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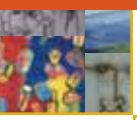


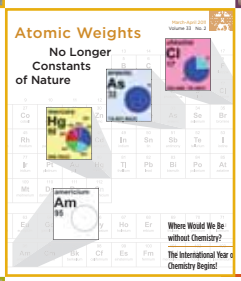

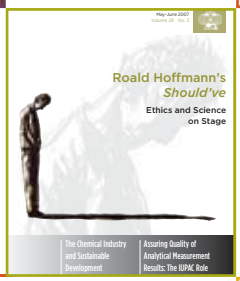

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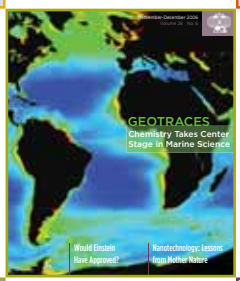

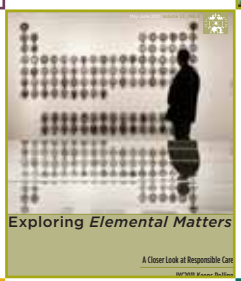

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

The Global Young Academy

Chemical Sciences in Development

CHEMISTRY International

The News Magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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From the Editor

With this issue, we celebrate 10 years of *CI* in color! Having produced 60 issues of this modern version of the magazine with production editor Chris Brouwer, I thought it would be a good time to reflect on what *CI* stands for and consider what else it could be.

The first "color" *CI*, published in January 2003, featured a red (Pantone 180 to be exact) frame, header, and highlights throughout. Each successive issue has featured one of six colors that we rotate through each year.

Chris and I had teamed-up in 2002, having "inherited" a magazine somewhat lost in transition and crying out for a face lift. You might remember the old magazine's design, a simple black and white interior and "striking" green cover reminiscent of the 1970s. Quickly, we shifted gears and adopted a more contemporary design, which is still in use today. In the late 1990s, like many organizations at the time, there was a strong focus at IUPAC on web development. But rather than abandon print all together, our focus has been to publish a steady stream of content of interest to the IUPAC community, providing details on new activities and updates on projects, with abundant references to more information online.

Over the past decade, with an issue every two months containing three to four feature articles and numerous sections, we have published 2300 pages. Chris and I will be delighted to get some feedback and hints about what you liked most and what you wish you could have found in those pages. CI is bound to keep evolving and your input and ideas will be greatly appreciated. Working on the magazine is very rewarding; the connections that it sparks hopefully contribute to greater awareness of what it means to be associated with IUPAC and deeper understanding of international or global issues related to chemistry.

While contemplating the current internationalization of science,* I can't help thinking how "clairvoyant" were the former IUPAC members who in 1979 adopted a moniker for this newsmagazine that is as fitting now as it was 35 years ago. Sure, "International" echoes the "I" in IUPAC, but today it is even more broadly associated with how to build science capacity or to establish research networks, or even how to envision better science funding. With science becoming ever-more *international*, becoming an Affiliate of IUPAC is more fitting than ever. You can help support *CI* by inviting your colleagues to join a thoroughly international organization.

Wishing you all the international best for 2013.

Fabienne Meyers
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*See for example "The New Map of Science," a recent special issue of *Nature*, 18 October 2012 <www.nature.com/news/specials/global>.

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A complimentary map/2013 calendar is enclosed with this issue.

Increasing the Value of IUPAC Activities

by Kazuyuki Tatsumi

I have been pleased to see the high level of activity of our divisions and standing committees. Here, I will mention only a few illustrations among the numerous examples of these activities.

1. At the 30th Latin American Chemistry Congress held in Cancun, Mexico, in October 2012, three workshops and a public event were superbly organized under the well-established Flying Chemists Program of the Committee on Chemistry Education (CCE). The public event conducted in Panama prior to the Cancun meeting was also well received. It was both gratifying and inspiring for me to observe many students and young chemists in Mexico and South America participating in these events with such enthusiasm. The related Young Ambassadors for Chemistry Program of the CCE has also been very successful.
2. The long-standing efforts of the Inorganic Chemistry Division on the natural abundance of isotopes has produced the new "IUPAC Periodic Table of the Isotopes," which was a highlight of the International Year of Chemistry (see July 2011 *CI* p. 20 & supplement). The most striking feature of the new table of the isotopes is that it shows the current atomic weight of each element with its measured uncertainty, and thus the standard atomic weights are no longer constants of nature. This will revolutionize the idea of atomic weight, and then that of molecular weights. While challenging, the attempt to familiarize students and teachers with this new way of defining atomic weights is underway. It is intriguing indeed to imagine that the molecular weight of the water at Niagara Falls, Iguacu Falls, and Victoria Falls may be different.
3. During 2012, off-year meetings of the divisions and standing committees were held. One such meeting was the Physical and Biophysical Chemistry Division held in June in Tokyo. This meeting was unique in that a scientific minisymposium was organized prior to the regular division meeting, where division members presented their recent research (see page 20). I very much enjoyed attending its opening and scientific sessions, as well as its social gatherings. According to the division president, there are two merits of holding a mini-symposium at the off-year meeting, with which I fully agree. For one, it is critically important to publicize division projects and the scientific activities of division members, and to share expertise. For another, it may be possible for associate members and national representatives to obtain financial support for travel expenses if the trip is for a scientific symposium.
4. The Polymer Division led the launch of the IUPAC Committee on Chemistry Research Funding (CCRF). The second phase of this program developed during the CCRF meeting held in August 2012 at the EuCheMS Congress in Prague. It is always a challenge to attain a strong and synchronized commitment of research funding organizations from various countries, particularly so during this time of economic crisis. I was encouraged by the positive attitude and devotion of the CCRF members and participating national funding agencies. To facilitate multinational research cooperation, the committee has drawn up a new International Call for Proposals to fund relatively small teams of three or four principal investigators from three different countries. These grants will support collaborative basic research focused in the area of sustainable chemistry. The new call is coordinated by the IUPAC Division of Chemistry and the Environment (see page 16).

The above-mentioned activities are only "the tip of the iceberg" of a wide variety of IUPAC programs and projects conducted by the divisions and standing committees. It goes without saying that the mission of the Chemical Nomenclature and Structure Representation Division has been an important core activity of IUPAC, and that the Committee on Chemistry and Industry has been addressing the challenge of strengthening the Company Associate program. Moreover, the IUPAC awards such as the Samsung Young Polymer Scientist Award, the CHEMRAWN VII Prize for Atmospheric and Green Chemistry, and the IUPAC Award of Chemistry Olympiads, have had positive impacts on the visibility of IUPAC.

Observing the high level of activity, I believe that both the significance and the "value" of IUPAC projects and their outcomes warrant wide recognition by the chemistry community and by society at large. We must continue to seek ways to increase the visibility of our activities and our accumulated resources of knowledge. Here the "value" could be acknowledged

in three ways. First, the scientific value has to be established, by which our organization is held in high esteem. In order to do so, we must keep up with the rapid progress of science and technology, and we must be proactive in ensuring that our projects capture the latest developments of the emerging areas in chemistry. Second, the link to social values must be reinforced to cope with the world's needs. An urgent task is to guide chemistry communities to play a major role in building a sustainable society. Third, we must strengthen ties with industry by demonstrating a clear vision for chemistry and chemical industry. Strengthening these values will facilitate an increase in the economic and monetary value of the outputs of our projects. This would put the finances of IUPAC on a firmer basis. Our Secretary General has been striving to generate a mechanism for IUPAC to realize financial benefits from the knowledge generated from our projects.

I sense that increasing the value of IUPAC activities is the key to the future of IUPAC.

I sense that increasing the value of IUPAC activities is the key to the future of the Union: to better recognition of the importance of chemistry, to better visibility, to higher prestige, and to a stronger organizational structure.

Kazuyuki Tatsumi's <i45100a@nucc.cc.nagoya-u.ac.jp> term as president of IUPAC began on 1 January 2012. Previously, he served as vice president of IUPAC and vice president and president of the Inorganic Chemistry Division. Tatsumi is a professor at Nagoya University and is a member of the Science Council of Japan (NAO for Japan).

IUPAC strives to become the global leader in advancing knowledge and understanding of chemistry worldwide. Having seen how successful the International Year of Chemistry was in energizing chemists all over the world, we plan to carry forward that momentum as we approach the 2019 Centennial of IUPAC.

Best wishes for a happy and successful 2013 from the IUPAC Officers, the Secretariat, and the editors of *Chemistry International!*

Providing a Voice for Young Scientists in the Sustainability Debate

by Michael Sutherland and Javier Garcia-Martinez

A sustainable future is one in which energy production, resource use, and economic progress are optimally managed to ensure the long-term survival of the human species. Achieving this goal will only be possible through a dramatic rethinking of many aspects of society and its infrastructure, and will require unprecedented levels of international collaboration and cooperation. There can be little doubt that science will play the starring role in this transformation, creating profound opportunities for chemists. A recent U.S. Department of Energy report[1] outlining priority areas for sustainability research highlighted the importance of chemistry. Carbon sequestration, nanoscale catalysts, efficient battery materials, and solar energy harvesting are cited as examples of how chemistry-based research can lead to breakthrough technologies with the potential for far-reaching impact.[2]

Wide implementation of these and other technologies will take time, and the road to a sustainable future is sure to be a long one. Negotiating this path will require thinking on a timescale of decades, as well as across international borders. From this perspective, it is essential to include young scientists from diverse backgrounds in the conversation about sustainability, as they will be the stewards of change over the coming decades. In 30 years, today's promising 20-something post-doc may well be in a key advisory role, shaping government policy and directing the course of scientific research. In 30 years, the scientific powerhouses of Europe, America, and Japan will be joined by countries like Thailand, Brazil, and South Africa as economies improve and more resources are invested into research. Bringing early career researchers to the table in discussions surrounding allocation of science funding, climate change, and energy policy is clearly an important part of promoting long-term thinking.

And yet, the plight of the young scientist is often precarious at best. A recent report produced jointly for the UK's Institute of Physics and the Royal Society of Chemistry highlighted the pressures often felt by early career chemists.[3] Faced with increased competition for jobs, research grants, and the overwhelming demand to publish or perish, most young chemists find themselves putting in long, hard hours in the lab or the classroom, leaving little time to consider science policy and social issues. Moreover, many tenure decisions at universities reflect grant income and publications with no reward for becoming involved in wide-ranging policy initiatives. Even if an early career chemist is interested in such things (and many are), there are very few forums in which to voice their thoughts, especially on an international level. Some national scientific institutions such as the UK's Royal Society and Germany's National Academy of Sciences have established young scientist programs, and while these are certainly helpful their activities are mainly limited to the national level and exist only in developed countries with long traditions of scientific research.

The GYA Initiative

A group of young scientists selected by their national academies to attend a 2008 World Economic Forum Meeting in China first realized the need for an organization that could act as an advocate for early career researchers. If businesses and political organizations could form globe-spanning networks, then why shouldn't young scientists? The idea caught the attention of senior figures in science—Howard Alper (the co-chair of the IAP, the global network of science academies) and Bruce Alberts (editor in chief of *Science* magazine)—who provided early guidance. With financial support from the Volkswagen foundation, the Global Young Academy (GYA) was launched in 2010. With 172 members from 54 countries, the GYA

is the first truly international network of early career researchers in evidence-based disciplines, committed to improving both the state of science and enriching the science-society interface.

As the global voice for young scientists, the GYA sees itself fulfilling several ambitious roles. Chief among these is facilitating international dialogues on key scientific issues (such as sustainability) between disciplines and generations and, in particular, between the developing and developed world. As an outward looking organization, the GYA also places an emphasis on communication of the value of science to the public, and on promoting science as a career of choice to young people. The highly international character of the GYA ensures a wide perspective on these issues, helping to bridge the gap between science in the developing and developed world.

Membership to the organization is selective and competitive, with the main criteria being excellence in research and an enthusiasm for engaging with science as a vehicle for social change. The GYA looks for young researchers who are not only current or future leaders in their field of study, but who are looking to make a wide impact through their work and passion for science. Applications are considered from those who are in the early stages of an independent research career in an evidence-based discipline, typically between 5 and 10 years from the completion of a Ph.D. or other advanced degree. The membership is selected to ensure representation across disciplines and continents. Current GYA members include not only those working in chemistry, but in physics, biology, engineering, and related humanities fields, such as the history and philosophy of science and economics. Roughly equal weighting is given between those in developing and developed countries, with one co-chair selected from each. The continued renewal of the organization is ensured by a turnover of its members, with initial membership limited to two years with the possibility of renewing for another two.

Shaping Policy, Shaping Science

Although barely two years old, the GYA has already made impressive progress towards its core goals through a combination of workshops, programs, and annual meetings. At the General Assembly held 20–23 May 2012 in Johannesburg, South Africa, the quality and scope of the discussions highlighted how the organization has become a key forum for the exchange of ideas among young scientists. Amid a palpable air of enthusiasm, delegates broke off into working groups themed around a particular project or area of science policy. Moving through the lobby of the conference venue it was possible to overhear a Scottish astrophysicist and an Italian philosopher arguing over the practicalities of open access scientific publishing, or an Egyptian biochemist making an impassioned plea for more resources to support young woman in science at key points in their career. A heated conversation surrounding the migration of some of the developing world's best and brightest scientists to faculty positions in the developed countries demonstrated the often complex and multifaceted nature of issues facing young researchers.

. . . the GYA sees itself fulfilling several ambitious roles.

Informed debates like these are at the heart of the GYA. From the small working groups emerge policy statements and reports that seek to capture young researcher's viewpoints on key issues from a multidisciplinary and international perspective, in a way that has not previously been possible. An excellent example of this is the Sandton Declaration on Sustainability that was the major outcome of the South Africa general assembly, themed around the issue of sustainability and timed to coincide with the Rio+20 meeting. The Sandton statement (see page 6) suggests scientists share a responsibility for ensuring a sustainable future and outlines a vision for how they might realize this goal. In addition to being knowledge creators, scientists must be able to mobilize this knowledge and ensure it is used effectively. The key is engagement at all levels of the decision-making process. Scientists need to do a better job at creating dialogue with industry, governments, funding agencies, and the general public. As a blueprint for the future, how appropriate that this came from the collective effort of early career researchers.

While it is tempting to dismiss these sorts of statements as wishful thinking unlikely to have any broad impact, the GYA has increasingly managed to have its voice heard at the highest levels of public discourse. Op-ed pieces from GYA members on issues discussed by its membership have found their way into top scientific journals like *Nature*[4] and *Science*.[5]

GYA members have been invited to participate in high-level international forums such as the World Economic Forum and the InterAcademy Panel (IAP), a global network consisting of 115 national science academies. A recent major policy document authored by the IAP and aimed at political leaders on global population and consumption was authored with input from GYA members. At a recent American Association for the Advancement of Science meeting in Vancouver in February 2012, members of the GYA hosted a State of Young Scientists forum, providing a high-profile forum for early career researchers to engage with leaders in the scientific arena. Taken together, these activities suggest there is a growing willingness to listen to the viewpoints of young scientists, and that the GYA is well poised to provide this perspective.

