Mohammed Mosihuzzaman

9. Green Chemistry
Pietro Tundo, M. Tawfic, D. StC. Black, L. Mammino, E. Lokteva, V. Lunin, R. Hoyos de Rossi, R.M. Romero, J. Scott, A. Patti, N. Tarasova and F. Zrcchini

10. Structure and Properties of Commercial Polymers
Rob Bailey

11. Modelling of Polymerization Kinetics and Processes
Michael Buback

12. IUPAC Standard Definitions of Terms Relating to Mass Spectrometry
Kermit Murray, R.K. Boyd, M.N. Eberlin, G.J. Langley, L. Li, Y. Naito, J.-C. Tabet, and David Moore

13. The IUPAC Compendium of Analytical Terminology On-Line Edition: A Free Resource
David Moore

14. Chemical Speciation of Mercury(II) with Environmental Inorganic Ligands
Kip Powell, Paul Brown, Robert Byrne, Tamas Gajda, Glenn Hefter, Staffan Sjöberg, and Hans Wanner

15. A Compendium of Physical and Chemical Properties of Selected Pesticides
David Shaw and R. Don Wauchope

16. The IUPAC Stability Constants Database
Leslie Pettit, Kip Powell, and V. Solov'ev

17. Terminology, Quantities, and Units Concerning Production and Application of Radionuclides in Radiopharmaceutical and Radioanalytical Chemistry
Mauro L. Bonardi, Z.B. Alfassi, V.P. Kolotov, R. Iwata, G.J. Meyer, P.B. Robouch, D.J. Schlyer, and L.I. Wiebe

18. Thermodynamic Analysis and Application of Metal Carbonate Solubilities (Solubility Data of Compounds Relevant to Mobility of Metals in the Environment)
Heinz Gamsjaeger, Erich Koenigsberger, and Maria Clara F. Magalhaes

Thinking ahead . . . please mark your calendar for 4–12 August 2007, and plan to participate in the next IUPAC GA/World Chemistry Congress in Torino, Italy. The Italians regularly demonstrate their ability to make us feel at ease, and they surely succeeded when in 2004 they hosted the 4th Conference for Europe's Younger Chemists, where President Sydnes (left) gave a presentation on IUPAC's role and function.

19. International Organization for Chemical Sciences in Development
Walter R. Benson

20. Chemistry and the Environment—IUPAC Division VI Takes Stock and Looks Ahead
Kenneth Racke and Patrick Holland

21. Soil Physicochemical and Biological Interactions
Pan Ming Huang

22. Environmental Colloids: Behavior, Structure, and Characterization
Kevin Wilkinson

23. Remediation Technologies for the Removal of Arsenic from Water and Wastewater (also see poster 39)
Yehuda Shevah and Hemda Garelick

24. Pesticide Properties and Information
R. Donald Wauchope

25. Air—Recent/Current Projects
Leo Klasinc

26. Chemistry and Human Health—An Overview of IUPAC Division VII Activities
Paul Erhardt

27. Nomenclature, Properties, and Units in Laboratory Medicine—The C-NPU Coding Scheme for Representation of Properties in Laboratory Medicine
Urban Forsum

28. Analog-Based Drug Discovery
Janos Fischer

29. Toxicology and Risk Assessment
John H. Duffus

30. Human Drug Metabolism Database
Paul Erhardt

31. The IUPAC International Chemical Identifier (InChI)
Alan McNaught

32. Graphical Representation Standards for Chemical Structure Diagrams
William G. Town

33. Nomenclature of Inorganic Chemistry—The IUPAC Red Book
Alan McNaught

34. Young Ambassadors for Chemistry
Lida Schoen

35. Public Understanding of Science: Identifying IUPAC's Niche
Megan Rosborough, Peter Mahaffy, Bob Bucat, Tony Ashmore, and Choon Do

36. ICCE, Chemistry, and Chemical Education for Humanity (CCE International Conference Series)
Choon H. Do

37. IUPAC–UNESCO–UNIDO Safety Training Program
Mark Cesa

Check out the Safety Training Program Workshop, Wednesday 17 August at 10:00 in Hall 17b

38. CHEMRAWN—A History
John Malin

39. Arsenic Mitigation in Bangladesh (also see poster 23)
J. Malin and S. Ahuja

40. Proposed International Standard for EMR Spectroscopic Data
Richard Cammack, Yang Fann, Robert J. Lancashire, John P. Maher, Peter S. McIntyre, and Reef Morse

continued from page 1

Gallium was discovered by the Frenchman P.-E. Lecoq de Boisbaudran, who named the new element in honor of his fatherland, since "France" in Latin is known as Gallia. Others have claimed that Lecoq de Boisbaudran named gallium after himself since "gallus" in Latin means "coq" (in French) or rooster. A final coincidence is that this is the year of the rooster on the Chinese calendar. What more could you ask for than news and updates about the GA brought to you by a rooster! OK, I must stop.

So, what exactly will you find in this *Gallium*? Plenty of miscellaneous information and reminders about dates and places of the various events happening this week in Beijing. An update of the schedule, including room assignments, is on p. 14. There are also two unique listings that I invite you to browse. One lists titles of posters displayed in *The* Project Place exhibit on level 2 (see pp. 1 and 12), which showcases the incredible breadth of IUPAC projects. The second is a short presentation of the Young Observers participating in the GA this year. Just over 20 YOs have been selected, and collectively they will rove all the committee meetings. Please offer them a friendly welcome. I wish you all an enjoyable and fruitful Assembly. See you around!

