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International Union of Pure and
Applied Chemistry (IUPAC)

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Exploring *Elemental Matters*

A Closer Look at Responsible Care

IYC2011 Keeps Rolling



From the Editor

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With IYC well under way, it is amazing to observe the global enthusiasm for celebrating CHEMISTRY. Just look at the IYC website chemistry2011.org and see who is participating. So far, more than 1000 activities in nearly 100 countries have been registered. All this within a network of more than 6000 individuals in more than 160 countries.

But the numbers don't tell the whole story—the diversity of activities and their origin is what I think makes IYC quite special: cultural events in Sri Lanka; a chemistry competition in Lebanon; science fairs and festivals in Canada, Chile, and Japan; webinars in the USA; a Science Café in UK,



Portugal, and throughout Europe; an open-door day in Paraguay; an educator workshop in Ethiopia; chemistry stamp releases in Indonesia and Switzerland; several international competitions for essay writing, cartoons, and videos; and numerous professional workshops and conferences. These activities involve clubs, schools, colleges, universities,

associations, organizations, societies, and industries. Participants represent all age groups and range in number from two to thousands.

One IYC event made an especially big splash: the launch of the Global Water Experiment “Water: A Chemical Solution” on World Water Day, 22 March. For the kick-off event, school children from Cape Town took part in the global experiment and, as the videos attest, had fun in the process. Rovani Sigamoney (from UNESCO) reports on the “splash days” on page 17. IUPAC and UNESCO owe much to the entire IYC water team for pulling this off. To help sustain this initiative all year—visit <http://water.chemistry2011.org>.

Turning to celebrations occurring this month, I must put the spotlight on 20 May: World Metrology Day. This recurrent event, organized by the International Organization of Legal Metrology and the International Bureau of Weights and Measures (BIPM), celebrates the impact of measurement on our daily lives. The day is especially noteworthy this year as the theme is “Chemical Measurements—for our life, our future,” which was chosen to echo the IYC motto and recognize the vital contribution of measurements in chemistry. “The importance of chemical measurements is well established within the International System of Units” as Professor Michael Kühne, director of the BIPM reminds us, and “the impact on our daily lives of chemical measurements is far-reaching and of enormous benefit . . .” To learn more about metrology and the day's events, check out www.worldmetrologyday.org.

To share your own IYC activity with everyone or to leave comments, log on @ www.chemistry2011.org.

Happy IYC!

Fabienne Meyers

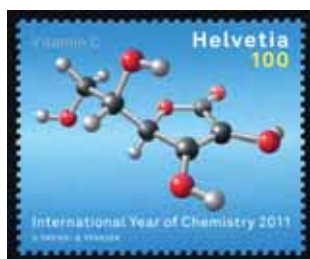
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Cover: *I don't think you understand the way I feel about the stove* by David Clark, Halifax, Nova Scotia, Canada; from CHF exhibit *Elemental Matters* (see feature on page 4). Courtesy of Chemical Heritage Foundation Collections, photograph by Conrad Erb.

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Go Forth and Nominate!

by *David StC. Black*

In February, I wrote to all National Adhering Organizations (NAOs) and members of the Bureau about the elections that will take place at the Council meeting on 3-4 August this year during the General Assembly in San Juan, Puerto Rico. Hopefully, numerous nominations for the various available positions will already have been sent to the Secretariat. However, this is a reminder that nominations can still be accepted until two months before the meeting (i.e., until 3 June). My purpose in writing this column is to encourage as many nominations as possible for the available positions.

IUPAC is the only international organization for the promotion of chemistry, and operates through the provision of a cooperative framework for global networking. It is therefore vital that this global framework is as broadly based as possible, with representatives not only from the large and powerful NAOs, but also from the smaller and less powerful ones. Currently, the Council is comprised of 57 NAOs with a very broad geographic spread and also a wide range of sizes.

Although the major NAOs or chemical societies are strong and regular contributors to IUPAC's international activities, the traditional and rather special IUPAC environment and ethos provide a serious platform for contributions from even the smallest participants. In this way, the stronger groups can be of great assistance to the weaker ones, and at the same time frequently learn from them as well.

NAOs have already focused their attention on nominating

individuals for the various division committees, and also, in a less formal sense, for the operational standing committees. But the NAOs also need to seriously consider possible nominations for the Bureau membership: We need strong personal qualities above all



else, and we need members who will proactively contribute ideas and sound judgment to help IUPAC fulfill its global goals. The Statutes and Bylaws contain the statement "Unless exceptional circumstances are established and special permission of the Council is granted, no Adhering Organization shall have more than one elected member on the Bureau, and the principle of fair geographical representation of members shall be taken into account." Consequently some NAOs have already supplied an elected

member of the Bureau, but there is enormous scope for most NAOs to nominate worthy candidates.

In reality, there is another geographical consequence in that all division presidents and operational standing committee chairs are members of the Bureau by virtue of their positions, and while this means that they are on the Bureau to represent their division or standing committee, of course they also come from their respective countries. Pragmatically, this could make it harder—but certainly not impossible—for a nominee from a country already well represented on the Bureau to become an elected member. It should be remembered that the terms of office are not the same, and an elected member could, if re-elected to a second term, serve on the Bureau for a period of eight years, whereas the turnover of division presidents and operational standing committee chairs would lead to considerably shorter periods of Bureau membership.

Again, reference to the Statutes and Bylaws reveals that the principal duties of the Bureau, are as follows:

- to ensure the strict observance of Statutes and Bylaws
- to prepare the agenda for meetings of the Council and in particular to make provision for elections
- to make recommendations thereon to the Council
- to attend the meetings of the Council
- to implement the decisions of the Council and execute the program of the Union as directed by the Council
- to take steps to ensure that International Congresses of Pure and Applied Chemistry are held
- to take decisions about the holding of scientific meetings as proposed by the division and standing committees
- to take all other steps necessary for the good conduct of the affairs of the Union.

... we need members who will proactively contribute ideas and sound judgment to help IUPAC fulfill its global goals.

These statements are rather bland and unexciting, but the most open-ended one is the last. In this instruction lies the capacity for creative ideas that could lead to the implementation of major programs of great significance to the promotion of chemistry. A very good example is the International Year of Chemistry. Bureau meetings do indeed cover all aspects of the affairs of the Union, and frequently surprise by springing to life from a seemingly dull agenda. Like all committees, the Bureau depends on the dedication of individual

contributions in time and thought and any satisfaction gained from membership would be directly proportional to input. One of the big issues for the Bureau moving into 2012 and beyond will be to capitalize on the momentum of the

It reflects badly on an organization if the number of candidates is equal to the number of vacancies.

International Year of Chemistry—IYC 2011. President-elect Kazuyuki Tatsumi has indicated that this will be firmly in his mind as he becomes president in 2012. The coming years will be an exciting period to be a Bureau member and have the opportunity to contribute significantly to the global promotion of chemistry.

It is very important that there is a serious election for Bureau members, which requires that there are many more nominees than vacant positions. It reflects badly on an organization if the number of candidates is equal to the number of vacancies. I do not think anyone goes through life being elected to all positions for which they have been nominated, so there should be no feeling of sensitivity or embarrassment involved in losing an election. Quite a high proportion of our IUPAC presidents over the years have not been elected as vice president and president-elect on their first attempt. However, they did not withdraw, but were quite prepared to offer their services again.

This brings me to the vacant officer positions: I also urge NAOs to think about nominations for these officer positions. There will be some excellent potential candidates among the wider IUPAC family, especially for vice president and president-elect, even from outside IUPAC. An elected vice president has two years to immerse themselves in IUPAC issues before taking over as president. No such “luxury” exists for the secretary general, but just as I received good advice and help from my predecessor, I will try to give the same

What Does the Bureau Do?

The Bureau is established by the Council to act for the Union during intervals between meetings of the Council; it therefore fulfills important functions by ensuring continuity. The Bureau normally meets once a year. It consists of the officers (president, vice president, secretary general, treasurer, immediate past president), the Division presidents and chairs of the Operational Standing Committees, and 10 other members elected by the Council. The elections should also allow for a fair geographical representation. In principle, no member country should have more than one Elected Member on the Bureau.

The principal duties of the Bureau—as quoted in the Statutes—are as follows:


- to ensure the strict observance of Statutes and Bylaws
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- to take steps to ensure that international congresses of pure and applied chemistry are held
- to take decisions about the holding of scientific meetings as proposed by the Division committees
- to take all other steps necessary for the good conduct of the affairs of the Union

See the Bylaws for more details.



www.iupac.org/web/nt/2011-02-25_Bureau_Nomination

to my successor. Sometimes, good potential candidates are reluctant to step forward because they feel that they do not have the time or capacity. It is up to our IUPAC membership to encourage these potential nominees, as they can be assured of wide-ranging support if elected.

So let us have a strong election on 4 August and make the ballot tellers work very hard! Let us show everyone that we have a truly vibrant Union of Pure and Applied Chemistry! 

See Call for Nominations on page 19.

IUPAC Secretary General David StC. Black <d.black@unsw.edu.au> has been involved in IUPAC since 1994 as a committee member of the Division of Organic and Biomolecular Chemistry. He served as division vice president during 2002–2003. He has served as secretary general since 2004.

This Art Has Chemistry

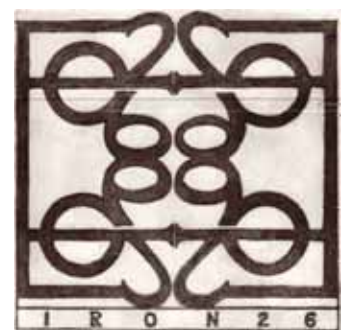
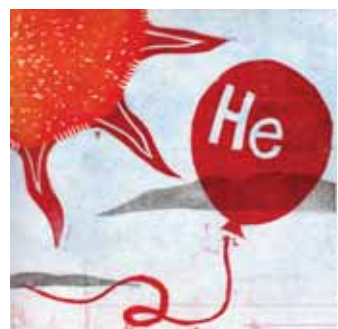
New Exhibit Kicks Off the U.S. Celebration of IYC 2011

by Chris Brouwer and Madeline Schaefer

What happens when you take contemporary art and mix in some chemistry? In the case of a new exhibit at the Chemical Heritage Foundation in Philadelphia, you get a dynamic and compelling way to experience the elements and the periodic table. *Elemental Matters: Artists Imagine Chemistry*, which opened on 4 February 2011 at CHF's Clifford C. Hach Gallery, features 15 works by seven artists as well as a group project involving nearly 100 artists. More than 250 guests attended the exhibit opening, as did the seven main artists who were on hand to discuss their works.

Ranging from graceful to moving to mysterious, the pieces comprising the exhibit explore the elements as symbol, raw material, or energy through a multitude of media: printmaking, sculpture, photography, outdoor installations, and audio recordings. *Elemental Matters* enlivens the senses with a lightness and energy belying the rather cozy exhibit space. "I don't think the space has ever looked happier," said curator Marjorie Gapp.

The exhibit is one of the key components of CHF's plans for celebrating the International Year of Chemistry 2011, and, as such, is meant to appeal to the general public as well as chemists. The inspiration behind the exhibit, according to Gapp, is to show how artists, like scientists, help us to see and understand the elemental world. This concept is clearly evident throughout the disparate works. In fact, a recurring theme among the artists and their creations is the similarity between chemists and artists.



Above and right: The Periodic Table Printmaking Project, 2007, by Jennifer Schmitt, Concord Massachusetts <www.azuregrackle.com/periodictable/table>.



Artist David Clark, Halifax, Nova Scotia, in front of *Braille* (2000).