The GYA Sandton Declaration on Sustainability

Twenty years ago, the 1992 Rio Conference on Environment and Development inspired a generation of young people to take up the global challenge of forging pathways to sustainability. Many of those who did are now emerging scientific leaders whose research programs are dedicated to understanding and discovering solutions to this challenge. These leaders are represented in the Global Young Academy.

On the cusp of Rio+20, we stand in a unique position as inheritors of the world that was promised in 1992. Having come of age in the lead-up to Rio+20, we, the Global Young Academy, now add our voice to that of the established stakeholders from the scientific community. We are moved to do so by the deep-seated belief of the necessity to chart a vastly different course of action for our global society over the next 20 years.

The Global Young Academy recognizes the vital role that scientific and technological innovation will continue to play as we advance toward sustainability. It is now, and must continue to be, a central component of a sustainable future. Yet, lack of scientific knowledge is not the immediate impediment to progress. Though we have much to learn, we have learned enough in the last 20 years to take action.

The aspirations that emerged from Rio have not been matched by commensurate actions, with the dangerous consequence that sustainability is now more distant than ever. We acknowledge the complexity of the situation in a multistakeholder world with different, sometimes opposing, interests. Nonetheless, current trajectories must be reversed immediately. Here, we offer three means for scientists to accelerate progress towards a sustainable future.

First, all scientists, whether academic, government, or industry-based, must actively engage with civil society and decision makers to convey the urgency of the global challenges that lay before us. The GYA will support efforts to bring scientific evidence to bear directly on the policy and decision-making processes. By mobilizing scientific knowledge we will also help communities understand how their choices may hinder or accelerate progress toward sustainable development goals.

Second, obstacles to initiating this dialogue must be overcome within the scientific community itself. The Global Young Academy recognizes scientific excellence as a prerequisite to having a credible voice in such discussion. Yet, we are concerned that metrics of success for scientists typically discourage public engagement and outreach. This must change. Public engagement must be valued, and not seen as something best left to others.

Third, we must foster scientific literacy in the broadest sense. The goal here is to ensure that citizens have the tools to engage in societal debate and make informed choices regarding the future of their communities. The Global Young Academy will work to transform scientific education from rote-learning to inquiry-based problem solving, at all levels from kindergarten through post-secondary education. An inquiry-based approach will illustrate how scientific discoveries are made and how past evidence catalyzes them. More transparency will build both public trust in scientific information and capacity to weigh evidence supporting competing positions in the transition to sustainable development.

The world cannot spend another 20 years in further discussions about the path toward sustainability. Progress toward a sustainable future must accelerate, and it must be both inclusive and enduring. The time for action, commensurate with the immediacy and diversity of sustainability challenges, is right now. The Global Young Academy believes that scientists, and science, are fundamental to realizing the goals of sustainability. Rio+40 must be a celebration of progress.

GYA General Assembly held in Sandton, Johannesburg, South Africa, 20–23 May 2012




A Transformative Experience

Getting involved with these sorts of activities at an early stage in a scientist's research career can have a transformative effect on one's outlook, motivating a young scientist to look beyond the lab bench and think critically about wider issues in science. Membership in the GYA provides experience in crafting science policy that can help facilitate engagement with other international science bodies. It is this sort of engagement by young scientists in high-level discussions that the GYA wishes to promote and encourage.

Nitsara Karoonuthaisiri, a chemical engineer based in Thailand and a founding member of the GYA, states that "membership in the GYA has been a blessing, working with a diverse group of young scientists on issues of international significance has made me realize the value of science-societal dialogues." As important as it is to remind governments and large organizations that the voice of young scientists should be heard, it is perhaps even more vital to remind young scientists that they have a voice; and to empower them to participate in discussions. This is especially important in the sustainability debate. If the GYA can channel the passion and enthusiasm of its membership into action, then there is cause for optimism that the goals of the Sandton Declaration will be met.

www.globalyoungacademy.net

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References

1. New Science for a Secure and Sustainable Energy Future, Basic Energy Sciences Advisory Committee, December 2008. [Full report at http://science.energy.gov/~/media/bes/pdf/reports/files/nsssef_rpt.pdf]
2. J. Garcia-Martinez, *The Chemical Element: Chemistry´s Contributions to Our Global Future*, Wiley-VCH (2011)
3. Mapping the Future: Survey of Chemistry and Physics Postdoctoral Researchers' Experiences and Career Intentions, Sean McWhinnie, March 2011. [http://www.iop.org/publications/iop/2011/page_50579.html]
4. Rees Kassen, *Nature* 480:153, 2011 (doi:10.1038/480153a)
5. Tilman Brück et al, *Science* 328: 17, 2010 (doi: 10.1126/science.1185745)

Is there a Y in IUPAC?

IUPAC has no committee of any sort devoted exclusively to the voices of the Young Chemists. The engine of the organization is project based and anyone can participate in that way. The organizational bodies, including the Council, the Bureau, the Executive Committee, and several divisions and other standing committees are populated with elected members and representatives from National Adhering Organizations.

To encourage more participation by young chemists in IUPAC activities and governance, a Young Observer program was established that provides an opportunity for "Young Observers" to participate in sessions of the IUPAC General Assembly. (see call for Istanbul 2013, *CI* Nov 2012, p. 16) The YO program strives to introduce the work of IUPAC to a new generation of distinguished researchers and to provide them with an opportunity to become involved in the work of the Union. The original Young Observer program was developed by the U.S. National Adhering Organization in 1977 and adopted by other NAOs (including UK, Japan, and Canada) and, in 2003, by IUPAC. To date, the program has supported over 250 scientists, many of whom have continued to serve on IUPAC activities and remain actively involved by joining or chairing committees or task groups.

Past Young Observers who are making a lasting impact on IUPAC include Mark Cesa (U.S. YO in 1997, current IUPAC vice president, past chair of the U.S. National Committee for IUPAC (USNC), and former chair of IUPAC Committee on Chemistry and Industry), Angela Wilson (U.S. YO in 2003 & 2005, USNC vice chair, and titular member/secretary of the IUPAC Physical and Biophysical Chemistry Division), and Dan Rabinovich (U.S. YO in 2005 & 2009, associate member of the IUPAC Inorganic Chemistry Division).

The co-author of this feature, Javier Garcia-Martinez, is himself an example that IUPAC welcomes the participation of younger fellows. Garcia-Martinez is a member of GYA and also of IUPAC, elected in 2011 as a member of the Bureau, representing the Spanish NAO. Javier's involvement in IUPAC started in 2006 when he became an associate member of the Inorganic Chemistry Division. In 2008 he also became involved in the IUPAC Committee on Chemistry Education and quickly established himself as a key player in the 2011 International Year of Chemistry Global Water Experiment.

—*CI* editor

IOCD
Chemical Sciences in Development

The International Organization for Chemical sciences in Development (IOCD) has much to be proud of in its first three decades of work. As a nongovernmental organization,[1] the overall impact of IOCD has been to raise the profile of the field and its practitioners; initiate, promote, or sustain a number of technical, managerial, policy, and collaborative projects and networks advancing chemical sciences in low- and middle-income countries (LMICs); and contribute to vital resources for teaching, learning, and research.[2] Commemorating the 30th anniversary of its foundation, IOCD's Annual Meeting in Strasbourg, France, in April 2011 included a special session reflecting on its history attended by Marie-Noelle Crabbé, daughter of IOCD's late founder Pierre Crabbé who was a Belgian chemist and inspired humanitarian.[3]

by Stephen Matlin

A New Strategy for Changing Times

Many changes have taken place in the landscape of science and development since IOCD was founded in 1981. There are many new actors and new sources of funding targeted at specific areas such as tropical diseases. The economies of many LMICs have advanced substantially (e.g., Brazil, China, and India are now among the largest economies in the world and are becoming leaders in areas of advanced technology). The paradigm of development has shifted from "aid as charity" provided by high-income countries (HICs) and focused on individual training and institutional capacity building: It is now centered on enabling LMICs to establish and manage their own systems of science, technology, and innovation. There is also now much greater emphasis on interdisciplinary cooperation and recognition of the value of working at the interfaces between traditional sciences.

In 2011, IOCD contributed to the celebrations of the International Year of Chemistry—see 2011 Milestones page 9— and marked its 30th anniversary by initiating a new strategy[4] focused on three priorities:

Chemistry for Better Health

The nature of health challenges faced in every part of the world is changing as a result of shifting patterns of disease, the globalization of health threats, and changes in the environment and in human behavior. IOCD's strategy is to support capacity building for medicinal chemistry, including drug analysis, discovery, and development in LMICs; and chemists working on the isolation, structure elucidation, and bioassay of natural products. IOCD's Plant Chemistry Working Group has a long track record of working in this field, including supporting structure elucidation and regular symposia on plant chemistry. The 2012 IOCD International Conference on Functional Molecules in Nature, held in Nanjing, China, 22–24 September 2012, focused on the chemistry and biology (particularly pharmacy) of natural products including phytochemicals and microbial secondary metabolites.[5]

IOCD's Biotic Exploration Fund (BEF) was established in 1995 in collaboration with Thomas Eisner (known as the "father of chemical ecology"). The BEF has worked in a number of countries in Latin America, Asia, and Africa, assisting the development of policies and programms for ethical, sustainable bioprospecting. In Kenya, the BEF collaborated for several years to facilitate the development of a national strategy for bioprospecting. On 3 November 2011, John Kilama, chair of the BEF, participated in Nairobi in the launch of the Kenya Bioprospecting Strategy, which received KES 10 billion (about 70 million Euros) of government funding. The strategy, spearheaded by the Ministry of Forestry and Wildlife and Kenya Wildlife Service, will provide structures and systems to manage and regulate bioprospecting activities in Kenya. It will seek to tap the huge market for bioprospecting and generate wealth and knowledge for the country. The launch makes Kenya among the first countries in the world to have a bioprospecting roadmap after establishment of the Nagoya Protocol.[6]

Chemistry for a Better Environment

Some countries are learning how to engage in sustainable development and avoid the historic pitfalls of development such as pollution, exhaustion of resources, and loss of biodiversity. IOCD's strategy is to enhance capacities for environmental chemical analysis and sustainable use of biological resources. IOCD's Environmental Chemical Analysis Working Group was initiated in 1993 in collaboration with IUPAC. Over the years, it has held workshops and training on practical techniques for analyzing pesticide residues and water quality. The emphasis of the Working Group has increasingly been on building capacity to tackle nationally relevant analytical challenges.

The IOCD Working Group has partnered with the Uganda National Bureau of Standards (UNBS) to strengthen its capacity to test export commodities to international standards. IOCD scientists have provided technical consulting to seven Ugandan Commodity Testing Laboratories engaged in testing commodities for export. UNBS has continued to enhance its capabilities for internationally acceptable analytical

methodology (e.g., in 2011 it was certified by the South African National Accreditation System as an accredited calibration laboratory).[7]

Because of increasing urbanization, the rise in vehicle emissions, and the trend towards greater industrialization, urban air quality in many countries is worsening. This is notably the case in Africa, where currently 38 percent of the continent's population is living in urban areas; this proportion will rise to 54 percent by 2030. A large number of African countries have begun to adopt air-quality-management legislation, regulations, or policies. Other countries are recognizing the need for improving air quality and moving to control emissions. In collaboration with the International Atomic Energy Agency and the Tanzania Atomic Energy Commission, IOCD's Environmental Analytical Chemistry Working Group organized a workshop in Arusha in 2011 focused on the analysis of air particulate matter.[8]

Capacity Building in Chemical Education

IOCD is enhancing chemical education in LMICs through the following projects:

- **Web-Based Resources:** IOCD groups have developed online tutorials in organic chemistry, available in Spanish, as well as training in practical medicinal chemistry, available online and as a CD, to help upgrade the skills of chemists in the field of drug design and development.[9]
- **Books for Libraries:** An IOCD Working Group on Books for International Development collects university textbooks across all disciplines, including the chemical sciences, as well as laboratory equipment and computers. In collaboration with UNESCO, the group makes a number of shipments each year to universities in Africa, Asia, and Latin America.[10]
- **Micro-Scale Science Kits:** Together with IUPAC, UNESCO, and the International Foundation for Science Education, IOCD has supported the Global Microscience Project, providing portable microscale kits enabling chemical reactions to be conducted with very small quantities of chemicals. The kits and materials are designed to be easily adaptable to different national curricula, and different language versions are in preparation.[11]

Moving forward, IOCD sees a need to strengthen chemical education by developing a broader, global approach that will enhance access for all to high-quality stores of knowledge and that will reflect the changing opportunities for learning in a digital age. IOCD is currently exploring how to develop a new kind of knowledge repository, free and online, that would have elements related to, but be distinct from, encyclopaedias, textbooks, and lecture notes. The knowledge base would be organized as lucid and clearly illustrated descriptions and explanations, which

2011 Milestones

The 30th anniversary of the International Organization for Chemical Sciences in Development (IOCD) coincided with the 2011 International Year of Chemistry and IOCD made several contributions to the year-long round of activities to mark IYC 2011. At the official launch ceremony of IYC 2011 on 27–28 January 2011 in Paris at the headquarters of UNESCO, Jean-Marie Lehn, Nobel Prize in Chemistry 1987 and IOCD president, gave the introductory lecture and framed the importance of the year in his talk entitled "From Matter to Life: Chemistry!" and in his piece for the opening program on "Protecting Our Planet: The Role of Chemistry in Creating a Sustainable Future." Professor Lehn also participated in a number of other meetings associated with IYC 2011, including several in France, Japan and Poland. Writing on "Chemistry: The Science and Art of Matter" in a special edition of the *UNESCO Courier* (Jan-Mar 2011, pp 7–9) marking the start of IYC 2011, Professor Lehn highlighted the pivotal role that chemistry has to play in relation to many aspects of human progress, including food and medicines, clothes and housing, energy and raw materials, transport and communications and much else. His comment "Chemistry will undoubtedly remain the central science in the 21st century" was featured, among other places, at the front of the Royal Australian Chemical Institute's IYC 2011 Media Kit. IOCD Executive Director Alain Krief, the distinguished Belgian chemist of Namur University, participated in the December 2011 Closing Ceremony in Brussels. IOCD Senior Advisory Council member Berhanu Abegaz and Board member Stephen Matlin contributed a major review of "Chemistry for Development" in the book *The Chemical Element: Chemistry's Contribution to Our Global Future* (Wiley 2011, ISBN 978-3-527-32880-2; thechemicalelement.com), published to mark IYC 2011.

See www.iocd.org/WhatWeDo/promoting.shtml and references therein.

may be used as sources for work by teachers or students, providing a global standard of knowledge at a specified level—whether for school- or university-level study or for broader understanding by the public and policy makers.