Fabienne Meyers
<fabienne@iupac.org>

2005
GA
Beijing

GA Schedule and Room Assignments

from Saturday 13 August to Sunday 21 August 2005

		Sat 13		Sun 14		Mon 15		Tue 16		Wed 17		Thu 18		Fri 19		Sat 20		Sun 21	
	AM 9:00 – 13:00; PM 14:00 – 18:00	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
	President's Address & Members Reception		**E**;02																
	Congress Reception				**EE**;01	*(Congress registration required)*													
Divisions	Division Presidents & Secretaries Briefing	**B**;3030																	
	Division Committees (DC) DC I – pchem	16a	16a	16a	16a														
	DC II – inorganic	16b	16b	16b	16b														
	DC III – organic			15	15	15													
	DC IV – polymer	07	07	07	07														
	DC V – analytical	10	10	10	10														
	DC VI – environment	13	13	13	13	13													
	DC VII – human health	12	12	12	12														
	DC VIII – nomenclature	11	11	11	11														
Standing Committees	CPEP (publications)			3030	3030	3030	3030												
	CHEMRAWN					12	12												
	COCI (industry)					10	10												
	CCE (education)					11	11	11											
	CHEMRAWN & COCI (from 14:00 to 15:00)								11										
	CHEMRAWN & COCI & CCE (from 15:15 on)								11										
	ICTNS (terminology etc.)							15	15	15	15								
	PAC Editorial Advisory Board													3030					
	Project Committee							3030											
	Evaluation Committee								3030										
	Division Presidents									3030									
	BUREAU										04	04	04						**L**;04
	International Research Funding											*tba*	*tba*	*tba*					
	World Chemistry Leadership Meeting														17				
Workshops	Metrological traceability of measurement results				**T**;10														
	Food Chemistry – IUPAC future direction						13												
	COCI Safety Training Program									**C**;17b	**C**;17b								
Subcommittees/Task Groups	Physicochemical Symbols, Terminology, and Units (Commission I.1)											16b	16b	16b	16b				
	Materials Chemistry					**C**;16b	16b												
	Organic Synthesis		15																
	Biomolecular Chemistry						15												
	Green Chemistry						16a												
	Structural and Mechanistic Chemistry						04												
	Macromolecular Terminology					07	07	07	07	07	07	07	07						
	WP Quality Assurance/TG on Traceability					3049	3049	3049	3049	3049	3049	3049	3049						
	Biophysico-Chemical Processes in Environmental Systems								16b										
	Medicinal Chemistry & Drug Development				04														
	COUNCIL															17	17	17	
	Council Reception																**E**;bh		
	Union Advisory Committee																		17

Version date: 27 July 2005

Key to Table

Refer to floor plan to locate the room/hall number indicated in the table.

bh: Banquet Hall in the BCG Hotel; *tba*: to be announced

C: morning session starting after plenary lecture of the Congress;
B: 8:00–9:00; **L**: 12:30–14:00; **T**: 16:00–18:00; **EE**: 18:30; **E**: 19:00

Participation in the GA is restricted to members of IUPAC bodies and invited observers. Only meetings color coded in green are accessible to observers, with the preliminary authorization of that meeting chairman. All other meetings are restricted to members of that specific body or upon invitation.

Other Pre-GA Meetings:

Commission on Isotopic Abundance and Atomic Weights (II.1): Thu, 11 Aug and Fri, 12 Aug (AM & PM)

Task Group on Ionic Liquids Databases: Fri, 12 Aug (AM & PM), Room 3030

Subcommittee on Structure and Properties of Commercial Plastics: Fri, 12 Aug (AM & PM), Hall 16A

Div VII Open Meeting: Fri, 12 Aug 16:30, Hall 11

Task Group on Rotaxanes Nomenclature: Wed, 10 Aug (PM), Hall 12

Task Group on Graphical Representation Standards: Thu, 11 Aug and Fri, 12 Aug (AM & PM), Hall 12

Notes

Miscellaneous

The Secretariat

Office: Room 16c (BICC level 3)
Telephone: 8497 9741
Fax: 8479 9744
(China country code: 86)
(Beijing city code 10)

Office hours:
Friday 12 Aug: from 14:00 to 17:00
Every day after: from 8:00 to 15:00

The team from the IUPAC Secretariat is here—John (Executive Director), Enid, Paul, Erin and Fabienne—and looking forward to meeting you. In addition, Chris (production editor of *Chemistry International*) will be roving around. Linda had to stay behind in North Carolina to guard the RTP office.

Things to Know

- GA registration area: Lounge, BICC level 3
- Coffee breaks: Lounge, level 3, each day at 10:30 and 15:30
- The Business Center, post office, and ATM: BICC level 1
- The Congress registration desk: Lounge, BICC level 2

IUPAC Booth

Visit the IUPAC booth in the Congress Exhibition Hall—the exhibition is free to all!

Hours:
Sunday 14, from 18:00 to 22:00
Monday 15 to Wednesday 17, from 8:00 to 18:30
Thursday 18, from 8:00 to 12:00

Hotels Located Near the Beijing International Convention Center

1 Beijing International Convention Center (BICC)
2 Beijing Continental Grand Hotel
tel.: 8497 2323
3 Crowne Plaza Park View
tel.: 8498 2288
4 Beijing Foreign Experts Building
tel.: 8285 8888
5 Beijing Tibet Hotel
tel.: 6498 1133
6 National Jade Hotel
tel.: 6496 9988
7 Yayuncun Hotel
tel.: 6499 2828
8 Huiyan International Apartment
tel.: 8498 0536