“The one thing that bridges art and science is the use of visualization to describe your observations,” said Rebecca Kamen, one of the featured artists. “There is so much we share in common and I think it is not such a great leap. I think chemists imagine things the way artists do too. We go through steps, exploring what that is, and then use the power of observation.”

Within the pristine and lofty gallery housing the exhibit, the art feels natural and at home. As visitors enter, they are met by a series of electric-stove-top burners arranged on the wall in the shape of a periodic table. Each burner’s spiral design and unique shape is nearly mesmerizing; the rusty red tint of the metal creating a rich and engaging display. Created by David Clark of Halifax, Nova Scotia, the 10-by-14-foot piece is titled *I don’t think you understand the way I feel about the stove*. Stoves, like the periodic table, and perhaps like chemistry itself, are so commonplace and under appreciated that the use of electric burners is compelling and transformative.

Clark’s other piece, *Braille*, marries the idea of chemistry and sight; how much of what we see is due to chemical processes? Here, the periodic table has been transformed into the familiar eye-exam chart; an accompanying Braille version, with large round bubbles, dots the wall. For this work, Clark says he was inspired by a quote from Dmitri Mendeleev’s Faraday lecture.

“If I am allowed to misunderstand Mendeleev’s remarks, it is possible to imagine that he is suggesting such a thing as chemical vision,” Clark states. “What a wonderful idea to think we could touch the world with our eyes, to know the world unencumbered by signs and representations, to know what the world really is, what substance it has, what things really are.”

Central to *Elemental Matters* is a display of the entire *Periodic Table Printmaking Project*, perhaps the most vibrant piece in the exhibit. Curated by Jennifer Schmitt, this ambitious project features 118 prints of each element by 97 artists from 29 states and 7 countries laid out in its familiar grid. The result is a diverse and beautiful tapestry of color, design, and imagination. Playful and eye-opening, the prints effectively link chemistry to everyday life, pop-culture, and society.

Schmitt said she got the idea one day when “I spread all my prints out on the floor of my apartment and thought ‘They look like the periodic table.’” At a friend’s urging, she turned the idea into a project. After setting up the basic guidelines and putting out a call for artists, word quickly spread.



Songs of Which [Evelina kneeling, looking left], 2004, by Dove Bradshaw, New York, NY.



Above and below: photographs of Brigitte Hitschler’s *Energy Field 1*, a 1999 installation in Hanover-Empelde, Germany.



This Art Has Chemistry

The project was a natural fit for Schmitt whose mother taught high school chemistry for 30 years. And although she never wanted to be a scientist, Schmitt said her mother made learning science fun and approachable. “Knowing how the world around you works makes life so much richer.”

Schmitt says she has been told by numerous people that they wished they had something like this when they were in high school. “This [version of the periodic table] makes it easier to remember facts about the elements. It offers something to hang onto.”

German artist Brigitte Hitschler said she was always, “Very interested in natural science, especially the questions and the results, but I never studied it because I never could remember all the formulas.” Her first foray into combining chemistry and art was on a grand scale. For *Energy Field 1*, Hitschler planted



Platonic Solid: Water by Rebecca Kamen.

Although it is hard to fully appreciate *Energy Field 1* by watching a video on a small screen, it is easy to imagine the beauty of the piece and to appreciate its significance. Hitschler describes the original installation as “Very poetic. The lights would glimmer and glow at dawn and then glow a bit more at dark. When it would get very dark, all you would see was the glowing lights showing you that something was happening there.”

Allure and mystery are central to many of the works on display. The photos of Dove Bradshaw show the beauty of the human figure juxtaposed with words listing the elements inside the human body. *Herself in the Element* depicts a seated woman, poised and unclothed. On the model's bare back, Bradshaw has painted “CARBON HYDROGEN NITROGEN . . .” Words decrease in size as they descend her spine. Elements in great abundance appear in large letters, while the viewer must squint to see the minute letters that list trace elements in the body—“TUNGSTEN, URANIUM . . .”

Bradshaw explained that her inspiration for painting the elements on the human body came from another piece in the exhibit, *Self-Interest* (1999), which displays all 57 elements found in a human body in proportion to one another.

For Bradshaw, being part of a chemistry-themed art exhibit was refreshing. “For me, I like the idea of getting out of the art world. We tend to enjoy ourselves in our own little world, our cordoned-off area. Some of the works here are very imaginative, dynamic, and interesting. I particularly like the piece visualizing the sounds of the elements.”

Exhibit visitors discuss Rebecca Kamen's Atomic Flowers.



Dove Bradshaw poses with two of her works in the exhibit, КИСЛОРОД [Oxygen, in Russian] and *Herself in the Element*.

battery structures of zinc, magnesium, and copper into the slagheap of an abandoned potash mine. The long, pole-like diodes reacted with the potash salts and moisture in the earth to fuel 400 red LED lights. Visitors to the exhibit had to make do with photographs and a video of the original installation, which only existed for four weeks in 1999.

“My idea was to show the energy of this special site,” said Hitschler. “There were once so many people working in this mine, and the energy of these working people is still there in this material. And once they clean it up, people will come to get energy from this place.”

Elemental Matters Opens at CHF

The range of styles in the exhibit mirrors the vibrancy of chemistry. Composer Susan Alexander takes the electromagnetic frequencies from the atomic world and brings them within the hearing range to reveal hidden patterns and relationships. Her soundtrack for the installation *An Elemental Garden* is based on the first eight elements that would have been created in the “belly of a dying star.” The composition “starts with hydrogen, which is a very high ping, and then as the elements get created they increase in pitch.”

“I’m really proud of the fact that I was kind of a pioneer,” Alexander said of her two decades of work in this medium. The beauty and excitement of the process are what keep her interested. “When you get in there and work with the patterns and translate frequencies to sound, lots of beautiful things show up.”

One of the more stunning pieces, *Carbon, Vanadium* by Rebecca Kamen, is one of several sculptures that comprise *An Elemental Garden*. Kamen uses Mylar paper and fiberglass rods to create 3-D visualizations of the sounds of eight different elements. The transparent Mylar creates a ghostly effect when hanging from the wall. A series of these structures placed on the floor creates a new-age ghost city with spiral skyscrapers and fiberglass parking garages.

For Kamen, the periodic table mysteriously entered her consciousness after she walked in her front door after returning home from teaching a workshop in Santiago, Chile. “I thought maybe I was jet lagged at first,” she said. Intrigued, she began to explore what the periodic table meant to her. “I decided that in order to really understand it, I needed to come here [to CHF] and use the library and understand it from its inception,” Kamen said. “Then I looked at the Platonic solids and thought ‘This is the first visualization of the elements, I need to honor that.’”

Visual artist Kevin H. Jones said he felt “ecstatic” to be included in the exhibit. “We’re like kindred spirits,” he said of his fellow exhibitors. “Most people are like ‘Why are you doing this?’” In *Broadcasting to Unknown Points*, Jones took a recognizable portion of the periodic table and placed enigmatic pictures alongside element symbols.



Broadcasting to Unknown Points, 2009, by Kevin H. Jones.

Although investigating the natural world through charts and diagrams has long been a theme in his art, Jones says that his friendship with a Ph.D. chemistry student in graduate school pointed him in the right direction. “He would invite me over to his lab and I would invite him over to my studio. I realized that we were doing kind of the same thing,” Jones said. “Although he was doing hard science, I was fixing stuff together and creating something new, so there were similarities. He gave me a chart that he was going to throw out that had some burn marks on it and I remember thinking: wow, this is exactly what I’ve been looking for.”

Elemental Matters is elegant and perceptive, diverse and engaging. The exhibit asks those who experience



Dove Bradshaw's Self-Interest (1999).

it to reconsider the role of chemistry and chemical processes in our everyday lives, effectively bridging the gap between the arts and the sciences. *Elemental Matters* will be on display at CHF through 16 December 2011. 🍷

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👉 www.chemheritage.org/visit/museum/exhibits/elemental-matters

A Closer Look at Responsible Care

Is there a Broken Link?

With supply chains strung across the developing world, how can the chemical industry ensure that the end product is safe?

by Gail Krantzberg and Peter Topalovic

Responsible Care, which began in Canada in the early 1980s, is an important initiative of the worldwide chemical industry. Now adopted in 54 countries, the program is about building trust through ethical behavior, listening attentively to the evolving concerns of the public, and providing responses that clearly demonstrate the concerns have been heard.

In 2006, the IUPAC Committee on Chemistry and Industry (COCI) began a project to assess the history of Responsible Care and develop a case study of the program (project 2006-047-1-022). The now-completed project produced a couple of documents and teaching aids that are available to anyone interested in exploring Responsible Care in more detail. The first paper presented here, by Gail Krantzberg and Peter Topalovic, is a summary of the case study of the 1996 tragedy in which 80 Haitian children died from ingesting cough syrup tainted with diethylene glycol (DEG), a chemical commonly found in antifreeze. The second paper by Rober Slater is based on his presentation made at the 3rd IUPAC Conference on Green Chemistry (August 2010) and uses the Bhopal and Gulf BP incidents to explain how critical events can be turning points in defining policy agendas.

Although the application of Responsible Care has led to significant improvements in the performance of the industry, incidents continue to occur. There are still many improvements to be made even within the industries that already adhere to the principles of Responsible Care. The articles contained in this issue of *CI* should help spark discussions about this important topic.

Bernard West <bernard.west@sympatico.ca> was chair of IUPAC project 2006-047-1-022.

 www.iupac.org/web/ins/2006-047-1-022

In 1996, 80 Haitian children died from ingesting cough syrup tainted with diethylene glycol (DEG), a chemical commonly found in antifreeze. An investigation conducted by the U.S. Food and Drug Administration (FDA) found that Pharval, a local company that produced the cough syrup products Afebril and Valodon, did not contaminate the product at its site. Instead, a supposedly pharmaceutical-grade shipment of glycerin, a key component in the most widely prescribed cough syrup in the country, was contaminated at its source in China. However, the Haitian company was under the assumption that the chemical was produced in Germany by VOS BV, owned by chemical giant Helm AG. According to a 1997 article in the *World Press Review*, Pharval felt that it didn't have to implement any quality controls on the imported product because of its presumed European origin.

Is BP the New Bhopal?

How Crises Set The Policy Agenda*

by Robert W. Slater

This article explores how critical events can be turning points in defining policy agendas for both the private and public sectors and for civil society.

First, the article describes the general way that licenses to operate are awarded to enterprises. Then it examines why a significant operational failure—a crisis—gets so much attention and how short- and long-term changes emerge from the wreckage. The Bhopal and Gulf BP incidents are used as case studies.

*Paper based on a presentation made at the 3rd IUPAC Conference on Green Chemistry, 15-19 August 2010, Ottawa, Canada.



Issues surrounding product stewardship, supply-chain management, quality control, politics, and legal responsibility are at the heart of this disaster. A complicated web of interactions led to negative implications for all the parties involved. In the aftermath of this disaster, many of the companies in the supply chain engaged in finger pointing, lawsuits, and denials of responsibility.

In this article, we address questions that arose from this disaster in the context of Responsible Care. We test the hypothesis that the magnitude of this crisis would have been reduced if some or all of the companies along the supply chain subscribed to Responsible Care principles and codes.

In 2007, *The New York Times* reported that the U.S. Food and Drug Administration's investigation of the cough syrup incident indicated that the pharmaceutical manufacturing and testing facilities at Pharval laboratories did not meet international standards. This was due to a variety of factors, including the fact that Haitian regulations are not as strict as those in other countries. Furthermore, the maintenance costs for clean rooms, proper HVAC systems, and high-tech

testing equipment are too high for most companies in developing countries. Even if the facilities were clean and properly maintained, Pharval would not have had access to the technologies required to test for diethylene glycol.