Chemical Sciences in a Changing World

Several key considerations underpin IOCD's current efforts to ensure its future relevance in a globalized, rapidly changing world:

- It is no longer relevant to consider the needs of "developing" countries as being separate from those of the rest of the world and to focus only on the "less developed" ones.[12] IOCD aims to help solve global problems while giving special emphasis to the problems that are most relevant to LMICs.
- In tackling major global problems (e.g., in energy, environment, health, food and nutrition, materials, water), it is increasingly evident that multidisciplinary approaches are required and that solutions are often found at the interfaces between sciences. While IOCD had long recognized that chemistry is a central science, there is further scope for IOCD to embrace "contemporary sciences" more broadly, address a broader audience and bring an understanding that chemistry had a special problem-

IOCD at the Crossroads

On 5 July 2012, IOCD co-organized a one-day international symposium and public seminar in Namur, Belgium, in collaboration with the Namur Research College at Namur University. The theme of the symposium was "Chemical Development: Chemistry, a Crossway Towards Interdisciplinary Science," featuring lectures by Nobel Laureate Ryoji Noyori (Saitama) on "Facts Are the Enemy of Truth," Don Hilvert (Zurich) on "Designer Enzymes," Luisa De Cola (Munster) on "Functional Materials by Self-Assembly. From Solution to in vivo," Klaus Mullen (Mainz) on "Is the Future Black?—The Chemist's Search for Graphene and Carbon Materials," and Peter Seeberger (Potsdam) on "Preventing and Curing Infectious Diseases: Carbohydrate Vaccines and Continuous Flow Synthesis." The lectures highlighted some of the many ways that chemistry, working at the interfaces with many other sciences including biology and physics, is contributing new insights and new materials with important applications of global significance.

The symposium was followed by a public seminar featuring three speakers. Berhanu Abegaz (executive director, African Academy of Sciences, Kenya) introduced a session in which Stephen Matlin (London) spoke about "New Challenges in Chemical Sciences for Development." He emphasized that the chemical sciences had made major contributions to human health, well-being, and wealth during the last two centuries, but not all populations had benefitted equally from this, resulting in some stark inequalities between richer and poorer nations. In addition to these persisting inequities, in the 21st century the world was faced with a number of new challenges as the population of the planet continued to grow and there were pressures on energy, material resources, and the quality of the environment. He spoke about the changing role of IOCD and especially the contribution it was seeking to make at the critical interface between science and policy.

Introduced by session chair Nicole Moreau, (IUPAC past president, France) Gerhard Bringmann (Würzburg) gave a talk on "The BEBUC Scholarship System: Re-Installation of Excellence in the Congo," describing his successful efforts to improve school education in the Congo and to assist young scholars to pursue advanced learning.

The Public Seminar concluded with a session introduced by Leopold Demiddeleer (Solvay Company, Belgium) in which Ryoji Noyori lectured on "Science and Technology for Future Generations." Noyori reflected on the challenges he had faced and lessons learned during his long career working on asymmetric catalysis. He noted that science is inevitably closely intertwined with society and there were now many opportunities for chemistry to contribute to "green" technology and the more efficient, cleaner production of energy. The Japanese organization RIKEN, of which Noyori is currently president, pursues innovative basic science and aims to return the results of research to society. Noyori observed that there have been many benefits of science and technology to society, but there were many new challenges in the modern world that require better prioritization and balancing of culture and technology. Noyori ended his talk with a call for scientists and technologists to help create a civilization that respects cultures and works through international cooperation.

solving role and is part of the solution to problems.

- The application of science to development problems should place stronger emphasis on the concepts of equity; inclusive, sustainable development; and frugal technologies that, having been developed for use in resource-poor settings, could be of global benefit.[13]
- In promoting the greater integration of science with innovation systems at national and global levels, there needs to be greater emphasis on the role of entrepreneurship. This is a key both to solving problems and to attracting young, creative people to work in science and innovation.
- Ensuring that science plays a key role in development also requires engagement at the science/policy interface, helping to translate science into policy and ensuring that science priorities are also informed by policy needs. One aspect of the science/policy interface that is starting to receive attention is "science diplomacy."[14]

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A version of this article is also published in *Chimie Nouvelle*, Vol. 111, 5–8 (2012) <www.src.be/chimienouvelle.html>.

www.IOCD.org

References

1. GT Seaborg. *Science*, 1984, 223, 9
2. JM Lehn, ER Blout, RH Maybury. *Chem Int*, 2002, 24(3), 3-5.
3. *IOCD History*; www.iocd.org/About/history.shtml and references therein
4. *IOCD Strategy 2011–2020*. Namur: IOCD, 2011. www.iocd.org/WhatWeDo/strategy.shtml
5. IOCD International Conference on Functional Molecules in Nature, Nanjing, China 22–24 Sep 2012. http://conference.nju.edu.cn/iocd2012/
6. *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity*. Montreal: Convention on Biological Diversity, 2012. www.cbd.int/abs/
7. *Certificate of Accreditation: Uganda National Bureau of Standards*. www.sanas.co.za/schedules/calibration/1462-06-2011.pdf
8. *Report on the AFRA Workshop on Environmental Analytical Chemistry, Arusha-Tanzania*, 23–24 May 2011. www.iocd.org/v2_PDF/ReportArushaWorkshop2011p.pdf
9. Open and distance learning in chemistry. Namur: IOCD, 2012.
10. Working Group on Books for International Development. Namur: IOCD, 2012.
11. Global Microscience Project. Namur: IOCD, 2012.
12. IOCD avoids the use of terms such as "developing countries" and prefers "low- and middle-income countries" and "high-income countries," as classified by the World Bank.
13. The term "frugal technologies" was used recently in: P. Howitt et al. Technologies for Global Health. *The Lancet*, 2012, 380, 507-35.
14. *New Frontiers in Science Diplomacy*. The Royal Society, London, 2010. http://royalsociety.org/policy/publications/2010/new-frontiers-science-diplomacy

Green Technologies from Biomass

At the IUPAC Committee on Chemistry and Industry workshop in Toronto in June 2012, Mohini Sain, a professor from the Centre for Biocomposites and Biomaterials Processing (CBBP) of University of Toronto, Canada, shared his experiences translating university research into business opportunities while maximizing the use of local sustainable resources.*

by Ruijun Gu and Mohini Sain

Examples of GreenCore products. *Copyright 2012. By permission of GreenCore and Ontario BioAuto Council.*

Millions of tons of sustainable materials are generated annually from forest biomass (i.e., barks, nuts, etc.), agricultural and food waste (i.e., wheat stalk, corn stover, crab shells, etc.), processing byproducts (i.e., lignin from pulping process), bio-energy byproducts (e.g., from ethanol production) and sludge from the paper industry and municipal treatment plants. Many researchers have conceptualized how to implement disruptive technologies using these materials. However, making the transition to commercialization can be quite difficult.

Industry-sponsorship programs have proven successful in facilitating commercialization of university research. And industry- or privately-funded centers are emerging as another model for fostering technological innovation at research universities. There is a third path based on our experience at CBBP: pre-commercializing green innovations to create disruptive technologies.

This approach has proven very successful, and has led to joint ventures, direct technology transfer, and start-ups. Since 2005, three start-up companies have spun off from projects of CBBP. The companies produce green polymers and additives out of agricultural residue. Over the past decade, CBBP innovations have led to natural-fiber-reinforced lightweight automotive parts, bio-based polyurethane cushions, protein-derived coatings, and biodegradable thermoplastic starch. The approach follows a stage-gate solution through scientific and engineering challenges, economic performance, and pre-commercialization. The important point is how to minimize early stage "cash burn" and implement an effective investment fund.

GreenCore Composites Inc.

GreenCore Composites Inc., a spin-off from CBBP's Auto21 project, produces plastic composites that offer clear advantages and high integrities through wood and agricultural fiber reinforcement. After a lengthy economic-performance evaluation, proprietary high-quality pellets of polymer composites were launched in the automotive and construction markets. Eventually, it required large non-public investments to start its production and expand from 1.5 million pounds to 5 million pounds annually.

Currently, CBBP is supporting GreenCore by introducing proprietary microfibre into composites. In addition, CBBP continues to support industrial innovation through direct transfer of technology to industry, such as natural-fiber reinforcements for Magna International and bast-fiber door panels for BASF for use in the BMW 7 Series sedan.

PolyBio Inc.

Biological materials have gained prominence as thermoplastic starch, nanofibers, and sustainable proteins. Nanofiber is a material composed of nanosized cellulosic fibrils with typical lateral dimensions in the range of 5–20 nanometres and longitudinal dimensions in a

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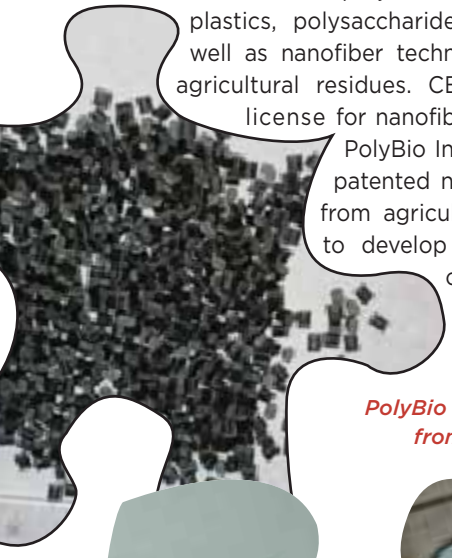
*The COCI workshop held in Toronto 1-2 June 2012 was the fourth in the series; previous events were held in Marl, Germany on 24-25 April 2008, and Kawasaki, Japan 7-8 April 2009, and on a smaller scale in Kuwait on 9 March 2010. The goals of the workshops are to improve communications among chemical industries, chemical societies/NAOs, and IUPAC through its Committee on Chemistry and Industry. The 2012 workshop focusing on the Great Lakes Area in North America was coordinated by Bernard West. For more details see IUPAC project 2011-053-1-022 (www.iupac.org/project/2011-053-1-022).

COCI Corner

wide range from 10 nanometres to several microns. Nanofiber exhibits a thixotropic property and is a renewable, recyclable, and abundant nanomaterial made of cellulose fibers from the wood pulp manufacturing process, agricultural feedstock, or special bacteria. There are three main types of nanofibers, which there are distinguished by the manufacturing processes used to create them: mechanical disintegration procedure,[1,2] chemical isolation process,[3] or bacterial generation.[4]

PolyBio Inc., a spin-off from one of CBBP's industrial collaborative projects, develops novel fungal plastics, polysaccharides, and proteins as well as nanofiber technology derived from agricultural residues. CBBP has granted a license for nanofiber manufacturing to PolyBio Inc., allowing it to use patented nanofiber technology from agricultural feedstock and to develop value-added applications. In contrast to other techniques, this proprietary technology makes it feasible to produce nanofiber from agricultural feedstock (such as wheat stalk) through mechanical defibrillation with enzymatic treatment. The process requires less energy and chemical consumption compared to conventional mechanical homogenization and electronic spinning. With funding from an ISTP Brazil-Canadian industry partnership, a pilot-scale device has been built at the center. According to CBBP, the nanofiber can be used to make iridescent flexible bio-nanocomposite films, biodegradable barrier packaging films, nanocoating for automotive products, and a host of other products to increase the biodegradability of polymer films.



PolyBio biocomposites made from waste residues and plastics.

PolyBio Inc. also markets fungal modified starch, which has already been pre-commercialized in the form of the starch/PVC blend under the names of PolyCarb® and PolyPearl® with the technical support of CBBP. The technology of PolyCarb® has been transferred to Canadian General-Tower Ltd. so it may produce biodegradable Vehreo® lightweight automotive cover stocks in its Cambridge facility.

Engineered Biofibre Inc.

No company wants to take the risk of producing a product no one wants. For example, a student research work is to justify a problem and identify the problem, and then propose solution to that problem. The solution might nurture customers related for rapid commercialization before a cost-performance evaluation completed. Under such circumstance, Engineered Biofibre Inc. is a prime example of a joint venture company led and promoted by students. The company, which turns industrial sludge, digestate, and lignosulfonate into biodegradable packaging and others materials, has entered into agreements with pulp mills, plastic processors, and automotive manufacturers that are beneficial to both sides.

So, what are the results of Canadian incentives for university-industry collaboration? How can we facilitate the commercialization of university research? Obviously, university commercialization is important because it creates tangible outputs from public investments and provides a return. However, some of the major hurdles for university research commercialization are lack of interest and new business procurement legislation, lengthy market validation resulting in high risk, and poor management and value-chain networks.

One of the biggest challenges is how to identify a good platform for new product launching.

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References

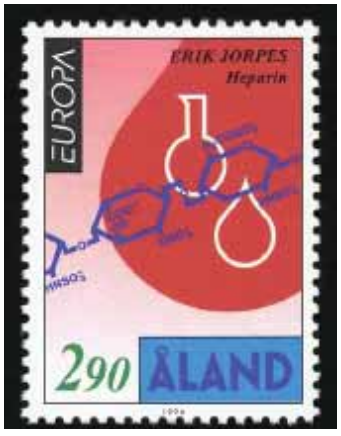
1. Ayse Alemdar and Mohini Sain. Biocomposites from wheat straw nanofibres: Morphology, thermal and mechanical properties. *Composites Science and Technology*. 2008, 68(2): 557-565.
2. Sreekumar Janardhnan and Mohini Sain. Targeted disruption of hydroxyl chemistry and crystallinity in natural fibres for the isolation of cellulose nano-fibres via enzymatic treatment. *BioResources*. 2011, 6(2): 1242-1250.
3. Paul B. Filson and Benjamin E. Dawson-Andoh. Sonochemical preparation of cellulose nanocrystals from lignocellulose derived materials. *Bioresource Technology*. 2009, 100(7): 2259-2264.
4. M. Schramm and S. Hestrin. Factors affecting production of cellulose at the air/liquid interface of culture of Acetobacter xylinum. *Journal of General Microbiology*. 1954, 11(1): 123-129.

Stamps International

See also www.iupac.org/publications/ci/indexes/stamps.html

Heparin: the Mighty Carbohydrate

Heparin, a complex carbohydrate extracted from pig intestines or cow lungs, is one of the most important anticoagulant drugs in clinical use today. Major medical advances after the Second World War, including heart transplants, kidney dialysis, and coronary arterial dilations (angioplasties), have been facilitated by heparin's ability to prevent the formation of blood clots. Heparin was discovered in 1916 by Jay McLean, a second-year medical student at Johns Hopkins University working under the supervision of the physiologist William Howell, who named the compound two years later. Modern commercial preparations of heparin are heterogeneous mixtures of sulfated polysaccharide chains with an average molecular weight of ~15 kDa. Despite its widespread use, uncertainties regarding the exact structure and biological activity of heparin, its limited supplies from animal sources, and the fact that contaminated samples occasionally reach the marketplace, have prompted in recent years the development of several methods for the preparation of synthetic heparin.



The stamp illustrated in this note was issued in 1994 by the Åland Islands, a Swedish-speaking autonomous region of Finland comprised of more than 6500 islands clustered at the entrance to the Gulf of Bothnia in the Baltic Sea. It pays tribute to Erik Jorpes (1894–1973), who was born in the small island of Kökar in the Åland archipelago and became a lifelong researcher on blood coagulation and a major contributor to the structural elucidation of heparin during the 1930s at the Karolinska Institute in Stockholm. Jorpes was also a great admirer of Jöns Jacob Berzelius, the legendary Swedish chemist (1779–1848) who pioneered the use of chemical symbols for the elements, discovered cerium, selenium, silicon, and thorium, and coined the terms "catalysis," "polymer," "isomer," and "allotrope." An interesting side note: Jorpes is the author of the only biography of Berzelius available in English, published in 1966, and he played a key role during the early 1970s in the reorganization of the Berzelius Museum operated by the Swedish Academy of Sciences.