The investigation of the glycerin suppliers led to some disheartening conclusions related to the management of international supply chains in China, the Netherlands, and Germany, especially where developing countries are concerned. In the Haitian case, no company along the supply chain was found to be directly responsible for the problems that occurred. Some denied responsibility, others covered up mistakes, and, in the case of the contamination source, it was never determined which Chinese company was responsible. However, according to a 2007 issue of *Pharma-Brief Special*, a newsletter put out by the German pharmaceutical-watchdog group BUKO Pharma-Kampagne, the company is believed to be Sinochem, based in Beijing.

The investigation of VOS BV by the Special Rapporteur of the United Nations Economic and Social Council of the Commission on Human Rights found that the company knew about the contaminated glycer-

There are three types of licenses under which companies operate:

Commercial License: Does the project meet the goal for return on investment for the shareholders? Does it meet the requirements of investors? Is it financially sound over its expected lifespan?

Government License: Does the project comply with all applicable laws and regulations—from local to global? Has it complied with due administrative process?

Public License: This exists when the public trusts a company in terms of its products, operations, and management. When trust has been established the company's products are welcomed in the market-

place, their plants are welcomed in communities, and they can attract high-quality personnel to work for them. Some have described this as socially generated economic capital, others have called it goodwill. When trust is lost, nothing can be taken for granted. This socially approved license is not formal or well documented, but it is just as important and real as the others.

Debates over the public licence to operate, after commercial and governance licences have already been granted, are quite common. For example, a boycott on Canadian pulp and paper products that occurred in Germany for a period in the 1990s was a protest against clear cutting of old-growth forests. A current attempt to deter-

tourists from visiting Alberta is associated with the environmental consequences of exploiting the oil sands.

Campaigns *in favor of* a public license can also be found. A current example is the breakthrough Boreal Forest Conservation agreement recently signed between the Canadian Forest Industry and environmental groups. With the agreement, which applies to an area twice the size of Germany, the industry has committed to meeting the world's highest standards in forest management and environmental groups agreed to suspend their "do not buy" campaign while the agreement is implemented. The agreement took 20 years to establish.

A Closer Look at Responsible Care

erin after it sent the shipment to Haiti, but did not alert authorities. VOS BV sent a sample of the Chinese shipment to an independent testing laboratory and falsely marked the barrels of glycerin as 98 PCT USP, pharmaceutical grade. Kevin J. McGlue, a board member of the International Pharmaceutical Excipients Council, told *The New York Times* “where there is a loophole in the system, a frailty in the system, it’s the ability of an unscrupulous distributor to take industrial or technical material and pass it off as pharmaceutical grade.”

The UN investigation found that the barrels were sent with a certificate of pharmaceutical quality that was taken from the certificate that originated in China. It is common practice to re-use certificates when a product changes hands from manufacturer to supplier and onward to the destination customer. The identification of the source

contamination and the FDA inspection of Pharval laboratories clearly established that the glycerin was contaminated at the source and not along the supply chain. It was a lack of product stewardship policies

and a lack of due diligence across the supply chain that lead to the disaster. In both Haiti and Panama, a country that experienced DEG contamination more recently, the factories’ original certificates of analysis for the glycerin containers did not accompany them as they moved across the supply chain. Instead, a copy of the original was used and stamped



with the receiving company’s information each time the container exchanged hands.

Helm AG, one of the largest chemical companies in the world, declined to comment on the case given that the contamination occurred outside of Germany. Helm AG has been associated with other issues involving

Adverse Public Attention Causes Change

Events that attract public attention, especially photogenic ones, precipitate change and influence the terms of all of the three licenses mentioned above. A project mired in controversy because of environmental or human health concerns will find it more difficult to attract investors. When investors are found, there may well be a premium to pay on the interest for loans and charges for insurance because the investment is considered more risky. This can have a spill-over effect and move from a single company to embroil an entire sector. This can be nationally and internationally significant—as is the case with the Canadian oil sands.

Public concerns can register with politicians and can be translated into a demand “to do something” visible and understandable that will impress and assure the general public. The search for the guilty party and their punishment may be pursued and regulations developed with the aim of avoiding a repetition. “React and cure” decisions taken in the white-hot crucible of public controversy are reasonably straightforward to predict and, frankly, easier to deal with. In contrast it is the tougher, long-term measures that result in much more ambitious systemic change. This approach is termed “anticipate and prevent.”

Any industrial accident results in the loss of control by the people who were expected to exercise it in both industry and government and the consequences are often

difficult to predict. The company in question will have been operating under the terms of the three licenses described earlier. Each one of those licenses will have been based upon conventional wisdom on matters such as technology reliability, integrity of governance, competence of personnel, and profitability. Conventional wisdom or consensus opinions do not fall like manna. They are the culmination of a lot of hard work to achieve a single view from parties of interest who typically start out with quite different ones. A consensus view is valuable because it is the foundation upon which operating licenses are issued.

Conventional wisdom can be thought of as the majority view. Different views—sometimes radically different ones—held by others outside mainstream thinking are



the transport of materials to the third world, according to the German media. The Chinese government also denied any responsibility since the glycerin was not shipped directly to Haiti from China.

No international supply chain management regulations exist to solve problems such as this. However, the European Union's Registration, Evaluation, Authorisation and Restriction of Chemical Substances (REACH) legislation and Responsible Care's supply chain management policies may have a positive effect. This issue has received major coverage over the years since the Haitian tragedy occurred.

In the Haitian case, there were many organizations responsible for transporting the glycerin across international boundaries; therefore, it is very difficult to lay blame. However, after the details of the case were sorted out, some litigation was undertaken in the Netherlands, Germany, and Haiti.

Pharval settled with the Haitian families whose children died from DEG exposure for USD 10 000 per family. The company also filed a civil suit, jointly with

...there were many organizations responsible for transporting the glycerin across international boundaries.

the families, against VOS BV in the Netherlands. The litigation focused on VOS BV, since it knowingly sent DEG-contaminated glycerin to Haiti. Eventually, the suit was settled out of court with the Dutch company for the same amount as Pharval had settled

with the parents. In the aftermath, the affected families were compensated, yet no company accepted full responsibility for the tragedy. VOS BV was also prosecuted by the Dutch government, found guilty of a cover-up, and fined USD 250 000. Although both companies were partly to blame,

Pharval and VOS BV (now Helm Chemicals BV) remain in business today.

Other attempted litigation has generally failed to produce a favorable outcome for the plaintiffs. The Chinese government and corporations denied responsibility and would not work with the U.S. FDA to find the source of the contamination, *The New York Times* reported. David Mishael, a U.S. lawyer representing Haitian parents has unsuccessfully pursued legal claims against Helm AG and VOS BV.

often referred to as outliers. It is the outliers who are more likely to be the source of a new consensus. The emergence of a new "absolute truth" in the aftermath of a crisis is often a messy and disruptive business; learning to listen to uncon-

ventional voices is essential and a challenge for both public and private sectors (this process is akin to the "paradigm shift" that Thomas Kuhn introduced in his 1962 book *Structure of Scientific Revolutions*).

When conventional wisdom is

found wanting it can shatter confidence. When the Bhopal tragedy occurred in India in 1984, Canadian public confidence in the Canadian chemical industry suffered the most precipitous decline that the pollsters had ever recorded. This was in spite of the fact that there were no Canadian links to the plant in Bhopal and it was half a world away. In the public's mind the whole chemical industry was "tarred with the same brush."

While the nature of the immediate technical response is primarily defined by the crisis itself, it will also be influenced by personalities and context. For example, good personal relationships amongst the principal players in industry, government, and civil society; the history of the company and the sector; and the electoral cycle will all play a part in the way the crisis



The infamous Union Carbide plant in Bhopal, India.

A Closer Look at Responsible Care

In terms of the economic and social effects of the disaster and the ensuing litigation, very little change occurred and a minimal amount of punishment was received by all the parties involved. The costs associated with non-compliance were USD 250 000 with very little transparency or accountability demanded in the aftermath. Policies on supply-chain management remain largely unchanged worldwide, with the exception of the European Union's REACH legislation. Over the past decade, evidence of a policy and regulatory gap has become clear as DEG contamination has been repeated in developing countries throughout the world. In many cases, the source of this contamination continues to be from poorly regulated Chinese suppliers.

In 2006, Panama experienced a tragedy similar to of the one in Haiti, with DEG contamination in a government-manufactured cough syrup resulting in hundreds of deaths. Over the years, other countries such as Bangladesh, Argentina, Nigeria, China, and

India have also been affected by DEG poisoning cases. The case in Panama clearly illustrates that the proper steps have not been taken to minimize a preventable disaster. After the Haitian experience, an inexpensive DEG testing kit was developed to assist regulators in identifying contaminated shipments; however, according to an article in the journal *Public Health Reports* this is not in widespread use.

In 2007, the *International Herald Tribune* reported that DEG poisoning had become a global problem with a preventable death toll in the thousands. China has recently taken action against drug counterfeiters, but when the role of pharmaceutical companies in the Panama tragedy was examined, it was found that no laws had been broken. According to the *Tribune*,

many developing countries, including China and India would need tougher regulations in order to meet safe standards.

After the Haitian incident, world health experts recommended improving the certificate of authentic-

The issues surrounding global supply chains that originate and terminate in the developing world have continued to plague the chemical industry.

is portrayed and understood by the public.

Forecasting Events

As the sage Yogi Berra once said, "forecasting is dangerous, especially when it is about the future." Nonetheless, there are things we can learn from the Bhopal tragedy of 1984: a catastrophic methyl isocyanate release that killed over 3000 people immediately and condemned at least an additional 20000 to a lingering death over the intervening 26 years. The case is still before the courts.

The immediate "react and cure" response included the following:

- shutting the plant
- urgent assessment of the state of underground storage tanks and the leakage controls on them

- improved environmental and process monitoring to detect leaks and the fate of the releases
- risk assessment of chemical plant operations and new standards for picking sites for new plants
- testing, validating, and upgrading of contingency plans for major industrial accidents

The "anticipate and prevent" responses were directed at systemic change. Two examples are [Responsible Care](#) and [Green Chemistry](#). Responsible Care was initiated by the Canadian chemical industry in 1985. It is based upon a set of guiding principles and codes of practice and was ultimately adopted by the Canadian industry.

For the Canadian chemical industry: "The codes, like the guid-



An oil containment boom in the Gulf of Mexico. Photo: U.S. Navy.

ing principles, reflect an ethic, an attitude, a method of thinking about the way in which member companies do business and their role in society. In particular, they address the reality that corporate values must emphasize a long-term commitment to community and occupational health and safety and to environmental protection. Indeed, the codes do not contain static requirements, which, once met, never change. Rather, they necessitate continuous



ity system to provide a clear path of the material flow through the supply chain from source to destination. These experts also stressed that transparency and accountability should be enforced through regulations and investigations within and between international borders. However, the *Tribune* article pointed out that as long as counterfeiters do not fear prosecution, there is no incentive to improve the quality of their products.

The issues surrounding global supply chains that originate and terminate in the developing world have continued to plague the chemical industry. In North America, issues with lead-poisoned toys, DEG-tainted toothpaste, and other dangerous products mimic the problems encountered in developing countries; however, in most situations, tainted products are identified before they reach the end customer. According to the 2007 *Pharma-Brief* article, tough North American regulations and industry standards, which are not usually present in developing countries, may be responsible for the successful identification of dangerous products.

In our recent paper, we examined events in which DEG poisoning and drug counterfeiting have con-

tinued to be an issue in developing countries since the 1996 Haitian tragedy. A mix of national and international regulations, along with corporate voluntary initiatives are assessed as a way to determine whether the public can be better protected from these poisonings. The central question of this case study asks: Would Responsible Care, appropriately applied throughout the supply chain, have averted the crisis experienced in Haiti and other developing countries?

The paper examined the key topics of global supply chains, stakeholder trust, due diligence, and corporate culture in the context of three main theories:

1. The companies involved did not internalize the concepts of product stewardship and the cradle to cradle philosophy that Responsible Care advocates.
2. The loss of business and reputation through erosion of trust was not a major consideration in the decision-making processes of the companies involved.
3. The major players involved in the case study did not embed the philosophies of the Responsible Care ethic or create a corporate culture of protection of all stakeholders.

performance improvement in an environment of changing knowledge and regulation. It represents a shift from a legalistic to a moral and ethical way of thinking; from asking, 'Is it legal?' To 'Is it the right thing to do?'"*

This statements has recently been amended to include a reference to serving a larger social purpose—"dedicate ourselves, our technology and our business practices to sustainability—the betterment of society, the environment and the economy." This includes innovating for safer products that conserve resources and provide enhanced value, and working for the improvement of people's lives and the environment.

These codes have been adopted

*From *A History of Responsible Care* produced by the Chemical Industry Association of Canada

by 54 countries to date and other industrial sectors are following suit in ways that make sense to them. By so doing, companies and sec-



The Deepwater Horizon drilling platform on fire.

Photo: U.S. Coast Guard.

tors are committed to continuous improvement and thereby get ahead of their governments' regulatory agenda. This sort of initiative reflects a symbiotic relationship with government. Enforcement of performance-based government

regulations is necessary to deal with free riders and negligent performers and encourage the innovation and creativity that Responsible Care demands. This increases the predictability of behavior by all parties to the benefit of all.

When the pioneers of Green Chemistry propounded the view that chemists were smart enough to displace inherently toxic synthetic chemicals with ones benign to the environment and human health they were probably greeted with derisions. I imagine the response included words like "unrealistic," "impractical," or "why bother?" These are common reactions to new ideas put forward by outliers to conventional wisdom. Decades later, Green Chemistry has made important progress. The proliferation of green products in the marketplace is evidence that green

Assessing Responsible Care

The paper concludes that Responsible Care, as implemented by the Chemistry Industry Association of Canada, would have mitigated or averted the crisis. Responsible Care needs to better promote preventative, rather than reactive approaches to risk assessment and risk management. Responsible Care's product stewardship principles can do more to encourage the substitution of the most dangerous chemicals. This approach would better demonstrate the industry's commitment to its principles and avoid claims that the industry has incongruent political and environmental goals. A related opportunity for the improvement of Responsible Care is the full integration of the principles of sustainable development into its mandate. A move to a more transparent and accountable process would most likely include an emphasis on sustainability and the principles of industrial ecology.

Overall, Responsible Care's commitment to continuous advancement will help capitalize on the opportunities for improvement identified and continue to ensure safe and equitable global supply chains in the future.

The text of this article was excerpted from a paper that, at the time of publication of this magazine, had been submitted to the journal *Environment, Development and Sustainability*. Reprinted from July/August 2010 *Canadian Chemical News*, p. 21.

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chemists are proud holders of a public, or social, license to operate.

The BP Spill

The essentials of the BP Macondo catastrophe in the summer of 2010 are well known: 11 deaths, 4.9 million barrels spilled into the most productive fishery in the United States, and intense, prolonged political and media attention at the national, international, and regional level for months.

The immediate "react and cure" agenda inspired by the BP spill in the Gulf of Mexico included the following:

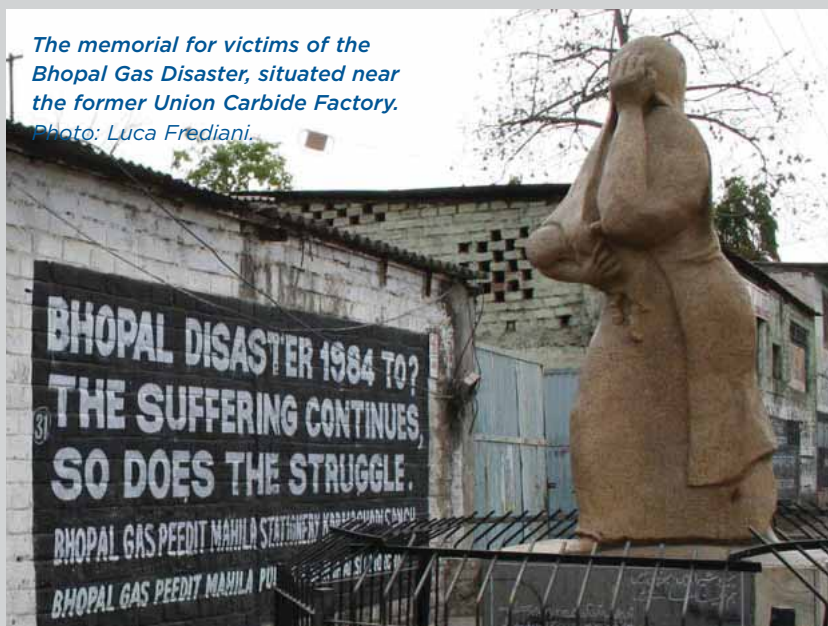
- blow-out preventers that work under all operating conditions
- contingency planning that works efficiently and effectively for all parties
- research into improved oil spill recovery and reduced toxicity of dispersants.
- governance—particularly who is in charge, when, and where?

In the long term, there were likely be two systemic shifts: one in risk assessment and management, and the other in the area of governance.

Risk Assessment and Management will be reformed. Currently, most risks are assessed on the basis of

individual projects through established processes like environmental or commercial risk assessments. Whenever something goes badly wrong, more complete answers seem only to come from specially commissioned comprehensive inquiries that demand information on strategic considerations like

The memorial for victims of the Bhopal Gas Disaster, situated near the former Union Carbide Factory.
Photo: Luca Frediani.





corporate culture and integrity of governance systems.

Three categories of risk management are warranted. The first is **Enterprise Risk Management**, which is the application of risk assessment to the three operating licenses noted above brought to the level of the enterprise in its entirety through the lifecycle of its activities and integrated across all operations.

The second is **Sector Risk Management**: The sector—especially for those involved with fossil carbon—needs to look across similar enterprises and consider risk beyond immediate corporate responsibility. The weakest-link theory makes this an exercise in self-interest for all players in a sector.

The third category of risk management is **Technology Assessment**: Special consideration is required for the assessment of new technologies or the novel application of existing technologies, as was the case with BP. Because the technologies are new there will be little operating experience and “conventional wisdom” will be mostly in the hands of those commercializing the technology. Their self-interest in rapid deployment is evident and government is frequently hamstrung because it will have both limited knowledge and access to expertise and qualified staff. Nonetheless, whatever is known, regardless of origin, will be used in a government decision to award a government license to operate.

If enlightenment prevails, all parties will acknowledge that more information is required and will demand a more rigorous performance-monitoring regime and a targeted research program to pro-

vide the knowledge that is not known, but believed to be important. Things that we don't know we don't know are a particular risk with assessing new technologies and the potential for encountering a “black swan”—an impossibility according to conventional wisdom of the 1800s—looms largest. Resource exploitation in ever-more-extreme conditions will elevate this concern.

The BP spill illustrates that we have to scale-up the governance



A satellite image of the Deepwater Horizon oil spill taken on 24 May 2010. Photo: NASA.

of risk in a way commensurate with the scale-up that is taking place in industry. This does not need to automatically lead to an increase in cost or paper burdens to industry. Recent moves by industry and government have been to seek relief from the burdens of project-level assessments on the grounds that they inhibit the speed of development. If the above trio of risk assessments at the enterprise, sector, and technology level were undertaken, then there would be a basis for claiming that the demands of project-level assessment could be modified. In their absence there is little to justify it.

The scale-up in operations and oversight results in the need to review *governance*, a challenge shared by all parties. Every crisis seems to pose new questions

about who is in charge, who is accountable for what, and up to what amount. The USD 20 billion reparation fund that BP has placed in trust effectively eliminates previous “ceilings for liabilities” set by government. Previously, liabilities were constrained to relatively modest amounts, meaning the taxpayer was on the hook for the rest.

It is hardly surprising that “lessons to learn from BP” has become a standard agenda item for boards of directors at institutions in all fields, both private and public. Some will want to see worst-case scenarios, while others will see business opportunities. Every aspiring and current CEO will want to avoid the fate of BP's Tony Hayward. It is less clear that government officials, policy-makers, and regulators have reacted at the same speed.

This a new world that is being haltingly revealed and it will require a serious, objective, non-partisan discussion engaging our best minds to think this through. Universities as institutions are non-partisan, independent, and used to handling new ideas. Perhaps they could be invoked to provide a safe haven for all parties to engage in locating solutions rather than just the documentation of positions by vested interests, which seems to be the fate of most consultations.

Robert Slater <robert_slater@carleton.ca> lectures in environmental and sustainable development policy from the practical experience of over 30 years as a senior manager of environmental issues for the Government of Canada and in his current position as president of an international consulting practice. He obtained his degrees from Imperial College and is a senior fellow at the International Institute for Sustainable Development. Currently, he is the executive director for Carleton University's Regulatory Governance Initiative.

2011

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CHEMISTRY

IYC2011 Keeps Rolling

The International Year of Chemistry, IYC2011, is well under way across the globe. The celebration began in France and then moved to the United States and many other countries around the world. During the last week of January, academics, industry leaders, Nobel laureates, and officials of many governments gathered at UNESCO headquarters in Paris to celebrate IYC with speeches, concerts, and social events.

After the UNESCO event on 27 and 28 January, a different group gathered at the Sorbonne on 29 January to honor Marie Curie. The year 2011 is the centennial of Curie's Nobel Prize in Chemistry. Curie also won a Nobel Prize in Physics in 1903. Speakers throughout the day talked about Curie's life, the difficulties she faced and overcame, and the many sacrifices she made on her path to immortality.

In the United States, the celebration began just two days after the festivities in Paris ended. On 31 January, the evening before the official launch of IYC in the United States, The Dow Chemical Company—one of the IYC2011 Global Partners—and the Chemical Heritage Foundation (CHF) hosted a dinner for 180 leaders in the chemical enterprise in the United States at the CHF Conference Center in Philadelphia.

The next morning, 1 February, a six-member panel discussed how the chemical enterprise could solve the daunting problems that face the world in the 21st century. The main topics, and the themes for IYC2011, were energy, food, health, and water. The six panelists were the following:

- Dan Nocera (moderator), Henry Dreyfus Professor of Energy and professor of chemistry, Massachusetts Institute of Technology
- Joshua S. Boger, former chair and CEO, current board member, Vertex Pharmaceuticals
- Rita Colwell, professor, Johns Hopkins University, and former director, National Science Foundation
- Janet Hering, director, Swiss Federal Institute of Aquatic Science and Technology

- Ellen J. Kullman, chair and CEO, DuPont
- Andrew N. Liveris, chair and CEO, The Dow Chemical Company

The two-hour event began with each panelist giving his or her perspective on how chemistry could help to solve the huge challenges that face the world today and in the future. Following the opening talks, the six panelists had a lively discussion. For the final 30 minutes, the panelists took questions from the 200+ audience at CHF as well as from those watching live on the web. The entire two-hour presentation is available online. Just click on the IYC2011 logo at www.chemheritage.org.