For a brief discussion on synthetic heparin, see Linhardt, R.J.; Liu, *J. Curr. Op. Pharmacol.* 2012, 12, 217–219.

Written by Daniel Rabinovich <drabinov@uncc.edu>.

IUPAC's Legacy Preserved in the CHF Archives

by Patrick H. Shea

For nearly a century, IUPAC has served to advance the chemical sciences worldwide, and to contribute to the application of chemistry in the service of Humankind. Adding to that mission, the Chemical Heritage Foundation (CHF) in Philadelphia strives to show the ways in which this service to chemistry has touched all of our lives, and frequently in unexpected ways. With its first-rate collection of artifacts, archives, fine-art, and rare books, CHF traces scientific progress and demonstrates how chemistry has created and continues to shape our modern world.

Many years ago, CHF created an archival program to actively collect and preserve the papers of organizations and individuals whose work has significantly advanced our scientific understanding. Through this material we document the history and heritage of the chemical and molecular sciences and illuminate the broad impact of these sciences on society in the twentieth century. The professional papers of scientific organizations often prove to be the most valuable sources for recording the history of science and constitute the primary material record of the human endeavor to investigate and shape nature.

In the early years of CHF, IUPAC records were identified as a critical record set in need of permanent archival preservation. To date we have collected over 200 linear feet of IUPAC records spanning from its inception in 1919 through 1995. The broad range of IUPAC activities has attracted scholars from around the world to use this collection. Indeed, it is perhaps one of the most highly used collections in the entire CHF archive, as researchers explore topics such as scientific nomenclature, environmental science, and scientific education, as well as topics related to the interdisciplinary role of chemistry as the central science.

To keep this important archive active and relevant to contemporary scholars it is important we now take steps to fill in the missing records from IUPAC's last 17 years. Indeed, the heart of any organization's memory is in its records, such as original letters, minutes, reports, photographs, publications, and other documents that officers, members, or volunteers have produced and compiled over the years. These documents provide unique testimony to the achievements of an organization, and such materials are also extremely valuable for administrative, legal, fiscal, and public relations purposes.

As a dedicated archival repository, CHF is a place where professional archivists and curators preserve and provide access to historically significant documents. We provide environmentally secure storage, while safeguarding the long-term integrity of archival material by monitoring its handling and use.

Many, but not all, of the records produced by IUPAC have long-term historic value. CHF is most interested in the records that best illustrate the purpose, activities, and policies of IUPAC. Such documents usually represent an "end product"—a final report, for example, instead of a draft. CHF accepts donations of as little as a single item and as large as dozens of boxes. Material need not be organized, it need not be "old," and it need not relate to a famous individual, event, or organization in order for it to be historically significant. Generally, however, repositories are more interested in a coherent body of material rather than individual items. It is also important to only donate records that are inactive and no longer regularly used for routine business.

I encourage all of the members and volunteers of IUPAC to ponder the subject of archiving their own records related to IUPAC with CHF, lest duty to posterity be neglected in the sheer rush of current pressures.

As not all records are suitable for archival preservation, it is important to discuss these issues with a CHF archivist prior to transferring any records to CHF. Typically, before any records are transferred, an archivist will survey the papers to determine which materials have enduring historical value. Because the research value of records may be diminished if items are removed or rearranged, records should not be weeded, discarded, or rearranged before they are examined by an archivist.

If you or someone you know has records that may be suitable for archival preservation at the Chemical Heritage Foundation, please contact Patrick H. Shea, CA, Senior Archivist, Chemical Heritage Foundation, 315 Chestnut Street, Philadelphia, PA 19106 <pshea@chemheritage.org>.

www.chemheritage.org

International Call for Proposals in Sustainable Chemistry

On 26 November 2012, IUPAC and participating national funding agencies issued an international call for proposals on "Novel Molecular and Supramolecular Theory and Synthesis Approaches for Sustainable Catalysis."

The call is intended to foster multinational cooperation in sustainable chemistry. All researchers working in the field of sustainable chemistry and eligible to apply for financial support from their respective participating national research councils, are invited to apply. This program is designed for small teams of three or four principal investigators, encompassing three countries. While larger teams may be considered, it is incumbent upon the team to articulate a clear and strong plan that optimizes both scientific coherence and effective management of resources. Each team will submit a single, joint proposal.

The motivation for this call is to foster networking among excellent scientists on topics in chemistry exemplified by a three-year program in sustainable chemistry. Grants will support basic experimental and theoretical research. A successful proposal will meet the following goals:

1. introduce novel approaches to develop a new generation of catalysts in which rare elements are replaced with earth-abundant elements;
2. successfully address a significant environmental problem.

This grant program does not support (i) basic research that focuses on biological techniques, cellular processes, or biomedical problems; (ii) applied research that focuses on extended solids and bulk materials; (iii) design, optimization, or other engineering aspects of devices; (iv) engineering aspects of chemistry, such as scale-up, processing, transport dynamics, and long-term stability.

This call involves the following partners:

- Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), Brazil; Mr. Alexandre Roccatto <aroccatto@fapesp.br>
- National Natural Science Foundation of China (NSFC), China; Prof. Guojun Zhang <zhanggj@nsfc.gov.cn>
- National Science Foundation (NSF), United States of America; Dr. Zeev Rosenzweig <zrosenzw@nsf.gov> or Dr. Carol Bessel <cbessel@nsf.gov>
- Deutsche Forschungsgemeinschaft e.V. (DGF), Germany; Dr. Markus Behnke <Markus.Behnke@dfg.de>

Research teams interested in this opportunity should be aware of the following important dates:

- Letters of intent are due 1 February 2013.
- Full proposals for eligible projects are due 29 March 2013.
- Final results of this call will be communicated to applicants by 30 September 2013.
- Funding of all awards will start no later than January 2014.

The call is coordinated by the IUPAC Division of Chemistry and the Environment. Questions can be addressed to the call secretariat at proposal@iupac.org.

Guidelines for Applicants are available at the IUPAC Call web address <www.iupac.org/news/news-detail/article/international-call-for-proposals-in-sustainable-chemistry.html> and at the relevant partner websites.

More Collaborations on the Horizon

On 16 August 2012, the African Academy of Sciences (AAS) and the International Organization for Chemical Sciences in Development (IOCD) signed a Memorandum of Understanding intended to foster more collaboration. In a joint statement, the presidents of the two organizations warmly welcomed the opportunity to strengthen education, research, practice, and policy-making in science and technology and to promote the application of science to tackle major challenges of the 21st century.

Based in Kenya, AAS was created in 1985 through the initiative of the Third World Academy of Sciences

(later the Academy of Sciences for the Developing World). One of its primary functions is to honor African science and technology achievers in Africa. It also acts as a development-oriented mobilizer of the entire African science and technology community to facilitate the development of scientific and technological capacity for science-led development in Africa, promoting excellence and relevance in doing so. Professor Berhanu Abegaz was appointed executive director of AAS in 2011. An Ethiopian chemist, he previously worked at the University of Botswana, where he established the Network for Analytical and Bioassay Services in Africa with assistance from IOCD.

Registered in Belgium and with an affiliate in the USA, IOCD was established in 1981 under the auspices of UNESCO, as the first international nongovernmental organization devoted to enhancing the role of the chemical sciences in development. In particular, IOCD focuses on enabling chemists in low- and middle-income countries, including those in Africa, to contribute to key science and technology areas for development (see feature p. 8). Over a number of years it has conducted work in environmental analytical chemistry, plant chemistry, biodiversity, medicinal chemistry, and chemical education. It has also supported the development of analytical chemistry capacity in low- and middle-income countries, especially in Africa. Professor Alain Krief was appointed executive director of IOCD in 2010. A Belgian chemist at the University of Namur, his interests include synthetic organic chemistry and knowledge-based computer systems for enhancing chemical education and practice.

Jean-Marie Lehn, President of IOCD (right), and Berhanu Abegaz, Executive Director of AAS, at the signing of the MOU at a meeting in Namur on 16 August 2012.

Strong ties between IOCD and Abegaz (who is a member of IOCD's Senior Advisory Council) led to an exploration of opportunities for collaboration when he assumed his new role in AAS. The value of combining expertise and knowledge was highlighted when IOCD was invited to provide input to a major publication being planned by the scientific publishers Wiley-VCH to mark the 2011 International Year of Chemistry. It was agreed that the input would be authored by Professor Stephen Matlin (one of IOCD's longest serving members) and Professor Abegaz. Their contribution, "Chemistry for Development" (available for downloading at www.thechemicalelement.com), forms the opening chapter of *The Chemical Element: Chemistry's Contribution to Our Global Future* edited by J. Garcia-Martinez and E. Serrano-Torregrosa and released in April 2011. The book has been extremely well received and has been given the accolade of patronage by UNESCO. Offering her personal congratulations, UNESCO Director General Irina Bokova said that the book will "contribute to the objectives of the 2011 International Year of Chemistry by promoting a better appreciation and understanding of chemistry among the public and young people." She also noted that the "focus on the critical areas addressed by the Millennium Development Goals makes this work even more relevant to today's society."

AAS and IOCD will now embark on a process of strategic collaboration. This will include further joint publications in diverse media and the two organizations will also seek opportunities for collaboration in a range of events and programs. IOCD and AAS have a shared interest and common purpose in strengthening scientific and technological capacity for science-led development. IOCD's president, Nobel Laureate Jean-Marie Lehn, said "with this formal agreement in place, we will be seeking practical ways for the two organizations to collaborate and add value to what each is doing. The aim is to reinforce the impact of our work and ensure that science and technology make their full contribution to development in Africa and elsewhere."

www.aasciences.org
www.iocd.org

Naofumi Koga Recognized as 2012 Emeritus Fellow

In November 2012, Professor Naofumi Koga (Japan) was honored as a 2012 Emeritus Fellow of the IUPAC Chemistry and Human Health Division in recognition of his outstanding work as the first president of the Asian Federation of Medicinal Chemistry, notably developing nine national societies in Asia (1992–1995), and as president of the IUPAC Medicinal Chemistry Section (1995–1999).

The list of Emeritus Fellows, their country of affiliation and year of appointment, and a brief statement of their service to IUPAC is given below. Their biographies are available online <www.iupac.org/body/700>.

- Naofumi Koga (Japan, 2012)—Chair of the IUPAC Medicinal Chemistry Section (1995–1999) and first President of the Asian Federation of Medicinal Chemistry
- Rita Cornelis (Belgium, 2011)—Chair of the Commission on Toxicology (1993–1998) and National Representative for Belgium (2006–2009)
- Stanley Brown (UK, 2010)—founding Member of the Commission on Toxicology (1972) and Division President (1985–1989)
- René Dybkaer (Denmark, 2010)—President of the IFCC (1979–1984) and founding and continuing member of the joint IUPAC–IFCC Commission on Nomenclature, Properties and Units
- Urban Forsum (Sweden, 2010)—Chair of the joint IUPAC–IFCC Commission on Nomenclature, Properties and Units (2000–2005)
- Philippe Grandjean (Denmark, 2010)—Chair of the Commission on Toxicology (1987–1991)
- Lester Mitscher (USA, 2010)—Titular Member of the Medicinal Chemistry Section (1991–1995)
- Henrik Olesen (Denmark, 2010; deceased 2012)—Chair of the Commission on Nomenclature for Properties and Units (1989) and member of the joint IUPAC–IFCC Commission on Nomenclature, Properties and Units (1988–1997)
- Frederick William Sunderman, Jr. (USA, 2010; deceased 2011)—Founding member and Chair (1972–1981) of the Commission on Toxicology, and President of the Clinical Chemistry Division (1981–1985)
- John G. Topliss (USA, 2010)—President of the Medicinal Chemistry Section (1992–1995)
- Camille-Georges Wermuth (France, 2010)—President of the Medicinal Chemistry Section (1988–1992) and President of Division VII (1998–2000)

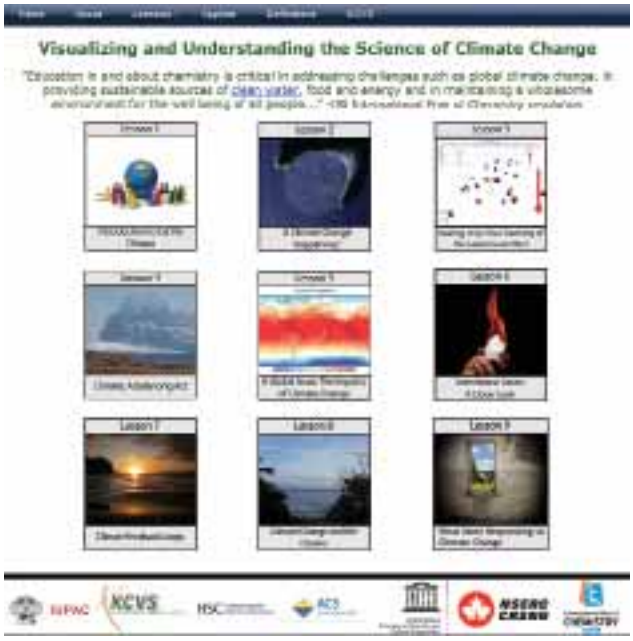
The IUPAC Chemistry and Human Health Division (Division VII) introduced a program of appointing Emeritus Fellows of Division VII in the Divisional Operating Procedures in 2009. The Fellows position is intended to honor those whose long service and distinguished contributions helped shape the division and its founding commissions, but also to allow the division to continue to draw upon the substantial collective experience of the Fellows for reviewing proposals and offering opinions on division matters in their areas of expertise. The Fellows receive IUPAC updates and are welcome to attend division meetings.

There are three subcommittees in Division VII: Medicinal Chemistry and Drug Development, Toxicology and Risk Assessment, and Nomenclature for Properties and Units. The operating procedures allow for each subcommittee to appoint one new Fellow during each biennium. So far, 11 distinguished scientists who played multiple roles in IUPAC and in the development of the division have been recognized. Naofumi Koga, the most recent Emeritus Fellow, was officially inducted at a meeting of the Pharmaceutical Society of Japan in November 2012.

New Interactive Tools Demystify Science Behind Global Challenge

Understanding and responding to global climate change is a defining challenge of the 21st century. The science is complex and the data can often appear both bewildering and contradictory. In response, many give up trying to make sense of it. As an International Year of Chemistry 2011 legacy project, the King's Centre for Visualization in Science announced the release of explainingclimatechange.com, a set of peer-reviewed, interactive, web-based materials to help a global audience of students, teachers, science professionals, and the general public see and understand the science needed to inform responsible decisions about climate change.

Resources were developed over a five-year period by faculty and undergraduate students at the King's Centre for Visualization in Science (Canada) as an IUPAC and UNESCO project in collaboration with chemists and educators from the Royal Society of Chemistry (UK), the American Chemical Society, and the Federation of African Societies of Chemistry. Additional financial support was provided by Canada's



Natural Sciences and Engineering Research Council through the CRYSTAL and Undergraduate Student Research Programs.

"The 2011 UN International Year of Chemistry resolution stressed the role for education in and about chemistry in addressing challenges such as global climate change," says Professor Peter Mahaffy, a member of the IYC global management team and co-director of the King's Centre for Visualization in Science. "This rich set of IYC legacy resources helps users ask crucial questions about what we know and don't know, use their learning of science to understand global climate change, and see how they can contribute with deeper understanding toward solutions."

The King's Centre for Visualization in Science is a research center of The King's University College, Edmonton, Alberta, Canada. The center is committed to improving the public understanding of science in Canada and globally through the development of innovative ways to visualize science. Professors Brian Martin and Peter Mahaffy are co-directors of the center, working with a talented interdisciplinary team of undergraduate researchers. This past year, almost a quarter million visitors from over 100 countries accessed KCVS resources.

www.explainingclimatechange.com
www.kcvs.ca

InChI Call for Supporters

The team of developers and supporters of InChI is seeking to broaden community participation in the support, maintenance, and ongoing development of InChI.

The IUPAC International Chemical Identifier, InChI, is the only internationally recognized standard for representing a defined chemical structure in computer readable form. InChI is regarded as one of the most significant and widely used IUPAC products of the 21st century. Initiated in 2000 under the leadership of former IUPAC Secretary General Ted Becker, the InChI project developed a computer algorithm that produces a unique and freely available Open Source, non-proprietary identifier for chemical substances that can be used in electronic data sources, thus enabling easier linking of diverse data and information compilations. In only some six years since its initial release, InChI has achieved considerable traction; there are now more InChIs in chemical databases than any other notation or identifier: the U.S. National Cancer Institute database has over 120 million, PubChem 36+ million, ChemSpider 27+ million, and Reaxys 20+ million. As of last year, you can even enter an InChI as a SciFinder search term.

While IUPAC provides the chemical expertise for the project, the InChI Trust—a not-for-profit charity—develops and supports the nonproprietary InChI standard and promotes its uses to the scientific community. The Trust's goal is to enable the interlinking and combining of chemical, biological, and related information, using InChI's unique machine-readable chemical structure representations to facilitate and expedite new scientific discoveries.

Readers may be familiar with two other electronic chemical structure representations, SMILES and the CAS Number. Both are proprietary and costly to obtain, maintain, and update; this severely limits their wide use in chemical information resources. In the case of SMILES, there are a considerable number of versions; indeed, a scientist at Eli Lilly has found 172 different SMILES representations for caffeine, making an internet web search difficult to say the least. InChIs save time and money and their use facilitates rapid location of information on a particular chemical. InChIs can be input into Google, Blekko, and other search engines enabling easy and free searching and lookup of information. The InChI standard is being supported

and adopted by virtually every major publisher of chemistry journals and books.

The InChI Trust currently has 15 major chemistry publishers and software developers as paid-up members and associates, and an additional 40 supporters, including universities, nonprofit organizations, and start-ups/small companies from around the world.

Members and associates of the Trust are in a position to shape and direct its ongoing development and maintenance of the InChI algorithm. Members have the following benefits:

- attendance at the Annual General Meeting to discuss the direction and management of the InChI Trust
- regular bulletins on the progress of the InChI and InChIKey
- a complimentary copy of the InChI Certification Suite
- advice on implementation of the InChI code
- inclusion in the Register of InChI-accredited implementers

If you are interested in joining the Trust and supporting InChI development, please contact Steve Heller <steve@hellers.com>, chair of the IUPAC Division VIII InChI Subcommittee, and InChI Trust project director, to discuss how you might contribute.

IUPAC PChem Visits University of Tokyo

The off-year meeting of the IUPAC Physical and Biophysical Chemistry Division, Division I, was held in Tokyo, 9–10 June 2012. One day before the meeting, "The One-Day IUPAC Division I Symposium" took place in the Chemistry Main Building on Hongo Campus of the University of Tokyo. All 10 division titular members (TM), two associate members (AM), and one national representative (NR), who came to Tokyo to join the meeting, were invited to give a talk to present their recent work. This highly appreciated scientific meeting was the first of its kind for the division. It allowed committee members to become mutually acquainted with their particular working domains. The excellent quality of the talks and lively discussions among committee members and around 75 participants—students and professors of the University of Tokyo, as well as researchers from nearby laboratories—proved the success of the enterprise.

The one-day symposium, originally proposed by Division President Kaoru Yamanouchi, will likely be continued at off-year meetings. The symposium was partially supported by the Chemical Society of Japan, the University of Tokyo, and the Science Council of Japan.

The symposium opened with an address from IUPAC President Kazuyuki Tatsumi, who underlined the high activity of the division while noting the need for more interdisciplinary projects within the Union. The program mirrored the diversity of the different domains of physical and biophysical chemistry that were covered by the talks. In 13 talks of 25 minutes each, a variety of topics at the frontiers of physical and biophysical chemistry were presented. Following is a sampling:

- infrared spectroscopy at wet surfaces (McQuillan, TM from New Zealand)
- high-resolution spectroscopy of water vapor (Császár, AM from Hungary)
- fluorescence correlation spectroscopy at single molecules (Bhattacharyya, NR from India)
- electrochemical studies of biomimetic membranes for the investigation of peptides and proteins (Guidelli, TM from Italy)
- thermodynamic and kinetic studies of protein oligomerizations using peptides (Assaf, TM from Israel)
- ultrafast intramolecular kinetics from molecular quantum dynamics (Marquardt, TM from France)

One participant said: "I did not expect that such a rich diversity of topics, ranging from the biophysics of nucleic acids to the quantum dynamics of tri-atomic molecules could be brought together in such an ideal way." We sincerely hope that his fruitful occasion will mark the first in a series of similar endeavors.

Deciphering and Constructing Names

by Jeffery Leigh

Someone attempting to construct a name using a specified kind of nomenclature, such as IUPAC nomenclature, or trying to discern the chemical structure implied by a name encountered in, say, an article, must first decide what kind of nomenclature is being used. Few chemists would have problems understanding a name such as sodium chloride. This is a venerable name, and the implications of the presence of the positive and negative entities of a salt are generally well understood. However, as we have seen in previous Notes, IUPAC promulgates several classes of nomenclature, sometimes specific to particular classes of compound, so that the chemist has first to decide which particular class of nomenclature should be used, or, if trying to decipher a name, which particular class has been used to construct the name under consideration.

The new edition of *Principles*, like the first edition, contains enormous amounts of information on how to construct names once the compound class has been recognized. This includes various classes of compound, such as organic, inorganic, organometallic, polymeric, and biochemical. However, a novel departure in the new edition is the incorporation of a new Chapter on deciphering (or deconstructing) names.

Upon encountering a new name, the chemist must first decide to which class of compound the name belongs. This is generally, but not always, straightforward. Then, for an organic compound, for example, it is recommended to decide first whether functional class or substitutive nomenclature is being used. Then, the chemist must deduce the identity of the parent hydride and hence its numbering scheme, recognize any suffixes to parent the name (there may not be any), and finally recognize the detachable prefixes and endings. These operations should enable the chemist to begin to write a structural formula. The names of biological compounds, mainly organic compounds, generally fall outside the scope of *Principles*, but information on the important groups of such compounds, such as sugars and nucleotides is given, and sources of more information are noted. Often the complete systematic names of such compounds may be so complicated and large that regular use requires alternative simpler, more compact names.

To name inorganic compounds, again the class of compound must be determined. A compound may span more than one class (e.g., it may be a salt and also contain a coordination entity) so that more than one system of nomenclature may need to be employed. To decipher the name of a coordination entity, the following steps are necessary: identify the central atom(s), identify the ligands (which may be organic compounds and be named using organic methods), and identify the coordination geometry and stereochemistry. The names of organometallic compounds reveal some specific aspects that need to be appreciated, and boron compounds often bear names that are derived using a different set of conventions.

The rules for constructing the names of polymeric compounds are different yet again. In decipherment, they are often easier to recognize because they contain the term "poly" at or near the beginning of the name. Then, the specific rules of the types of polymer nomenclature should be consulted to unravel the structure.

Constructing and deciphering chemical names are certainly not easy problems for a beginner, and are sometimes not easy even for the nomenclature expert. However, Principles provides a summary of methods employed in both name construction and name decipherment, replete with many examples of both kinds of process. Although the tasks of applying nomenclature rules may appear imposing, chemists should persist. A couple of old English sayings should always be remembered. One is that "practice makes perfect," even though the most experienced nomenclaturists are still striving for perfection. None of us is ever likely to reach the stage where "familiarity breeds contempt."

Jeffery Leigh is the editor and contributing author of *Principles of Chemical Nomenclature—A Guide to IUPAC Recommendations*, 2011 Edition (RSC 2011, ISBN 978-1-84973-007-5). Leigh is emeritus professor at the University of Sussex and has been active in IUPAC nomenclature since 1973.

Next in this series will be a review of Drawing Chemical Structures.

Making an imPACt

Recent IUPAC technical reports and recommendations that affect the many fields of pure and applied chemistry. See also www.iupac.org/publications/pac

Terminology and Nomenclature for Macromolecular Rotaxanes and Pseudorotaxanes (IUPAC Recommendations 2012)

Jiří Vohlídal, et al.
Pure and Applied Chemistry, 2012
Vol. 84, No. 10, pp. 2135–2165

This document provides (i) definitions of terms related to macromolecular rotaxanes and macromolecular pseudorotaxanes and (ii) recommendations for naming these macromolecular assemblies. The nomenclature recommendations presented here have been developed by combining the nomenclature rules for the low-molar-mass (low-M) rotaxanes and those for macromolecules (both established in published IUPAC recommendations) in such a way that the developed nomenclature system provides unambiguous names for macromolecular rotaxanes (and pseudorotaxanes), including differentiation among various isomers of these supramolecular assemblies. Application of the nomenclature recommendations is illustrated using examples covering a wide range of structure types of macromolecular rotaxanes and pseudorotaxanes. An Alphabetical Index of Terms and a List of Abbreviations and Prefixes are included.

http://dx.doi.org/10.1351/PAC-REC-11-10-15

JCAMP-DX for Circular Dichroism Spectra and Metadata (IUPAC Recommendations 2012)

Benjamin Woollett, et al.
Pure and Applied Chemistry, 2012
Vol. 84, No. 10, pp. 2171–2182

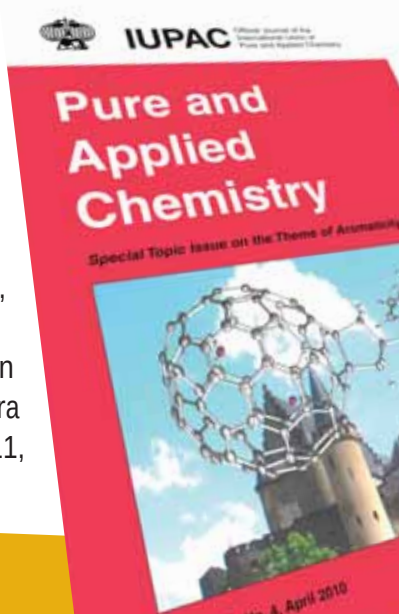
Circular dichroism (CD) spectroscopy is a widely used technique for the characterization of proteins. A number of CD instruments are currently on the market, and there are more than a dozen synchrotron radiation circular dichroism (SRCD) beamlines in operation worldwide. All produce different output formats and contents. In order for users of CD and SRCD data to compare and contrast data and the associated recorded or unrecorded metadata, it is essential to have a common data format. For this reason, the JCAMP-DX-CD format for CD spectroscopy has been developed, based on extensive consultations with users and senior representatives of all the instrument manufacturers and beamlines, and, under the auspices of IUPAC, based on the Joint Committee on Atomic and Physical Data Exchange protocols. The availability of a common format is also important for deposition to, and access from, the Protein Circular Dichroism Data Bank, the public repository for CD and SRCD data and metadata. The JCAMP-DX-CD format can be read by standard JCAMP programs such as JSpecView. The project team also created a series of parsers, which will enable the conversion between instrument and beamline formats and the JCAMP-DX-CD format.

http://dx.doi.org/10.1351/PAC-REC-12-02-03

Did you Know that *PAC* Does Conferences?

Pure and Applied Chemistry includes papers based on presentations made at IUPAC–sponsored international scientific events. Here are some recent examples:

— 43rd IUPAC Congress, San Juan, Puerto Rico, 30 July–7 August 2011, PAC Vol. 84, No. 9, 2012
— 14th Asian Chemical Congress (14 ACC), Bangkok, Thailand, 5–8 September 2011, PAC Vol. 84, No. 10, 2012
— International Symposium on Ionic Polymerization (IP 2011), Akron, USA, 10–15 July 2011, PAC Vol. 84, No. 10, 2012
— 14th International Meeting on Boron Chemistry (IMEBORON-XIV), Niagara Falls, Canada, 11–15 September 2011, PAC Vol. 84, No. 11, 2012



www.iupac.org/publications/pac/conferences

Provisional Recommendations

Provisional Recommendations are drafts of IUPAC recommendations on terminology, nomenclature, and symbols made widely available to allow interested parties to comment before the recommendations are finally revised and published in Pure and Applied Chemistry. *Full text is available online.*

Definition of the Transfer Coefficient

The transfer coefficient α is a quantity that is commonly employed in the kinetic investigation of electrode processes. An unambiguous definition of the transfer coefficient, independent of any mechanistic consideration and exclusively based on experimental data, is proposed. The cathodic transfer coefficient α_c is defined as $-(RT/F)(\mathrm{d}\ln j_c/\mathrm{d}E)$, where j_c is the cathodic current density corrected for any changes in the reactant concentration on the electrode surface with respect to its bulk value, E is the applied potential and R, T and F have their usual significance. The anodic transfer coefficient α_a is defined similarly, by simply replacing j_c with the anodic current density and the minus sign with the plus sign. This recommendation aims at clarifying and improving the definition of the transfer coefficient reported in the 3rd edition of the IUPAC "Green Book."

Comments by 31 March 2013
Professor Rolando Guidelli
University of Florence
Department of Chemistry "Ugo Schiff"
Via della Lastruccia 3
I-50014 Sesto Fiorentino (Firenze), Italy
E-mail: guidelli@unifi.it

www.iupac.org/project/2011-038-1-100

Vocabulary for Nominal Properties and Nominal Examinations

Comments by 28 February 2013
Dr. Françoise Pontet
E-mail: francoise.pontet@orange.fr

www.iupac.org/project/2004-023-1-700

Glossary of Terms Used in Medicinal Chemistry Part II

The evolution that has taken place in medicinal chemistry as a result of major advances in genomics and molecular biology has carried with it an extensive additional working vocabulary that has become both integrated and essential terminology for the medicinal chemist. Some of this augmented terminology has been adopted from the many related and interlocked scientific disciplines with which the modern medicinal chemist must be conversant, but many other terms have been introduced to define new concepts and ideas as they have arisen. In this supplementary glossary we have attempted to collate and define many of the additional terms that are now considered to be essential components of the medicinal chemist's expanded repertoire.

Comments by 30 April 2013
Professor Derek Buckle
18 Hillfield Road, Redhill, Surrey, UK
E-mail: drb@drbassoc.co.uk

www.iupac.org/project/2008-010-1-700

Terminology of Metal-Organic Frameworks and Coordination Polymers

A set of terms, definitions and recommendations is provided for use in the classification of coordination polymers, networks and metal-organic frameworks. A hierarchical terminology is recommended where the most general term is coordination polymer. Coordination networks are a subset of coordination polymers and metal-organic frameworks (MOFs) a further subset of coordination networks. One of the criteria a MOF needs to fulfill is that it contains potential voids but no physical measurements of porosity or other properties are demanded per se. The use of topology and topology descriptors to enhance the description of crystal structures of MOFs and 3D-coordination polymers is furthermore strongly recommended.