The next evening, 2 February, in collaboration with Headhouse Books, CHF hosted a book discussion of *The Emperor of Scent* by Chandler Burr. Chemist Joseph Rucker, project leader, Biosensors-Integral Molecular, Inc., Philadelphia, led the discussion of the sense and sensibility of smell.

On Thursday, 3 February, Professor James Armstead, a historical recreator, came to Philadelphia in the character of Percy Julian, the great 20th-century chemist who was the subject of a two-hour documentary titled *Forgotten Genius*. Released in 2005, this award-winning feature-length film tells the story of Julian's long and improbable life.

Armstead is an actor of considerable range. He has recreated many characters and spends the day "in the role" of the men he portrays. Armstead spoke to student groups at the African-American Museum in Philadelphia and at The College of Physicians.

On Friday, 4 February, *Elemental Matters*, a new exhibit of seven contemporary artists responding to the periodic table of elements, opened to the public for the first time. All of the artists, even



Joshua S. Boger, former chair and CEO, current board member, Vertex Pharmaceuticals.



Rita Colwell, professor, Johns Hopkins University, and former director, National Science Foundation

from as far away as Germany, traveled to CHF for the opening. Nearly 250 visitors came to CHF to meet the artists and participate in the opening. Their work will be on display in CHF's Hach Gallery through December of this year (see feature page 4).


Separate from these activities, CHF made chemistry part of celebrating Valentine's Day by hosting "Science on Tap" at Philadelphia's National Mechanics bar and restaurant on 14 February, featuring Sam Kean, author of *The Disappearing Spoon and Other True Tales of Madness, Love, and the History of the World from the Periodic Table of Elements*.

CHF has also launched "It's Elemental," a national high-school video competition that invites students to submit videos inspired by a single element for an interactive periodic table. Nearly 700 student teams submitted videos. To watch, go to www.chemheritage.org/elementalvideos.



Ellen J. Kullman (left), chair and CEO, DuPont; Andrew N. Liveris (middle), chair and CEO, The Dow Chemical Company; and Dan Nocera, Henry Dreyfus Professor of Energy and professor of chemistry, Massachusetts Institute of Technology.

And this report just covers the opening weeks of IYC. For events throughout this important year, go to the website below.

 www.chemistry2011.org
www.chemheritage.org/iyc2011

Big Splash for the IYC Global Water Experiment

by *Rovani Sigamoney*

On the United Nation's World Water Day, 22 March 2011, UNESCO and IUPAC launched the International Year of Chemistry (IYC) Global Experiment: "Water: A Chemical Solution." The event occurred at Ratanga Junction, Cape Town, from 22-25 March 2011 and was organized in collaboration with the City of Cape Town Municipality.

The IYC Global Experiment, entitled "Water: A Chemical Solution," consists of four component activities: pH measurement, salinity measurement, filtration/disinfection, and desalination. Each can be carried out by children of all ages in schools around the world and no special equipment is needed (all experiments can be done with laboratory equipment at schools).

The activities are adaptable to the skills and interests of students of various ages and use equipment that is widely available.



IUPAC Wire

The theme for the UN World Water Day 2011 was "Water for Cities: Responding to the Urban Challenge". During the Big Splash, which coincided with the South African National Water Week, students were exposed to different activities that emphasized the importance of water in their city, Cape Town. Pupils from different schools in Cape Town (areas such as Langa, Khayelitsha, and Hout Bay) were first exposed to the difficulties of obtaining water from a standpipe in Khayelitsha (an informal settlement). This activity taught the students the hardships faced daily by people in informal settlements as well as how they cope. They were then transported to Ratanga Junction where they watched a play, performed by the Jungle Theatre, that dealt with the importance of conserving and preserving local water supplies.

Next, the students conducted two of the four experiments for the IYC Global Experiment under the expert supervision of Erica Steenberg from RADMASTE Centre, University of Witwatersrand, and three volunteers. The participating pupils enthusiastically found the pH of a sample of water from Intaka Island (a wetland in Cape Town) and then filtered and



purified the water. This was the first chemistry experiment that most of the pupils had ever carried out and their excitement at completing the exercise and obtaining the results was delightful to witness. Their total engagement in the experiment was evident in the many questions that they asked.

The Department of Science and Technology in South Africa generously donated IYC Global Experiment kits to the schools that attended the Big Splash. In a brief opening ceremony on 22 March 2011, presided over by UNESCO, the Deputy Minister of Science and Technology, Derek Hanekom, presented the schools with their kits for the IYC Global Experiment. Sasol also sponsored the event and provided the students with caps.

A short film of the activities has been posted on YouTube <www.youtube.com/watch?v=r4gS9bep8Tc>.

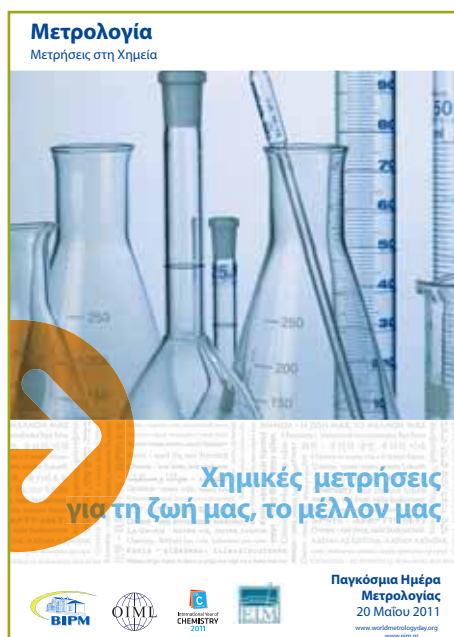
Rovani Sigamoney <r.sigamoney@unesco.org> is the IYC Focal Point at UNESCO.

 <http://water.chemistry2011.org>
www.chemistry2011.org/about-iyg/news/make-a-big-splash

On 20 May, Celebrate World Metrology Day

World Metrology Day celebrates the signature by representatives of seventeen nations of the Metre Convention on 20 May 1875. The convention set the framework for global collaboration in the science of measurement and in its industrial, commercial, and societal application. The original aim of the Metre Convention—the worldwide uniformity of measurement—remains as important today, in 2011, as it was in 1875.

Both the International Organization of Legal Metrology and the International Bureau of Weights and Measures are deeply involved in the improvement of chemical measurements. For this reason, the two international metrology organizations have decided to join IYC2011 and have chemical measurements as the theme for this year's World Metrology Day.



Special posters have been designed, and events will take place all over the world. Judging from the success of previous years, it is expected that the 2011 World Metrology Day will again attract thousands of visitors to the website and a vast number of international celebrations across the planet. Visit the website and learn why metrology, the science of measurement, goes hand in hand with chemistry in 2011.

 www.worldmetrologyday.org

Election of IUPAC Officers and Bureau Members—Call for Nominations

At its assembly in San Juan, Puerto Rico, 3–4 August 2011, the IUPAC Council will be asked to elect a vice president, a secretary general, and members of the Bureau to fill the vacancies created by retiring members. IUPAC National Adhering Organizations are invited to submit nominations no later than **3 June 2011**.

On 1 January 2012 Kazuyuki Tatsumi (Japan), vice president and president-elect of IUPAC, will become president. Nicole Moreau (France), current president, will become past president and remain an officer and a member of the Bureau for a period of two years, while Jung-Il Jin (Korea), current past president, will retire. Secretary General David StC. Black (Australia) will also retire after completing a second and final four-year term. Treasurer John Corish (Ireland), who was elected for a four-year term 2007–2011, will become eligible for a second four-year term commencing in 2012.

In addition, this year there are four vacancies for Elected Members of the Bureau. Members are elected to a four-year term and are eligible for reelection to a second four-year term. No National Adhering Organization shall have more than one Elected Member on the Bureau, and the principle of fair geographical representation of Members shall be taken into account, as stipulated in IUPAC Statutes.

Elected Members whose terms expire at the end of 2011:

- Anders Kallner (Sweden) (2004–2007, 2008–2011)
- Werner Klein (Germany) (2004–2007, 2008–2011)
- Ram Lamba (Puerto Rico) (2008–2011), eligible for nomination
- Natalia Tarasova (Russia) (2008–2011), eligible for nomination

Elected Members whose terms continue to the end of 2013:

- Colin Humphris (UK) (2010–2013)
- Stanislaw Penczek (Poland) (2006–2009, 2010–2013)
- Elsa Reichmanis (USA) (2006–2009, 2010–2013)
- Maria Van Dam-Mieras (Netherlands) (2006–2009, 2010–2013)
- Itamar Willner (Israel) (2010–2013)
- Qi-Feng Zhou (China) (2010–2013)

IUPAC Wire

In addition to the 5 officers and the 10 Elected Members, the Bureau also includes the eight Division Presidents (each elected by each individual Division), and three ex officio members representing the Operational Standing Committees (i.e., the Committee on Chemistry Education, on Chemistry and Industry, and CHEMRAWN, the CHEMical Research Applied to World Needs Committee).

IUPAC National Adhering Organizations are invited to submit nominations to the Secretary General at <secretariat@iupac.org> **no later than 3 June 2011**.

To maintain a vibrant organization it is important that all vacant positions be filled after a fair and vigorous election process, so all nominations are encouraged. To make your voice heard, contact your National Adhering Organization and get involved.

Medicinal Chemistry and Drug Development Meeting

The report and minutes from the IUPAC Subcommittee on Medicinal Chemistry and Drug Development meeting held in Brussels from 3–4 September 2010 are available on the subcommittee webpage (address below).



Robin Ganellin (left) presents the Division Emeritus Fellowship to Professor Camille-Georges Wermuth in recognition of his many outstanding contributions to the Medicinal Chemistry Section.

The meeting was held during the European Federation for Medicinal Chemistry meeting, during which Professor Gosh delivered his 2010 Richter Prize lecture. In celebration of the International Year of Chemistry, the subcommittee has invited former

winners of the prize to share their experiences in a video interview. The first installment, featuring Ghosh, is accessible at <www.chemistry2011.org/participate/activities/show?id=840>.

 www.iupac.org/web/ins/703

Third *Polymer International*–IUPAC Award 2012—Call for Nominations

The Executive Editorial Board of *Polymer International* and the IUPAC Polymer Division are pleased to announce the third award for creativity in applied polymer science or polymer technology. This award celebrates the achievements of young researchers in the polymer community.

The 2012 Award will be presented at the IUPAC World Polymer Congress—MACRO 2012, 24–29 June 2012, Blacksburg, VA, USA. The winner will be awarded USD 5000 plus travel and hotel accommodation expenses to attend MACRO 2012, where he/she will present a keynote lecture.

The winner will be selected by the Scientific Committee representing *Polymer International* and the IUPAC Polymer Division after 30 November 2011.

Nominations should be sent by e-mail to *Polymer International* at polyint@wiley.com before 31 October 2011. Nominees must be less than 40 years old on 31 December 2012 and must be available to present a keynote lecture at MACRO 2012.

Include the following information with your nomination:

1. Your name and address
2. Full name and date of birth of nominee
3. Business address of nominee
4. Nominee's academic background and education
5. Nominee's employment history (position, organization, duties, dates)
6. Nominee's publications, patents, unpublished reports, papers presented at meetings
7. Nominee's honors and awards
8. Scientific achievements for which the candidate is nominated for this award

Self-nominations will not be accepted.

 www.interscience.wiley.com/polymerinternational and click on "News."



The Third Polymer International – IUPAC Award for Creativity in Applied Polymer Science or Polymer Technology



Call for Nominations!



Recognize the achievements
of your colleagues by nominating
them for this award.

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The award will be presented at the **IUPAC World Polymer Congress – MACRO 2012**, 24-29 June 2012 in Blacksburg, VA, USA. The winner will be awarded **US\$ 5,000** plus travel and hotel accommodation expenses to attend MACRO 2012, where he/she will present a keynote lecture.

The winner will be selected by the Scientific Committee, representing Polymer International and the IUPAC Polymer Division after 30th November 2011.

Join our previous PI-IUPAC Award Winners:



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Winner 2008



Professor Molly Stevens
Winner 2010

Nominees must be aged under 40 years on 31st December 2012, and must be available to present a keynote lecture at MACRO 2012.

Please include a current resumé for the nominee including the following information in your nomination:

- ▶ Your name and address
- ▶ Full name and date of birth of nominee
- ▶ Business address of nominee
- ▶ Nominee's academic background and education
- ▶ Nominee's employment history (position, organization, duties, dates)
- ▶ Nominee's publications, patents, unpublished reports, papers presented at meetings
- ▶ Nominee's honors and awards
- ▶ Scientific achievements for which the candidate is nominated for this award
- ▶ Self nominations will not be accepted

Please send your nominations by email to Polymer International: polyint@wiley.com before 31st October 2011.



For further details please go to:
wileyonlinelibrary.com/journal/pi
clicking on 'News'

Harmonized Protocol for the Proficiency Testing of Sampling of Environmental Matrices

If the measurement result is used to assess the properties and the characteristics of a wider batch of material, or a contaminated soil area, from which the samples analyzed are collected and prepared, the measurement process will include sampling, any sample preparation steps, and the analysis. When sampling is part of the measurement process, it should also be part of a general scheme of quality assurance (QA) within a laboratory. To this end, the external quality-control activities, commonly pursued by carrying out PTs, should be aimed also to give an external and independent assessment of the samplers' (operators') performances.

The IUPAC International Harmonized Protocol for the Proficiency Testing of Analytical Laboratories (M. Thompson et al., *Pure Appl. Chem.*, vol. 78, no. 1, pp. 145–196, 2006), updating a previous version of the protocol, is strictly focused on the analytical part of a chemical measurement process. This protocol, as well as other international references establishing guidance on this issue for wider fields of application, does not consider the sampling phase anyway.

Recent experiences on intercomparison exercise and collaborative trials on soil sampling suggest the need for a better definition of harmonized protocol for carrying out such activities. Scopes, fields of application, terminology, scheme, structure, organization, logistic aspects, and the fundamental tools for performing this kind of exercise should be discussed in the project and defined by the envisaged protocol.

Equivalence and/or analogies between reference materials (routinely distributed among the laboratories within chemical PTs schemes) and references used for sampling (soil reference sampling, reference sampling target, etc.) have even been debated in the past years. Moreover, these aspects also involve the requirements of such references to be properly used in sampling PTs.

Starting from the experience on soil sampling intercomparison exercise, the project will

1. generate general guidance for carrying out proficiency testing on sampling, and for integrating the protocols already published on proficiency testing for chemical analyses
2. include a simple example of application (where possible)

The protocol should indicate and tackle, for example, the following items:

- scope and field of application
- terminology to be used
- critical issues in the organization and design of PT on sampling
- requirements requested for the reference (assigned) values
- methods to be applied for performance assessment
- consideration of the interpretation of the results of the PT and the quality of the information obtained

The protocol will help the worldwide harmonization of comprehensive QA schemes, including proficiency testing on environmental sampling for specified matrices.

For more information, contact Task Group Chair Paolo de Zorzi <paolo.dezorzi@isprambiente.it>.

 www.iupac.org/web/ins/2009-010-3-500

Chlorine-Free Syntheses for Green Chemistry (PAC special topic issue)

Because of their peculiar characteristics, halogens are widely used by all sectors of the chemical industry to produce solvents, catalysts, building blocks, additives, and drugs. In addition, halogens are contained in several commodities that we all use daily (e.g., chlorine is contained in PVC, one of the most widely used plastic materials). More than 20 million tonnes of chlorine and coproducts caustic soda and hydrogen are produced each year at about 80 plants across Europe, mostly (about 95 percent) via electrolysis-based techniques (chlor-alkali industry); the sector directly employs about 40 000 people in 20 countries (data: www.eurochlor.org).

Since the Industrial Revolution, the halogen chlorine has been “an iconic molecule” for industrial chemical production. Even though its production by the electrolysis of sodium chloride is really energy intensive, it still is used, since it allows the manufacture of chlorinated derivatives in a very easy way, because of its high energy and reactivity; for example, AlCl_3 , SnCl_4 , TiCl_4 , SiCl_4 , ZnCl_2 , PCl_3 , PCl_5 , POCl_3 , COCl_2 , etc.

Thus, chlorinated derivatives have many applications. Examples of their use include plastics, solvents for dry cleaning and metal degreasing, textiles, agrochemicals and pharmaceuticals, insecticides, dyestuffs, household cleaning products, and disinfectants. Chlorine is used extensively in organic and inorganic chemistry as an oxidizing agent and as a leaving group in substitution and elimination reactions. In addition, chlorine compounds find use as intermediates in the production of a number of important commercial products that do not contain chlorine. Examples include polycarbonates, polyurethanes, silicones, polytetrafluoroethylene, carboxymethyl cellulose, and propylene oxide. Through a chain of chemical derivatives and relatively easily made compounds and intermediates, such molecules have utilized the intrinsic energy available through the use of chlorine primarily produced via electrolysis.

The substitution of compounds where "chlorine is used in the making" means that we will avoid such a primary energetic source; this, however, makes chemistry "without chlorine" considerably more difficult and illustrates why it has not been adopted before. The

environmental constraints and the growing need for efficient energy usage force us to take advantage of available high technologies to develop a new chemical strategy. Because of the negative impacts of chlorine and other halogens on global environment and health (e.g., toxicity and ecotoxicity, ozone layer depletion, energy consumption, and climate change, etc.), significant contributions to alternative solutions may be provided by research devoted to the systematic substitution of halogens (whenever feasible), which adopt a holistic and proactive approach. The substitution of halogens requires a look at the whole picture, rather than approaching the problem through one elemental aspect of halogen usage at a time.

This special issue of the IUPAC journal *Pure and Applied Chemistry (PAC)* intends to contribute to these aims, and deals with the following topics: chlorine-free reagents, chlorine-free catalysts, phosgene replacement, chlorine-free solvents, thionyl chloride substitution, and metrics for chlorine-free reactions.



www.iupac.org/web/ins/2008-016-1-300

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.

Definitions of Terms Relating to Crystalline Polymers

The recommendations in this document concern the terminology relating to the structure of crystalline polymers and the processes of polymer crystallization. This document is a revision and expansion of IUPAC recommendations with the same title, published in 1989, *Pure Appl. Chem.*, vol. 61, no. 4, pp. 769-785.

Comments by 31 May 2011

Professor G. Allegra
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 http://media.iupac.org/reports/provisional/abstract11/allegra_31052011.html

Terminology for Biorelated Polymers and Applications

The aim of the following recommendation is to provide a standard terminology that can be used across all fields of science involved with biorelated polymers, namely medicine, surgery, pharmacology, agriculture, packaging, biotechnology, and polymer waste management.

Comments by 31 May 2011

Prof. Michel Vert
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E-mail: vertm@univ-montpl1.fr



http://media.iupac.org/reports/provisional/abstract11/vert_31052011.html

Traditional Plants as Source of Functional Foods: A Review

G. Riveraab, V. Bocanegra-Garcaab, A. Mongec
CyTA—Journal of Food, Volume 8, Issue 2
August 2010, pages 159-167

Plants as sources for nutraceuticals in Latin America is an important objective in the development of societies of Latin America. Culture and tradition offer magnificent examples of the use of plants by these societies in the interest of world health. The history of the Aztecs, Mayas and Incas, among others, of great importance in the region, confirm this proposal. Over time, the search for medicinal agents with plant origin has been initiated and the history is rich in results of great interest using this approach. As a result of the development of societies, a new approach of great interest for both health and the economy that is in the interest of all, and especially in that of the region, now appears on the scene. We are referring to the nutraceuticals and functional foods. The developed societies are seeing the food complements, in the interest of health, as an important approach. On the one hand, the additives to these foods are being taken into consideration and on the other hand, the foods themselves are being considered for their benefits for health. It is in this last approach where the contribution of these Latin American societies, in the interest of all, is especially important. The use of plants with benefits for conserving health and recuperating from disease is identified in their own traditions. In this project the problem in the Latin American societies has been put forth, and specific studies have been developed in different areas of the region.

It is important to point out that, in general terms, the possibility of commercializing plants or their extracts or other formulations is much more accessible to the development of the region than the identification of the individual active molecule in each plant. Naturally, the importance of finding these active ingredients can not be excluded but the possibility of using the properties of these plants of American tradition in the form of functional foods has been studied. This work completes project <www.iupac.org/web/ins/2005-031-2-700>.

 <http://dx.doi.org/10.1080/19476330903322978>

Glossary of Terms Used in Biomolecular Screening (IUPAC Recommendations 2011)

John Proudfoot, et al.
Pure and Applied Chemistry
ASAP article published online 2011-02-07

Biomolecular screening is now a crucial component of the drug discovery process, and this glossary will be of use to practitioners in the field of screening and to those who interact with the screening community. The glossary contains definitions related to various aspects of the screening process such as assay types, data handling, and relevant technologies. Many of the terms used in this discipline are not covered by existing glossaries, and where they are, the definitions are often not appropriate for this field. Where appropriate, this document provides new or modified definitions to better reflect the new context. The field of biomolecular screening is multidisciplinary in nature, and this glossary, containing authoritative definitions, will be useful not only for regular practitioners, but also for those who make use of data generated during the screening process.

 <http://dx.doi.org/10.1351/PAC-REC-09-05-03>

State Diagrams for Improving Processing and Storage of Foods, Biological Materials, and Pharmaceuticals (IUPAC Technical Report)

Maria Pilar Buera, et al.
Pure and Applied Chemistry
ASAP article published online 2011-03-07

Supplemented temperature/composition phase diagrams include the non-equilibrium glass-transition temperature (T_g) curve and equilibrium ice-melting and solubility curves. The inclusion of the non-equilibrium curve allows one to establish relationships with the time coordinate and, thus, with the dynamic behavior of systems, provided that the thermal history of such systems is known. The objective of this report is to contribute to the potential applications of supplemented state diagrams for aqueous glass-formers, in order to describe the influence of water content,

nature of vitrifying agents, and temperature on the physico-chemical properties of foods and biological and pharmaceutical products. These data are helpful to develop formulations, processing strategies, or storage procedures in order to optimize the stability of food ingredients and pharmaceutical formulations. Reported experimental data on phase and state transitions for several food and pharmaceutical systems were analyzed. Some methodological aspects and the effect of phase and state transitions on the main potential chemical reactions that can alter those systems during processing and/or storage are discussed.

 <http://dx.doi.org/10.1351/PAC-REP-10-07-02>

Glossary of Terms Used in Photocatalysis and Radiation Catalysis (IUPAC Recommendations 2011)

Silvia E. Braslavsky, et al.