Comments by 30 April 2013
Professor Lars Öhrström
Chalmers University of Technology
Dept. of Chemical & Biological Engineering
Physical Chemistry, Room 5023,
S-412 96 Göteborg, Sweden
E-mail: ohrstrom@chalmers.se

www.iupac.org/project/2009-012-2-200

Analogue-based Drug Discovery III

Editors: Janos Fischer, C. Robin Ganellin, and David P. Rotella
Wiley-VCH, 2013, ISBN: 978-3-527-33073-7

"Analogue-based Drug Discovery" is the most general principle in medicinal chemistry. The analogue plays a very important role in both organic chemistry and pharmacology. A new compound is always compared to a reference compound, either from a chemical or biological viewpoint.

If referred to in such a general manner, then all medicinal chemistry should be included in the book *Analogue-based Drug Discovery*. However, our studies have been restricted to drugs that already have an existing reference drug. It has been investigated how new and better drugs could be obtained from already existing drug molecules.

The book series was developed with IUPAC support. The first volume (2006) mostly focused on structural and pharmacological analogues. Well-established drug classes have been studied from the viewpoint of drug optimization. The second volume (2010) had a broader scope, discussing several examples of pharmacological analogues. The third volume (2013) consists of three parts: General Aspects, Drug Classes, and Case Histories.

General Aspects

The introductory chapter discusses the relationship between pioneer and analogue drugs where their overlapping character can be observed. A chapter by Christian Tyrchan and Fabrizio Giordanetti (AstraZeneca) analyzes competition in pharmaceutical drug development. Amit S. Kalgutkar and Antonia F. Stepan (Pfizer) study the important role of metabolic stability in drug research. Mark L.Peterson, Hamit Hoveyda, Graeme Fraser, Éric Marsault, and René Gagnon (Tranzyme Pharma Inc.) write on the use of peptide-based macrocycles in drug design, exemplified by the discovery of ulimorelin.

Drug Classes

Arun Ganesan (University of East Anglia) gives an overview on discovery research into anticancer epigenetic drugs. Joseph A. Jakubowski (Lilly) and Atsushiro Sugidachi (Daiichi Sankyo) evaluate the structurally diverse drug class of the antithrombotic P2Y12 receptor antagonists. Paul Erhardt, Amarjit Luniwal, and Rachael Jetson (University of Toledo, USA) summarize the medicinal chemistry of selective estrogen receptor modulators. Kazumi Kondo and Hidenori Ogawa (Otsuka Phramaceutical Co., Japan) describe the discovery of aquaretics that are vasopressin V2 receptor antagonists. Peter R. Bernstein (PhaRmaB LLC) discusses the discovery of cysteinyl-leukotriene receptor antagonists, which are important in the treatment of asthma.

Part III (Case Histories)

Norbert Hauel, Andreas Clemens, Herbert Nar, Henning Priepke, Joanne van-Ryn, and Wolfgang Wienen (Boehringer Ingelheim, Biberach, Germany) report on the discovery of dabigatran etexilate, an oral direct thrombin inhibitor approved for use in treatment of acute thrombosis. Klaus P. Bøgesø and Connie Sánchez (Lundbeck) descibe the discovery of escitalopram, which is one of the most successful selective serotonin reuptake inhibitors in the treatment of depressive disorders. Helmut Buschmann (Pharma-Consulting, Aachen, Germany) analyzes the discovery of tapentadol, a novel centrally acting synthetic analgesic with a dual mechanism of action. Hervé Bouchard, Drothée Semiond, Marie-Laure Risse, and Patricia Vrignaud (Sanofi) describe the discovery of cabazitaxel, a novel semisynthetic taxane, a new anticancer drug. Srikanth Venkatraman, Andrew Prongay, and George F. Njoroge (Merck) summarize the discovery of boceprevir and narlaprevir, hepatitis C protease inhibitors. Ken Okamoto, Shiro Kondo, and Takeshi Nishino (Nippon Medical School, Teijin Ltd and University of Tokyo) describe the discovery of febuxostat, a new uric-acid production inhibitor.

The book's 15 chapters and 40 authors from 9 countries bring important, successful drug discoveries closer to medicinal chemists and all who are interested in the history of drug discoveries. The major part of the chapters are written by key inventors.

This book is the outcome of IUPAC project 2011-011-1-700.

www.upac.org/project/2011-011-1-700
www.wiley.com

Macromolecular Complexes

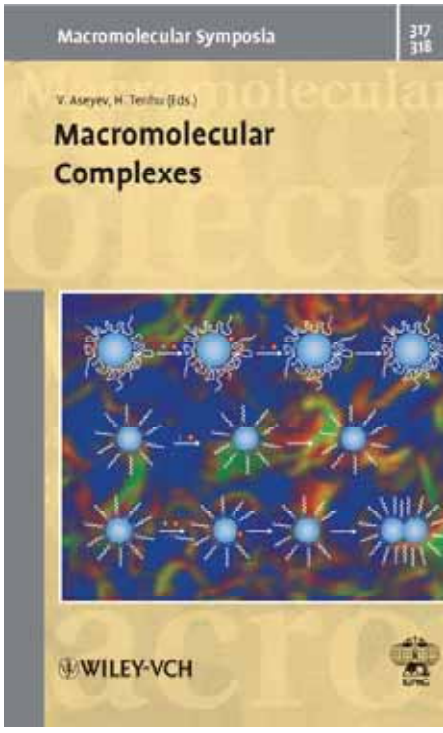
Macromolecular Symposia Vol 317–318, August 2012, edited by Heikki Tenhu and Vladimir Aseyev

Macromolecular complexes, whether they are interpolymeric ones or polymers complexed with low-molar-mass organic molecules, metal ions, or particles participate in all fundamental aspects of life. They are as essential to the function of living organisms as to the development of new functional materials.

Of interpolymeric complexes, those formed by polyelectrolytes are among the most complicated ones when it comes to the factors affecting their formation and structure, as well as their properties under various conditions and the influence of stimuli from the surroundings. Polyelectrolyte complexes mediate the essential processes involved in the functions of living cells. The number of technological applications of charged polymers bound to each other is immense, ranging from water purification to cosmetics, biopharmaceutics, and medicine. An impressive example of the use of polyelectrolyte complexes was the treatment of contaminated soil around the Chernobyl nuclear reactor after the catastrophic disaster in 1986. This example demonstrated the dynamic nature of the complexes, which in this case where used to bind ions and glue contaminated soil into a solid crust.

Polyelectrolyte complexes also show properties of polyampholytes. Interpolymeric complexes may also build up due to stereochemical factors or via host-guest interactions. Cyclodextrins and calixarenes are known structural motifs, which may be utilized in host-guest complex formation and in building macromolecular complexes in a controlled manner.

Various aspects of the complexes between macromolecules and metals have been studied for several decades. Mechanisms of the complex formation, as well as the structures of the complexes are an important research problem as such, but detailed knowledge of all these factors is needed for application of the materials as catalysts and photoactive and electrically conducting materials. Macromolecular complexes are promising materials for high-performance energy devices. There are several examples of the use of macromolecular metal complexes in cancer therapy. Because macromolecules may be tailored to contain several functionalities they may be used to bind various toxic metals or organic substances from water. Owing to the remarkable advances in the methods of polymer synthesis, functional polymers can be used in advanced applications such as controlled drug delivery or as carriers of active substances from magnetic nanoparticles to human growth factors.



Controlled methods of polymer synthesis have accelerated the growth of diversity of compounds based on macromolecular complexes. Dendrimers and hyperbranched polymers, as well as polymeric brushes, comprise one important aspect in developing new materials. Both advanced synthesis methods and theoretical knowledge are needed for the creation of materials with specific properties. Another fast-growing research area closely related to macromolecular complexes is that of hybrid nanocomposites. Recent advances in nanoparticle technologies have opened a new field of complex composite materials based on gold, silver, or silica nanoparticles.

This volume includes papers based on presentations made at the 14th IUPAC International Symposium on Macromolecular Complexes (MMC-14) held in Helsinki, Finland, 14–17 August 2011. See conference report in March-April 2012 *CI*, p. 26.

http://dx.doi.org/10.1002/masy.201290022

Role of Chemistry Research in National Development

by Subramaniam Sotheeswaran

The Institute of Chemistry Ceylon (ICHEMC) organized an **International Conference on Chemical Sciences** on 20–22 June 2012 at Waters Edge, Capital City, and Sri Lanka Foundation Institute, Colombo. The theme of the conference was the "Role of Chemistry Research in National Development."

The major aim of the conference was to discuss how chemistry can meet global challenges such as clean air and safe water, healthy food, and dependable medicine from plants/natural products. Consequently, the conference brought together chemists, environmentalists, food scientists, educators, and scientists from other field to exchange ideas, discuss the role of chemistry research in national development, and to foster research collaborations.

Chief Guest, Professor Tina Overton of the University of Hull, UK, lighting the oil lamp to inaugurate the International Conference on Chemical Sciences.

The 41st Annual Sessions, 71st Anniversary Celebrations and the Annual Dinner at which the new President of ICHEM, Dr S. Mohandas, was inducted were also held alongside the conference. The inauguration ceremony on 20 June was attended by 324 participants. Attendees of the international conference on chemical sciences and the 41st annual sessions were from all regions of Sri Lanka, representing 89 different institutions of higher education. International participants were from India, Pakistan, Malaysia, Taiwan, Japan, Fiji Islands, Australia, Sudan, Egypt, Nigeria, UK, USA, and Canada.

Among the participants were 46 young scientists who received grants through the IUPAC FSC program to cover the cost of conference participation. The National Science Council of Sri Lanka also supported 22 local participants.

The international conference was sponsored by the Organization for the Prohibition of Chemical Weapons, IUPAC, Royal Society of Chemistry (UK), and the National Science Foundation of Sri Lanka, as well as by local industries, institutions, past students, and members of the Institute of Chemistry Ceylon.

The chief guest at the conference was Tina Overton of the University of Hull, UK and the Guest of Honor was John Dyke. The participation of these speakers was made possible by a grant from OPCW.

IUPAC sponsored the participation of two keynote speakers at the workshop on "Some Non-Standard Ways of Developing Deep Understandings and of Assessing Understandings of Students of Chemistry": Mei-Hung Chiu of National Taiwan Normal University, Taipei, and Robert Bucat of The University of Western Australia, Perth.

In the interesting and fruitful workshop session, Chiu and Bucat explained their research findings in relation to student psychology. Participants were given hands-on exposure to the teaching and learning resources described in the lectures. The participants were told that in teaching, language, gestures/wordings, visualization, and reality are the most important factors in determining whether students understand a theory/concept or principle.

The main conference featured plenary speeches by distinguished chemists from the UK, USA, Australia, Taiwan, Pakistan, and Sri Lanka. In addition, there were seven keynote speeches on topics such as natural products, environmental chemistry, food science, chemical education, and new technological developments. A total of 100 oral and poster papers were presented.

W.S. Fernando received the Distinguished Service Award for tireless and noteworthy service promoting the aims of the Institute of Chemistry Ceylon. It

Mei-Hung Chiu: "We use multiple choice questions not with just one level, but two."

is notable that this year, a very young chemist, Ms PKV Ranji of the Open University, was awarded The Kandiah Award for Basic Chemistry. Bright Chemists at the College of Chemical Sciences, ICHEMC, were awarded prizes and bursaries.

Schoolchildren who were winners of various chemistry competitions organized for schools by ICHEMC were also presented with awards. This outreach program has reached far and wide: winners were from Bandarawela, Galle, Matara, Jaffna, Vavuniya, Kalmunai, Ibbagamuwa, and Ruwanwella.

The enthusiasm with which sessions were attended was reward enough for the organizers. The only drawback was that parallel sessions, as always, meant that choices had to be made and some lectures missed. It is hoped that the links formed in Colombo will be enduring and fruitful.

Professor S. Sotheeswaran <sotheeswaran@hotmail.com> was chair of the organizing committee; he is immediate past president of the Institute of Chemistry Ceylon.

Stimulating Reflection and Catalyzing Change in Chemistry Education

by Morton Z. Hoffman

The **22nd International Conference on Chemical Education/11th European Conference on Research in Chemical Education** (ICCE/ECRICE 2012) were jointly held at the University of Rome "La Sapienza" on 15–20July 2012. The meeting, which attracted almost 600 participants from 71 countries with 80 attendees from North America, featured plenary and keynote lectures, more than 600 abstracts (of which 356 were oral presentations), computer and chemical demonstration workshops, and a social program that included a welcoming reception, an excursion to Hadrian's Villa, a banquet dinner in Tivoli, and a Participants' Night of singing and dancing. A discussion of the writings of Primo Levi was also scheduled. In addition, the IUPAC Distinguished Contribution to Chemistry Education Awards were presented to Peter Mahaffy (Canada) and Robert Bucat (Australia). The conference chair was Luigi Campanella (past president, Italian Chemical Society, University of Rome) who led the local organizing committee.

The five days of sessions had the following themes, respectively: Communicating Chemistry, Didactics of Third-Level Chemistry, ICT and Multimedia in Teaching Chemistry, Didactics of Second-Level Chemistry, Laboratory Work in Teaching Chemistry.

From left: Peter Mahaffy (King's University College, Canada), past chair of CCE; Mei-Hung Chiu (National Taiwan Normal University), chair of CCE; Ilka Parchmann (University of Kiel, Germany), chair of Division of Chemical Education, EuCheMS.

Plenary lectures were presented by Vincenzo Balzani (Italy), Harry Kroto (UK/USA), Brian Coppola (USA), Mansoor Niaz (Venezuela), Alexander Renkl (Germany), Norman Reid (UK), Bassam Shakhashiri (USA), and Avi Hofstein (Israel). Peter Mahaffy (Canada) and Ilka Parchmann (Germany) reflected on "Where Do We Go From Here?," emphasizing the need to connect students to chemistry in the real world, create networks of change agents to break through the boundaries of the discipline, and view chemistry education beyond the national level toward the global.

Keynote lectures were delivered by Mei-Hung Chiu (Taiwan), Melanie Cooper (USA), Hans-Dieter Barke (Germany), Odilla Finlayson (Ireland), Maria Sheehan (Ireland), Silvija Markic (Germany), and Marcelo Conti (Italy).

At the end of the meeting, a panel discussion of the plenary and keynote speakers examined the challenges for putting the results of chemistry education research into practice, understanding how students learn chemistry, and the directions for the renewal of chemistry education. This reporter made an oral presentation on peer-led team learning (PLTL) in the session on best pedagogical practices that was organized by Mickey Sarquis and Lynn Hogue, and chaired a session on college/university general chemistry education. Details about the meeting program and the papers are available at <www.iccecrice2012.org>.

Full papers from the conference will be published in the Italian Chemical Society journal *Chimica*

nella Scuola. ICCE/ECRICE 2012 was organized by IUPAC-CCE and the Division of Chemical Education of the European Association for Chemical and Molecular Sciences, under the High Patronage of the President of the Italian Republic. Among the co-sponsors were the American Chemical Society, the Organization for the Prohibition of Chemical Weapons, the City and Province of Rome, and Cengage Learning.

The conference was preceded by a five-week pre-conference virtual colloquium "To Sustain and Celebrate IYC 2011 Initiatives in Global Chemical Education" (hosted by the Committee on Computers in Chemical Education, a standing committee of the Division of Chemical Education of the ACS). Organized by Bob Belford, the colloquium featured 13 papers that were extensively and vigorously discussed <www.ccce.divched.org/spring-2012confchem>.

Luigi Campanella (University of Rome, Italy).

Bassam Shakhashiri (University of Wisconsin-Madison, U.S.A.), ACS president, at left, and Liberato Cardellini (Polytechnic University of Marche, Italy), national representative from Italy to CCE and member of the ICCE/ECRICE 2012 Scientific Committee.

IUPAC Committee on Chemistry Education (CCE)

ICCE/ECRICE 2012 was also the occasion of the annual meeting of CCE, which consists of six titular members, eight IUPAC divisional representatives, and 23 national representatives. CCE approved the minutes of its last meeting in San Juan, Puerto Rico, in August 2011 at the IUPAC General Assembly and Congress as presented by its Secretary, Jan Apotheker (Netherlands). It also received the April 2012 report of CCE Chair Mei-Hung Chiu (Taiwan) to the IUPAC Bureau, and heard reports from its subcommittees (Chemistry Education for Development, International Year of Chemistry) and the Project Group subcommittee. CCE also reviewed its activities (Flying Chemists Program, Global Stamp Project, Climate Change Visualization, Young Ambassadors of Chemistry), its relationship with other organizations, and its completed, current, considered, and future projects.

Judith Poë and Andrew Dicks from the University of Toronto, co-chairs of the 23rd ICCE, offered a preview of the meeting ("Developing Learning Communities in the Chemical Sciences"), which will be held in Toronto, Ontario, Canada, 13–18 July 2014 <www.icce2014.org>. Expressions of interest to host the 24th ICCE in 2016 were made by Ting-Kueh Soon, national representative to CCE from Malaysia, and Siegbert Schmid, University of Sydney, Australia.

The next meeting of CCE will be at the IUPAC Congress and General Assembly in Istanbul, Turkey (11–16 August 2013), at which time the formal bids for the 24th ICCE will be considered and the site chosen for the meeting in 2016.

Morton Z. Hoffman <hoffman@bu.edu> is professor emeritus at Boston University; U.S. National Representative to CCE and conference coordinator for CCE. Hoffman was a member of the International Advisory and Scientific Committees of ICCE/ECRICE 2012.

Photochemistry

by Silvia E. Braslavsky

The **XXIV IUPAC Symposium on Photochemistry** took place 15–20 July 2012 in the wonderful city of Coimbra, Portugal, in the historical buildings of the university, overlooking the city. The symposium demonstrated how photochemistry is nowadays employed in very different areas, running from new materials for medical applications, solar cells, photoremediation of contaminated water, photodynamic therapy, manipulation of nanostructures, mimicking of biofunctionality, restoration and conservation of art objects, and more. For all these applications, basic research and theoretical understanding is a prerequisite that was also demonstrated in some of the lectures, such as the plenary by G. Scholes on "Quantum Mechanisms for Light Harvesting in Photosynthesis." Among the other plenary lectures were the following:

- A. Harriman on "Artificial Light Harvesting Antennae"
- B.L. Feringa on "Controlling Assembly and Motion by Light"
- F. Scandola on "Supramolecular Strategies towards Functional Units of Artificial Photosynthesis" G. Bazan on "Conjugated Polyelectrolytes and Oligoelectrolytes for Emerging Optoelectronics"
- T. Majima on "Charge Transfer in DNA"
- S.J. Formosinho and L. Arnaut (a joint lecture) on "From Elementary Reactions to Chemical Relevance in Photodynamic Therapy"
- V.W.W. Yam on "Photofunctional Organometallics"

One of the highlights of these meetings is the awarding of the Porter Medal, which was given this year to Tom J. Meyer from the University of North Carolina who gave an account on "$Ru(bipy)_3^{2+}$ and other Remarkable MLCT States."

Among the 640 participants from 53 countries, were many young scientists who either contributed short communications organized in three parallel sessions, or presented more than 400 posters. A remarkable session was held on solar energy conversion, which included contributions on material science and engineering for solar energy conversion. Many contributions on nanoparticles, nanocrystallites and nanocomposites were presented. The novel techniques used to monitor the photochemical reactions in complex materials and in nanoparticles were also subject of many contributions.

IUPAC Poster Prize awardees Waheed Saban (left), University of Western Cape, South Africa, and Joanna M. Malicka, University of Namur, Belgium.

Several awards were given to young colleagues (for details see Awards at <www.photoiupac2012.com>). The European Photochemical Association prize for the best thesis in photochemistry 2011–2012 was awarded to Karl Börjesson from Chalmers University, Sweden. The Langmuir award for best presentation in the young photochemists' session was presented to Danielle Wilson, Victoria University, Canada. Special commendations were given to Laurence Pessoni, Université de Pau et des pays de l'Ardour, France, and to Marina Blanco-Lomas, Universidad de La Rioja, Spain.

IUPAC Poster Prizes were awarded to Waheed Saban, University of Western Cape, South Africa, and to Joanna M. Malicka, University of Namur, Belgium. The Springer editors awarded a Ph.D. student poster prize to Karel Goossens, KU Leuven, Belgium, and to Giorgio Pariani, Osservatorio Astronomico di Brera, Italy. A special XXIV IUPAC Photochemistry Symposium Young-at-Heart Poster Prize was awarded to Devens Gust from Arizona State University, USA, for the presentation "Bio-Inspired Solar Energy Conversion."

Several companies generously sponsored the symposium, some of them located in Portugal and some which are spin-of companies of research groups at the university.

A special impact on the audience was made by Franco Scandola, who showed, during his lecture, a sequence from the famous 1938 movie from Frank

Capra "You can't take it with you" demonstrating Capra's vision on the future of solar energy.

The symposium was inaugurated by fados beautifully sung by a Tuna from Coimbra and closed by a banquet at Quinta do Sobreiro, a refined venue with a gracious landscape.

The General Assembly of the European Photochemical Association was held in one of the evenings and the IUPAC Subcommittee on Photochemistry held its meeting during one of the lunch breaks.

We thank Hugh Burrows, the Portuguese photochemical community, and the organizing Committee for the organization of the symposium, which showed again that photochemistry is a lively interdisciplinary area, which can fascinate many young scientists and can contribute to solving many technical and scientific questions.

The next IUPAC Symposium on Photochemistry is planned for July 2014 in Bordeaux, France, under the scientific chairmanship of Dario Bassani.

Silvia E. Braslavsky <Silvia.Braslavsky@cec.mpg.de> is at the Max Planck Institute for Chemical Energy Conversion.

www.photoiupac2012.com

Australasian Polymer

by Sébastian Perrier

The Australasian Polymer Symposium (APS) is the flagship meeting for polymer science in Australia, and over the years, the symposium has developed a reputation as an excellent showcase of Australian Polymer research, and also as a forum that attracts top international polymer scientists. The **33rd Australasian Polymer Symposium** (33APS), held at The Wrest Point Convention Centre, Hobart, Tasmania, between 12–15 February 2012, under the auspice of the Royal Australian Chemical Institute (RACI) Polymer Division and under the sponsor of the IUPAC, was another excellent example of delivering just that. 33APS welcomed a number of leading Plenary and Keynote Speakers, and also contributors (over 300 in total) from Australia and around the world. The ratio of international delegates was nearly a third of the total delegate number.

The program covered all areas of polymer science and engineering, with themes on "Latest Developments in Polymer Synthesis," "Latest Trends in Polymer Characterization," "Advance Materials," "Polymers for Health," "Polymers and the Environment," and "Polymers for Electronics and Energy." It also included a number of special sessions, including an Early Career Researchers symposium and a session on Innovation, which covered the very dynamic topic of knowledge transfer from academia to industry. Plenary lectures were given by Harm-Anton Klok (EPFL), Heather Maynard (UCLA), Gordon Wallace (University of Wollongong), David Haddleton (University of Warwick), Ludwick Leibler (ESPCI) and Xi Zhang (Tsinghua University). Each session was championed by a keynote lecture delivered by our invited speakers: Stuart Rowan (Case Western Reserve University), Remzi Becer (University of Warwick), Thomas Junkers (Universiteit Hasselt), Steven Holdcroft (Simon Fraser University), Brian Hawkett (The University of Sydney), Laurent Fontaine (LCOM —Chimie des Polymères), Feihe Huang (Zhejiang University), Martina Stenzel (University of New South Wales), Junpo He (Fudan University), Ulrich Wiesner (Cornell University), Theresa Reineke (University of Minnesota), Jas Pal Badyal (Durham University), Bert Klumperman (Stellenbosch University), Eduardo Vivaldo-Lima (Universidad Nacional Autonoma De Mexico), Brent Sumerlin (Southern Methodist University), Filip DuPrez (Ghent University), Richard Kaner (UCLA), Philippe Guégan (Université d'Evry Val d'Essonne), Michael Monteiro (The University of Queensland), and Nicolas Voelcker (University of South Australia). Each theme had both oral and poster sessions, and interestingly all of them covered topics at the interface between polymer science and other disciplines, a testimony of how much polymer science has evolved as discipline over recent years. Topics of course addressed a range of important issues faced by our modern society in medicine, energy and the environment, but also covered a number of fundamental issues in polymer science, and especially chemistry, a traditionally very strong area in Australia. This very varied programme clearly illustrated the multidisciplinary aspect of modern polymer science, and how collaborations across fields are the best approach to tackle today's chal-

lenges. APS has also as strong reputation as focusing on early career researchers, graduate and postdoctoral researchers, but also young lecturers. This year again, students made more than the third of our total delegate numbers, and a special session for Early Career Researchers was organized, which included presentations by Patrice Castignolles (University of Western Sydney), Kristopher Thurecht (University of Queensland), Anthony Granville, (University of New South Wales) and Daniel Keddie (CSIRO Materials Science and Engineering). The inclusion of so many excellent oral and poster presentations by young researchers is a clear indication that Australian polymer research is very healthy, and has a bright future ahead. Among the topics discussed, the special session on living radical polymerisation (or reversible-deactivation radical polymerization, according to the nomenclature recommended by IUPAC), held towards the end of the meeting, deserves a special mention, as it is an area of research that has always been very strong in Australia. The session was introduced by a plenary from David Haddleton (University of Warwick), and concluded with plenary lectures from the recipients of the Australian 2011 Prime Minister's Prize for Science, David Solomon (University of Melbourne) and Ezio Rizzardo (CSIRO). Solomon describes the discovery of the fundamentals behind the establishment of nitroxide mediated polymerization (NMP), and Dr Rizzardo discussed the discovery of reversible addition fragmentation chain transfer (RAFT) polymerization. NMP and RAFT are two of the major living radical polymerization techniques reported to date, and their discovery has certainly placed Australia as one of the leading nations in the field of living radical polymerization/reversible-deactivation radical polymerization.

In parallel to a packed scientific program, the APS also included a busy social schedule, as is always the case. The welcome reception was held in one of the best wineries in Tasmania, Meadow Bank Winery, where the delegates were welcomed with great wine and great food, and enjoyed the sunset over the hills surrounding Hobart. A special student night in Hobart city center allowed research groups to meet and discuss science in an informal atmosphere. The symposium dinner was held on the Wednesday night at Wrest Point Convention Centre, during which prize-winners were announced. The Treloar Prize, awarded for outstanding oral and poster presentations by young polymer scientists at National or International Polymer Division Meetings, was awarded to Zhou Zhang (University of Melbourne) and Adrian Sulistio (University of Melbourne) for best oral presentation, and Wei Zhao (The University of Sydney), for best poster presentation. The prize is named in honor of the late Edward (Ted) Treloar who was an enthusiastic supporter of young polymer scientists in

Australia. During the dinner, Graeme Moad (CSIRO) also received the highly prestigious Batteard-Jordan Australian Polymer Medal, and Greg Qiao (University of Melbourne) and Martina Stenzel (University of New South Wales) each received a Polymer Division Citation for their contributions and service to polymer science and/or technology.

APS is not a conventional conference. It is traditionally the time of the year when Australian researchers come together and catch up, when Australian polymer science celebrate its young researchers, and it has now also become an international event attracting delegates from around the world. I guess the mix of great science and social programme have contributed to make it such a special event. An excellent testimony to the meeting is the large number delegates, Australian and from around the world, who come back every year. We are now looking forward to the next edition of the meeting, the 34APS, again under IUPAC sponsorship, which will be held in Darwin between 7–10 July 2013 <www.34aps.org.au/2013> and chaired by Kevin Jack from the University of Queensland. See you there!

Sébastian Perrier <s.perrier@chem.usyd.edu.au> is professor at the University of Sydney and director of the Key Centre for Polymer Colloids Key Centre for Polymers & Colloids. He was chair of the symposium.

Science for Poverty Eradication and Sustainable Development

24–26 February 2013, Rio de Janeiro, Brazil

The IAP—the global network of science academies—**Conference on Grand Challenges and Integrated Innovations: Science for Poverty Eradication and Sustainable Development** will be hosted by the Brazilian Academy of Sciences in Rio de Janeiro, Brazil, on 24–26 February 2013. The conference will be followed by the IAP General Assembly on 27 February.

The overarching goals of the conference are as follows:

1. highlight the important contributions of science to poverty eradication and sustainable development
2. connect IAP academies and members with Grand Challenge opportunities
3. provide the opportunity for IAP academies and members to shape future Grand Challenges
4. showcase innovators, particularly young innovators, tackling these Grand Challenges

IAP is a global network of the world's science academies, launched in 1993. Its primary goal is to help member academies work together to advise citizens and public officials on the scientific aspects of critical global issues. IAP is particularly interested in assisting young and small academies achieve these goals and, through the communication links and networks created by IAP activities, all academies will be able to raise both their public profile among citizens and their influence among policy makers.

www.interacademies.net/Activities/10880/18317.aspx

Heterocyclic and Synthetic Chemistry

3–6 March 2013, Gainesville, Florida, USA

Thirteen previous Florida Conferences, held each March from 2000 through 2012, brought together the academic and industrial communities to discuss the latest developments in heterocyclic and synthetic chemistry. The program holds particular interest for the industrial chemical community where pharmaceuticals, agrochemicals, and colorants usually contain at least one heterocyclic ring.

This, the **14th Florida Heterocyclic and Synthetic Conference**, continues the tradition of its highly successful predecessors. Registration will start on Sunday, The conference will feature 11 plenary lectures given by academic and industrial experts from around the world, as well as invited lectures and three short courses on catalysis and heterocyclic chemistry. A poster session combined with a buffet supper will be held on the evening of 4 March 2013. A wine reception and conference banquet are scheduled for the evening of 5 March. The conference closes with a farewell party on the evening of 6 March.