Pure and Applied Chemistry

ASAP article published online 2011-03-14

This glossary of terms covers phenomena considered under the very wide terms photocatalysis and radiation catalysis. A clear distinction is made between phenomena related to either photochemistry and photocatalysis or radiation chemistry and radiation catalysis. The term "radiation" is used here as embracing electromagnetic radiation of all wavelengths, but in general excluding fast-moving particles. Consistent definitions are given of terms in the areas mentioned above, as well as definitions of the most important parameters used for the quantitative description of the phenomena. Terms related to the up-scaling of photocatalytic processes for industrial applications have been included. This Glossary should be used together with the *Glossary of Terms Used in Photochemistry, 3rd edition*, IUPAC Recommendations 2006: (doi:10.1351/pac200779030293) as well as with the *IUPAC Compendium of Chemical Terminology, 2nd ed.* (the "Gold Book", 2006- doi:10.1351/gold-book) because many terms used in photocatalysis are defined in these documents.

 <http://dx.doi.org/10.1351/PAC-REC-09-09-36>

Mechanisms of Chemical Generation of Volatile Hydrides for Trace Element Determination (IUPAC Technical Report)

Alessandro D'Ulivo, et al.

Pure and Applied Chemistry

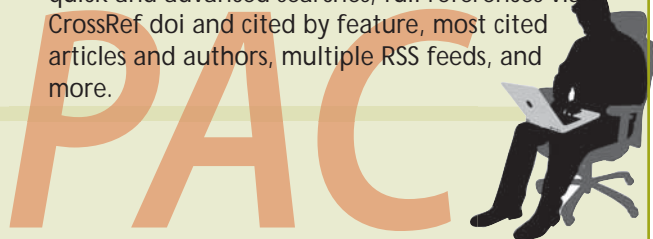
ASAP article published online 2011-03-16

Aqueous-phase chemical generation of volatile hydrides (CHG) by derivatization with borane complexes is one of the most powerful and widely employed methods for determination and speciation analysis of trace and ultratrace elements (viz. Ge, Sn, Pb, As, Sb, Bi, Se, Te, Hg, Cd, and, more recently, several transition and noble metals) when coupled with atomic and mass spectrometric detection techniques. Analytical CHG is still dominated by erroneous concepts, which have been disseminated and consolidated within the analytical scientific community over the course of many years. The overall approach to CHG has thus remained completely empirical, which hinders possibilities for further development. This report is focused on the rationalization and clarification of fundamental aspects related to CHG: (i) mechanism of hydrolysis of borane complexes; (ii) mechanism of hydrogen transfer from the borane complex to the analytical substrate; (iii) mechanisms through which the different chemical reaction conditions control the CHG process; and (iv) mechanism of action of chemical additives and foreign species. Enhanced comprehension of these different mechanisms and their mutual influence can be achieved in light of the present state of knowledge. This provides the tools to explain the reactivity of a CHG system and contributes to the clarification of several controversial aspects and the elimination of erroneous concepts in CHG.

 <http://dx.doi.org/10.1351/PAC-REP-09-10-03>

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Bookworm

Waste: A Handbook of Waste Management

Trevor Letcher and Daniel Vallero (editors)

Elsevier, 2011

ISBN 978-0-12381-475-3

Waste: A Handbook of Waste Management looks at all the types of waste being generated in the world and includes chapters on waste generated in space and medical, urban, industrial, electronic, mine, radioactive, textile, paper, glass, battery, tire, metal paper, and agricultural waste. Other chapters focus on landfills, waste collection, waste regulations, risk assessment and accountability, green engineering of waste, air and marine pollution, and dangerous household chemicals. Chemistry is an important theme throughout the book, as most of the waste created in our society has a major chemical component.

Waste is not new; it has been a problem for thousands of years. However, with the industrial and petrochemical revolutions, rapid growth in the world's population, and greater consumerism, waste concerns have grown exponentially. Generally, engineers and scientists have done much to address previous problems long considered intractable (e.g., open dumps, lack of substitutes for dangerous products, and pesticides). Their work has encouraged a well-deserved dose of technological optimism, although the amount and hazardous nature of wastes continue to threaten society.

The waste threat impinges on our public health and the integrity of ecosystems, it can compromise our aesthetic sensibilities, and it can be economically crippling. This crucial issue, often ignored in technical handbooks, is discussed in this book.

This book is designed to be a resource for the designer, practitioner, researcher, teacher, and student. Like other handbooks, this text seeks to include best practices and proper management of waste before, during, and after it is generated. Key to the usefulness of this handbook is its attention to the scientific challenge of how to achieve sustainable solutions to one of the most important of society's problems: the management and elimination of waste in all its various forms, sectors, and waste streams. Obviously, no single resource is sufficiently comprehensive on its own in dealing with waste, so each of the chapters is richly annotated with additional references.

The main objectives in presenting all the issues related to waste in one volume are the following:

- to create a source book for easy consultation and for direction in further studies
- to provide a resource for helpful comparisons between different waste streams, leading to synergistic solutions
- above all, to help develop a better and more informed society

This handbook will be of particular interest to

- students and lecturers in science, engineering, and environmental studies
- researchers, who need the latest references
- parliamentarians and leaders in society, who need to be aware of the serious problems created by waste
- editors and journalists, who need to know the latest issues regarding waste
- captains of industry, technicians, and maintenance personnel, who need to be aware of the problems in their fields and related areas
- all interested parties, even more casual readers, whose awareness of the enormity of the problems surrounding waste will be enhanced

Perhaps the central value of this book, and how it differs from other books on similar themes, is its pragmatic perspective. Each chapter is written by an expert scientist or engineer working in the specific field and addresses a particular waste challenge. The book highlights the severity of each of the problems identified and offers the best solutions and recycling processes. In fact, one of the key values of this book is what it cannot say—that is, the chapter authors are upfront about uncertainties, and about areas in which advances and future research are needed.

The book is divided into three parts:

- Part 1, Introduction to Waste Management, which includes chapters on the history of waste management, green engineering and sustainable design as related to waste management, waste regulations, and waste collection
- Part 2, Waste Streams, which is a collection of 25 chapters on the most important waste streams in our society
- Part 3, Best Practice and Management, which contains chapters on landfills, pollution management and responsible care, and risk management and accountability of waste



www.iupac.org/web/ins/2008-039-2-600

Chemistry: Human Activity, Chemical Reactivity

Peter Mahaffy, Roy Tasker, Bob Bucat, John C. Kotz, Gabriela C. Weaver, Paul M. Treichel, John E. McMurry

Nelson Education Ltd., 2010

ISBN-13: 978-0-17660-625-1

ISBN-10: 0176606254

reviewed by Tina L. Overton

There are many general chemistry textbooks on the market and they all almost inevitably cover similar content. Academic staff choose these books for their undergraduate students based on many criteria; level, detailed content, layout, design, chapter order, habit, etc. *Chemistry: Human Activity, Chemical Reactivity* may give academics additional criteria to consider. The book is authored by a well-known team of chemical educators who have a particular passion for representing chemistry visually, using electronic resources to enhance conceptual understanding, and for making explicit the importance of chemistry in the world today. Thus, when choosing your general chemistry text for next semester, ask yourself whether it is important to you that your students leave your course with an understanding of the centrality of chemistry, with an appreciation of its impact on all aspects of life on Earth. Ask yourself whether you want your students to have access to a varied range of high quality e-resources to supplement your own interaction with them. If either of these criteria is important to you then I recommend that you spend some time studying what *Chemistry: Human Activity, Chemical Reactivity* has to offer.

It is the “human activity” in the title that is central to the philosophy of this book. Many textbooks describe the applications of chemistry in everyday life, and this book does that too. But the contexts are not add-ons or afterthoughts; rather, they act as the driver for the text. Each chapter commences with a substantial case study. These case studies draw from the natural world issues of green chemistry and sustainability in most

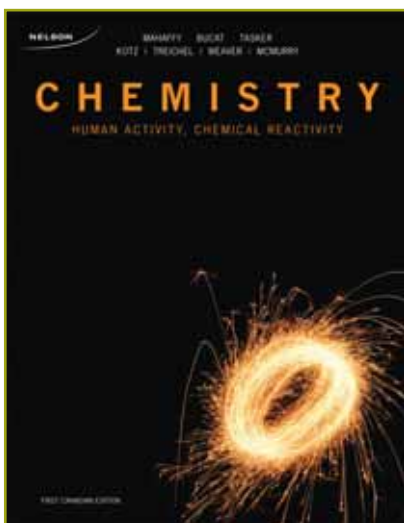
chapters. For example, the chapter on carbon compounds starts with a case study of methane clathrates, and that on chemical reactions and energy, with a case study of hydrogen as a fuel. The more obviously organic chapters use contexts from pharmaceuticals or biological chemistry, with case studies on curing and death and dying in the aromatics compounds chapter, and a case study on the discovery of penicillin in the carbonyl compound chapter. These case studies are fascinating and a useful resource in themselves, and I looked forward to each one. It is perhaps a little unfortunate that the first two are about drug abuse, and that some potential adopters may be prudish enough to be put off by that. But in each case the topics are discussed in their scientific context, and in a way that helps us to appreciate (in these cases) the power of analytical techniques.

The case studies are not the only place that the essential importance of chemistry is discussed. Real-life context is embedded within the text, often

in a way that encourages students to think about how we know what we know, and that demonstrates the scientific method effectively. Context in this book is not assigned to “boxes” or sections but is an integrated part of the whole. Big issues are tackled here: climate change, alternative energy sources, feeding the world. It is right and proper that chemistry be presented in these important contexts—especially, I suspect, for many general chemistry students for whom this will be their last encounter with formal education in the subject.

The authors have been very careful about explaining to students the multiple ways in which chemical information can be presented at the symbolic, observational, and molecular levels. All too often tutors move between these levels without properly explaining to students what the ground rules are, why there are different conventions, and why they matter. This problem has been faced head-on in this book and should result in students having increased confidence in using the book and tackling chemistry.

A major failing of many general chemistry books is a dire lack of organic chemistry. Organic chemistry is introduced here in chapter 4, and is then comprehen-



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sively dealt with in seven further chapters. Organic compounds are treated in the same way as inorganic compounds throughout the text, so that students will be just as familiar with carbon chemistry as they are with the rest of the periodic table. So, for example, discussion of Lewis acidity or shapes of molecules is just as likely to use organic species as inorganic ones. The integrated approach extends to the other major branches of chemistry too, so that it is difficult to identify chapters as predominantly inorganic or physical, and the power of analytical chemistry as a tool in answering “How do we know?” is also demonstrated throughout.

Compared with the comprehensive treatment of carbon compounds, the rest of the periodic table is dealt with in just two dedicated chapters, one on main group chemistry and one on transition metal chemistry. This might seem a little stingy but probably reflects the current importance of organic chemistry. And inorganic chemistry looms large in the chapters on, for example, structure and bonding, equilibrium, solubility, and energy. The chapter on main group chemistry focuses on charge density and polarization as underlying concepts that are used to describe trends in the properties. The chemistry is described in terms of underlying trends before presenting essential and distinguishing features of each group. The chapter on transition metal chemistry takes a structure-and-bonding approach rather than a descriptive one and deals very effectively with complexes, crystal field theory, and magnetism as well as metallic chemistry. The final chapters in the book take this text where other general texts don't currently go and that is to the frontiers of contemporary research topics. So the book is very nicely rounded off with chapters on materials, biomolecules, and nuclear chemistry.

There are worked examples and in-chapter questions throughout the book, and extensive end-of-chapter exercises. I particularly liked the end-of-chapter summary and conceptual questions. These move away from closed questioning to more open-ended questions that test synoptic and conceptual understanding.

As might be expected from these authors, the book is beautifully illustrated with photographs, molecular structures, and stills from animated molecular simulations. I am sure that these will do much to aid students' understanding.