See Mark Your Calendar for contact information.

www.arkat-usa.org/conferences-flohet-others

Metal Ions in Biology and Medicine

11–13 March 2013, Punta del Este, Uruguay

The **12th International Symposium on Metal Ions in Biology and Medicine** which will be held in Uruguay in March 2013. For the first time, the symposium will be held in South America. Following the tradition of previous symposia, the 12th edition will promote a good atmosphere for researchers from all over the world to share their work, exchange knowledge, strengthen productive collaborations, and discuss all issues related to the role of metal ions in biology and medicine. The scientific program will cover a diverse and multidisciplinary research agenda with topics related to metals and semimetals in biology and medicine.

See Mark Your Calendar for contact information.

www.metal-ions2013.com

Austrian-Slovenian Polymer Meeting

3–5 April 2013, Bled, Slovenia

The **3rd Austrian-Slovenian Polymer Meeting** (ASPM 2013) will be held in Bled, Slovenia, from 3–5 April 2013. The conference will cover all major topics in polymer science and engineering and provide a venue for discussions about the current trends. To achieve this goal we have invited renowned scientists from various polymer research fields. ASPM 2013 will host three plenary speakers: Nikos Hadjichristidis from King Abdullah University of Science and Technology (Kingdom of Saudi Arabia), Mariastella Scandola from the Department of Chemistry 'G. Ciamician' of the University of Bologna (Italy), and Gerhard Wegner from the Max Planck Institute for Polymer Research (Germany). In addition, there are 14 confirmed keynote speakers, who will share their knowledge and research findings. The keynote speakers confirmed so far are Michael R. Buchmeiser, Andrzej Dworak, Todd Emrick, Dieter P. Gruber, Sabine Hild, Peter Krajnc, Igor Lacik, Robert Liska, Matej Praprotnik, Volker Ribitsch, Sabu Thomas, Gregor Trimmel, and Ema Žagar. There will be about 70 oral contributions and up to 150 poster presentations.

www.aspm.si

Mark Your Calendar

Upcoming IUPAC-sponsored events
See also www.iupac.org/home/conferences.html for links to specific event websites

2013

IUPAC poster prizes to be awarded

22–23 January 2013 • Test Results in Analytical Chemistry • Tel Aviv, Israel
Workshop on Human Errors and Out-of-Specification Test Results in Analytical Chemistry
Prof. Ilya Kuselman, National Physical Laboratory of Israel, Givat Ram, IL-91904 Jerusalem Israel
Tel.: +972 2 630 3501, Fax: +972 2 630 3516, E-mail: reut@bioforum.co.il

17–22 February 2013 • Scanning Electrochemical Microscopy • Ein Gedi, Israel
7th Workshop on Scanning Electrochemical Microscopy
Prof. Daniel Mandler, The Hebrew University of Jerusalem, Department of Inorganic and Analytical Chemistry, Safra Campus, IL-91904 Jerusalem, Israel,
Tel.: +972 2 658 5831, Fax: +972 2 658 5319, E-mail: mandler@vms.huji.ac.il

3–6 March 2013 • Heterocyclic Chemistry • Gainesville, Florida, USA
14th Florida Heterocyclic and Synthetic Conference (FloHet-2013)
Prof. Alan R. Katritzky, University of Florida, Department of Chemistry, Gainesville, FL 32611-7200, USA
Tel.: +1 352-392-0554, Fax: +1 352-392-9199, E-mail: katritzky@chem.ufl.edu

11–13 March 2013 • Metal Ions in Biology • Punta del Este, Uruguay
12th International Symposium on Metal Ions in Biology and Medicine
Dr. Dinorah Gambino Universidad de la República Cáterdra de Química Inorganíca Facultad de Química 2124 Avenida General Flores Montevideo 11700 Uruguay
Tel.: +598 2 924 9739, Fax: +598 2 924 1906, E-mail: dgambino@fq.edu.uy

11–15 March 2013 • Polymer Characterization • Gwangju, Korea
21st International Conference on Polymer Characterization—World Forum on Advanced Materials (PolyChar-21)
Prof. Witold Brostow, University of North Texas, Department of Materials Science & Engineering, P.O. Box 305310, Denton, TX 76203-5310, USA, Tel.: +1 940 565-4358, Fax: +1 940 565-4824, E-mail: brostow@unt.edu

24–28 March 2013 • Macromolecules & Materials • Stellenbosch, South Africa
12th UNESCO/IUPAC Workshop and Conference on Macromolecules & Materials, Prof. Harald Pasch, Department of Chemical & Polymer Science, University of Stellenbosch, Private Bag X1, Matieland 7602, South Africa
Tel.: +27 21 12 808 3173, Fax: +27 21 12 808 4967, E-mail: hpasch@sun.ac.za

19–23 May 2013 • Clinical Chemistry & Laboratory Medicine • Milan, Italy
20th IFCC-EFLM European Congress on Clinical Chemistry & Laboratory Medicine; 45th Congress of the Italian Society of Clinical Biochemistry & Clinical Molecular Biology
Dr. Ferruccio Ceriotti, Instituto Scientifico Ospedale San Raffaele, Servizio di Medicina di Laboratorio, Via Olgettina 60, I-20132 Milano, Italy, Tel.: +39 10 226 432 282, E-mail: ceriotti.ferruccio@hsr.it

28–29 May 2013 • on Clinical Laboratory • Barcelona, Spain
7th European Symposium on Clinical Laboratory and In Vitro Diagnostic Industry:
Molecular Genetics in the Clinical Laboratory
Dr. Xavier Fuentes-Arderiu, Hospital L'University de Bellvitge, L'Hospitalet de Llobregat, E-08907 Barcelona, Spain, Tel.: +34 93 260 76 44, Fax: +34 93 260 75 46, E-mail: xfa@csub.scs.es

16–21 June 2013 • European Polymer • Pisa, Italy
Congress of the European Polymer Federation (EPF-2013)
Prof. Giancarlo Galli Università di Pisa Dipartimento di Chimica e Chimica Industriale Via Risorgimento 35 I-56126 Pisa, Italy, Tel.: +39 050 221 9272, Fax: +39 050 221 9240, E-mail: gallig@dcci.unipi.it

7–10 July 2013 • Polymer Chemistry • Northern Territory, Australia
34th Australasian Polymer Symposium (34 APS)
Dr. Kevin Jack, University of Queensland, Centre for Microscopy & Microanalysis, Level 1, AIBN, Bldg. 75 St. Lucia, QLD 4072, Australia, Tel.: +61 7 3365 1143, Fax: +61 7 3346 3993, E-mail: k.jack@uq.edu.au

7–12 July 2013 • Solution Chemistry • Kyoto, Japan
33rd International Conference on Solution Chemistry (ICSC 2013)
Prof. Toshio Yamaguchi Fukuoka University Department of Chemistry Nanakuma, Jonan, Fukuoka 814-0180, Japan, Tel.: +81 092 871 6631 ext. 6224, Fax: +81 092 865 6030, E-mail: yamaguchi@fukuoka-u.ac.jp

8–12 July 2013 • Chemistry for Sustainable Growth • Pretoria, South Africa
12th International Chemistry Conference in Africa (ICCA-2013)
Prof. Mathew Muzi Nindi, Department of Chemistry, University of South Africa , P.O. Box 392, UNISA 0003 South Africa, Tel.: +27 12 429 8559, Fax: +27 12 429 8549, E-mail: nindimm@unisa.ac.za

7–11 July 2013 • Polymer Spectroscopy • Prague, Czech Republic
19th European Symposium on Polymer Spectroscopy (ESOPS 19)
Prof. Jiri Spevacek Academy of Sciences of the Czech Republic Institute of Macromolecular Chemistry Heyrovsky Square, 2 CZ-162 06 Prague Czech Republic
Tel.: +420 2 9680 9380, Fax: +420 2 9680 9410, E-mail: spevacek@imc.cas.cz

14–17 July 2013 • Calixarenes • St. John's, Newfoundland, Canada
12th International Conference on Calixarenes (Calix 2013)
Prof. Paris Georghiou, Memorial University of Newfoundland, Department of Chemistry, St. Johns, NL A1B 3X7 Canada, Tel.: +1 709 864 8517, Fax: +1 709 864 4569, E-mail: parisg@mun.ca

25–27 July 2013 • Chemistry Literacy for Global Citizens • Pingtong City, Taiwan
5th International Conference Network for Inter-Asian Chemistry Educators (5th NICE)
Professor Shyan-Jer Lee, Department of Chemical Biology, National Pingtung University of Education, No.4-18 Minsheng Rd., Pingtung City, Pingtung County 90003, Taiwan (R.O.C.)
Tel.: +886-8-7226141 ext 33201, Fax: +886-8-7230305, E-mail: sjlee@mail.npue.edu.tw or 5thicnice@gmail.com

28 July–1 August 2013 • Organometallic Chemistry • Fort Collins, Colorado, USA
17th International IUPAC Conference on Organometallic Chemistry Directed Towards Organic Synthesis
Prof. E. Peter Kündig, Université de Genève, Département de Chimie Organique, CH-1211 Genève 4, Switzerland
Tel.: +41 22 379 6093, Fax: +41 22 328 7396, E-mail: peter.kundig@unige.ch

28 July–2 August 2013 • Novel Aromatic Compounds • Taipei, Taiwan
15th International Symposium on Novel Aromatic Compounds (ISNA-15)
Prof. Ken-Tsung Wong, Taiwan National University, Department of Chemistry No. 1, Sec. 4, Roosevelt Road, Taipei 10167 Taiwan, Tel.: +886 2 3366 1665, Fax: +886 2 3366 1667, E-mail: kenwong@ntu.edu.tw

4–9 August 2013 • Homogeneous and Heterogeneous Catalysis • Sapporo, Japan
16th International Symposium on Relations between Homogeneous and Heterogeneous Catalysis (ISHHC-16)
Prof. Atsushi Fukuoka, Hokkaido University, Kita 21-10, Sapporo 001-0021, Japan
Tel.: +81 11 706 9140, Fax: +81 11 706 9140, E-mail: fukuoka@cat.hokudai.ac.jp

Visas

It is a condition of sponsorships that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all bona fide chemists from throughout the world to attend irrespective of race, religion, or political philosophy. IUPAC sponsorship implies that entry visas will be granted to all bona fide chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting, the IUPAC Secretariat should be notified without delay by the applicant.

How to Apply for IUPAC Sponsorship

Conference organizers are invited to complete an Application for IUPAC Sponsorship (AIS) preferably 2 years and at least 12 months before the conference. Further information on granting sponsorship is included in the AIS and is available upon request from the IUPAC Secretariat or online.

www.iupac.org

Mark Your Calendar

11–16 August 2013 • IUPAC 44th Congress • Istanbul, Turkey
44th IUPAC Congress—Clean Energy Through Chemistry
Prof. Mehmet Mahramanlioglu, Turkish Chemical Society, Istanbul University, Department of Chemistry, TR-34320 Avcilar, Istanbul, Turkey
Tel.: +90 212 591 1996, Fax: +90 212 591 1997, E-mail: mehmah@istanbul.edu.tr, www.iupac2013.org

13–16 August 2013 • MacroMolecular Complexes • Clemson, South Carolina, USA
15th International Symposium on MacroMolecular Complexes (MMC-15)
Prof. Anthony Guiseppi-Elie, Clemson University, Department of Chemical & Biomolecular Engineering, 132 Earle Hall, Clemson, SC 29634, USA, Tel.: +1 864 656 1712, Fax: +1 864 656 1713, E-mail: guiseppi@clemson.edu

18–23 August 2013 • Advanced Polymers via Macromolecular Engineering • Durham, UK
10th International Conference on Advanced Polymers via Macromolecular Engineering (APME-2013)
Prof. Neil R. Cameron, Department of Chemistry, Durham University, Durham, DH1 3LE, UK
Tel.: +44 191 334 2008, Fax: +44 191 384 4737, E-mail: n.r.cameron@durham.ac.uk

25–29 August 2013 • Analytical Chemistry • Warsaw, Poland
XVIIth European Conference on Analytical Chemistry (EuroAnalysis XVII)
Prof. Maciej Jarosz, Warsaw University of Technology, Department of Analytical Chemistry, Ul. Naokowskiego 3, PL-00 664 Warsaw, Poland, Tel.: +48 22 234 7408, Fax: +48 22 234 7408, E-mail: mj@ch.pw.edu.pl

28–29 September 2013 • Biorefineries • Brasília, Brazil
2nd Brazilian Symposium on Biorefineries (II SNBr)
Dr. Sílvio Vaz, Jr. , EMBRAPA Agroenergy Parque Estação Biológica, Av. W3 Norte, Asa Norte Brasília, DF 70770-901 Brazil, Tel.: +55 61 3448 2315, Fax: +55 61 3448 1589, E-mail: silvio.vaz@embrapa.br

17–22 October 2013 • Novel Materials • Shanghai, China
9th International Conference on Novel Materials and their Synthesis (NMS-IX)
Prof. Yuping Wu, Fudan University, Department of Chemistry, New Energy & Materials Laboratory Shanghai, 200433 China, Tel: +86 21 55 664 223, Fax: +86 21 55 664 223, E-mail: wuyp@fudan.edu.cn

8–13 December 2013 • Frontiers of Polymers • Auckland, New Zealand
12th International Conference on Frontiers of Polymers and Advanced Materials (ICFPAM 2013)
Prof. Paul Kilmartin, School of Chemical Sciences, University of Auckland, 23 Symonds Street, P.O. Box 92019, Auckland 1142 New Zealand
Tel.: +64 9 373 7599 x 88272, Fax: +64 9 373 7422, E-mail: p.kilmartin@auckland.ac.nz

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ADVANCING THE WORLDWIDE ROLE OF CHEMISTRY FOR THE BENEFIT OF MANKIND

MISSION

IUPAC is a non-governmental organization of member countries that encompasses more than 85% of the world's chemical sciences and industries. IUPAC addresses international issues in the chemical sciences utilizing expert volunteers from its member countries. IUPAC provides leadership, facilitation, and encouragement of chemistry and promotes the norms, values, standards, and ethics of science and the free exchange of scientific information. Scientists have unimpeded access to IUPAC activities and reports. In fulfilling this mission, IUPAC effectively contributes to the worldwide understanding and application of the chemical sciences, to the betterment of the human condition.

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Österreichische Akademie der Wissenschaften *(Austria)*
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Brazilian Chemical Society *(Brazil)*
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Chemical Society of Ethiopia *(Ethiopia)*
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Comité National Français de la Chimie *(France)*
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Fonds National de la Recherche *(Luxembourg)*
Institut Kimia Malaysia *(Malaysia)*
Academy of Sciences of Mozambique *(Mozambique)*
Koninklijke Nederlandse Chemische Vereniging *(Netherlands)*
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Norsk Kjemisk Selskap *(Norway)*
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Sociedade Portuguesa de Química *(Portugal)*
Colegio de Químicos de Puerto Rico *(Puerto Rico)*
Russian Academy of Sciences *(Russia)*
Serbian Chemical Society *(Serbia)*
Slovak Chemical Society *(Slovakia)*
Slovenian Chemical Society *(Slovenia)*
National Research Foundation *(South Africa)*
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Institute of Chemistry, Ceylon *(Sri Lanka)*
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Chemical Society of Thailand *(Thailand)*
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