This is a book for which the e-resources are marketed as strongly as the text itself, and it will be interesting to see how this new approach to publishing might progress. The online resources are available when you have registered and received a password.

The textbook suggests that students pay for four semesters' access to these resources.

The e-book is searchable, which will be a great advantage for users. It is also possible to highlight the text and bookmark pages, which makes it easy to return to for key sections. Embedded additional resources include “think about it” tutorials that link to an in-depth tutorial on a specific topic—for example, use of isotopic ratio mass spectrometry in identifying the origins of methane linking to four case studies. These tutorials use animations, video, and questioning to explore students' understanding. These are a useful additional resource, but unfortunately not all of the simulations ran on my PC. The chapters also have links to interactive exercises that give students practice in calculations and answering questions. Some of these use videos of chemical reactions, animations, and multiple-choice questions. The “taking it further” links take the reader to what look like additional textbook pages that extend the material covered in the main text. These additional resources also have links to “think about it,” interactive exercises and molecular modeling activities.

There are also links to molecular simulations that utilize the Odyssey software. The book also provides access to the Odyssey software itself, which presents tutorials and demonstrations for each chapter. In addition, the “applied chemistry” resources give interactive molecular models for many molecules organized by application—for example, sanitation, pharmaceuticals, materials, and polymers. There is also an extensive “molecular stockroom” resource that gives interactive molecular models for hundreds of molecules, organized by molecule type, group, or functional group. The molecular modeling kit enables students to build their own interactive models. The Odyssey resources are potentially the biggest draw of all the e-resources, and I imagine that students will find them enlightening, entertaining, and useful.

The embedding of these additional online resources in an e-book certainly greatly enhances the textbook. They add an additional dimension that should support students who need extra help and stretch those who want to take their studies further.

The website also offers a range of additional instructor's downloads. These include a solutions manual for all of the exercises and problems in the book. There is a test bank of objective questions covering each chapter. This is a rich resource, as each chapter is served by about 35 questions, all categorized by intellectual level—for example, memorization or higher order. Some chapters also contain some

Bookworm

essay-style questions that instructors may find useful in setting assignments. Also available is an instructor's guide. This resource summarizes each chapter and gives suggested "lesson plans" with ideas for in-class activities and discussions. These could be used alongside the PowerPoint files for each chapter, which provide a lecture related to the chapter. I am not a fan of PowerPoint in teaching, but these are as good as it gets—not too many and full of visual images. These two resources taken together could be very useful for new instructors or anyone who wants to tie their teaching very closely to each chapter. The third in-class resource is a set of Turningpoint files that provide PowerPoint slides of multiple-choice questions designed to be used directly with in-class voting systems or clickers. Taken together, these resources provide a comprehensive pack of material to support instructors.

An image bank of all the images from the book is also available. There are also links to additional resources for students, but these were all unavailable at the time I tried to access them.

Overall, this is a great general chemistry text. The student experience is enriched significantly by the embedded activities in the e-book. The additional downloads for instructors will make their job easier and enable them to enhance their students' learning. The book succeeds in conveying the importance of chemistry in the natural and human environments and should make the subject accessible and captivating to students.

Tina Overton is a professor at the University of Hull, UK.

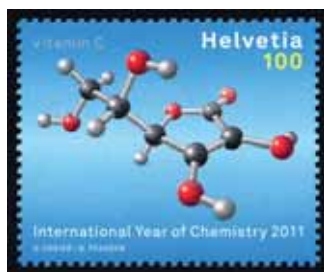
 www.chemistry.nelson.com/mahaffycommunity/default.html



Stamps International

Vitamin C and the Age of Discovery

Among the stamps celebrating the International Year of Chemistry, the one issued in Switzerland on 3 March 2011 features the molecular structure of L ascorbic acid (vitamin C). This simple molecule has played a fascinating role in history, particularly since the relationship between the consumption of citrus fruits and fresh vegetables rich in vitamin C and the prevention of scurvy was realized around the mid 18th century. In this regard, Jay Burreson and Penny Le Couteur argue in their provocative book *Napoleon's Buttons* that vitamin C may well be responsible for extending the trade routes to the Americas and the Far East during the 17th and 18th centuries. The exploration of the world, fueled by the Europeans' relentless appetite for spices and precious metals, certainly accelerated when more balanced diets and healthier ship crews enabled longer maritime voyages. Nowadays, vitamin C is a common dietary supplement even though its ability to prevent or cure diseases, ranging from the common cold to cancer, has not been unequivocally demonstrated.



The stamp illustrated in this note also pays tribute to Tadeus Reichstein (1897-1996), the Polish-Swiss chemist who developed in 1933 a practical semisynthetic method for the industrial production of vitamin C while working at the Federal Institute of technology in Zurich. The Reichstein process, still widely used today, involves the hydrogenation of naturally occurring D glucose and the bacterial fermentation of the resulting D sorbitol intermediate to L sorbose in its initial steps. Interestingly, it was not Reichstein but the British chemist Sir Norman Haworth (1883-1950) who received the 1937 Nobel Prize in Chemistry for his independent (and virtually simultaneous) synthesis and structural elucidation of vitamin C and his extensive work on carbohydrates. However, it is also worth noting that Reichstein's methodical discovery and isolation of several hormones of the adrenal cortex, including cortisone and aldosterone, were eventually rewarded with the Nobel Prize in Physiology or Medicine in 1950.

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

The Pesticide Properties DataBase

by *Kathy Lewis and Andy Green*

Modeling and decision support systems for pesticide risk assessments are invariably data hungry, and there has been a long and widely recognized need for a single authoritative and comprehensive database of pesticide physicochemical and toxicological properties that is available both as an online resource and in a portable electronic format suitable for embedding in or interrogating from other software applications. The Pesticide Properties DataBase (PPDB) has been developed to address this need. The online system is free of charge and currently contains records for about 1800 active substances and their metabolites. It holds data required for modeling the fate and ecotoxicological risks of pesticides in both terrestrial and aquatic systems, as well as information on chemical identifiers and data relating to regulatory issues and commercial products.

Database Design and Description

The database has been designed to meet two primary objectives. First, it aims to provide a single, comprehensive source of reliable, consistently presented pesticide data having common syntax, units, and semantics. Second, it seeks to ensure that the information is accessible to and usable by as wide a range of end users as possible.

During database development two distinct end-user types were identified: first, users who require large data sets for software applications such as risk assessments, and second, users seeking particular parameters for a specific chemical. To satisfy the needs of both, the approach adopted was to store the data using MS Access 2000 and then stream this through various “data filters” for formatting into HTML pages for online access. It was determined that the MS Access format (or an MS Excel export) would probably meet the needs of most software applications, whereas the online version would be the ideal way to deliver data for most other uses. This approach also helps simplify the updating and maintenance process.

Data stored can be divided into a number of discrete areas:

- general information: e.g., various identifier names, codes and reference numbers, language translations, chemical group, formula, structures, and country registration data
- physicochemical data: e.g., solubility, vapor pressure, density, refractive index, and dissociation constants
- environmental fate: e.g., the octanol-water partition constant, Henry’s law constant, degradation rates in soil, sediments, and water, the Freundlich coefficient, the organic-carbon sorption constant, and information on degradation products
- human health: e.g., WHO toxicity classifications, Acceptable Daily Intakes, toxicity to mammals, other exposure limits and toxicity endpoints, recognized health issues plus the EC risk and safety classifications
- ecotoxicology: e.g., acute and chronic toxicity data for a wide range of fauna and flora plus information on bioaccumulation

In addition to “basic” data, a range of “metadata” is also provided. For example, “layperson” interpretations of the data are presented by applying classification thresholds, such as those used to indicate a need for detailed risk assessment under European Directive 91/414, or “rules of thumb” in general use, such as the guidelines used by the UK pesticide industry for developing Pesticide Environmental Information Sheets.¹ The online system also automatically calculates a number of “coarse” indicators, such as the GUS Index for groundwater leaching potential² and a measure of particle-bound transport that indicates the pesticide’s risk of being transported with runoff.³

A number of support facilities are also available online, including extensive documentation, a comprehensive search facility, an A–Z index, print facilities, and an e-mail help line.

Database Population

Probably the best sources of information currently available for pesticide properties are the monographs produced as part of regulatory processes such as the EU 91/414 review, and data within these types of documents have been the first choice for populating the database. Where regulatory monographs are not available, alternative sources are used, including data provided by regulatory authorities, charities, NGOs,



peer-reviewed journals, research, manufacturers, and online and hard-copy data publications.

As the primary purpose of the PPDB is risk assessment, data have been selected for this particular use. The values quoted for physicochemical and fate properties are usually a mean of the various studies identified. Where data are particularly sensitive, to climate or soil, for example, information on the data range has been added. Where data are just naturally very variable, the most appropriate for EU conditions have been selected. For toxicological data, "worst-case" values have been selected. The data relate to, wherever possible, specific species and endpoints to ensure a harmonized and balanced data set.

Database Quality Assurance

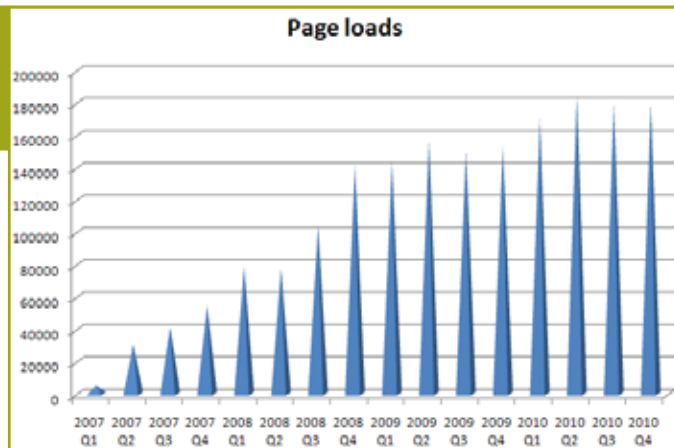
Accuracy of the data always challenges the accuracy and reliability of risk assessment processes, as the results will only ever be as good as the data driving them. Pesticide data are inherently variable, and sources are not always as reliable as would be liked. Consequently the PPDB uses a unique "Quality Barometer"—a code tagged to most parameters that reflects the data source and the extent to which the data are considered reliable and verifiable.

The Quality Barometer consists of two parts. The first is used to identify the type of data source (e.g., regulatory, peer-reviewed publication, manufacturer's data, etc.). The second part is a confidence score in the range 0–5. These scores are awarded based on a set of rules and reflect confidence in the source. For example, a regulatory dossier would usually be awarded a 5, whereas data from a nonstandard and unreferenced source may be awarded a 1 or 0. It should be emphasized that a low score does not necessarily mean poor quality data, just that the data have not been verified.

Accuracy and reliability of the data are not the only data quality issue. Database management is conducted according to strict protocols, and data are reviewed and updated on a continuous and ongoing basis.

Database Access and Usage

The online version was launched on a free-to-all basis in late 2006, and the IUPAC specific portal was released about a year later. Access has been monitored using an embedded web analysis tool, and, as shown in the chart, usage has grown from year to year. Around 42 percent of access is from within Europe, and a further 30 percent from the USA and Canada. The online database has had about 750 000 visitors to date.



PPDB data have been used to support a variety of applications. These include the EU 6th Framework Programme FOOTPRINT project, which developed a suite of pesticide aquatic risk and management tools;⁴ the EU Life project ArtWet, which developed a model to predict pesticide pollution in surface waters following runoff events;⁵ and the development of a pesticide risk indicator for Tasmania.⁶ PPDB data also support the online ASTERisk system,⁷ which is a tool to support the sustainable use of pesticides in the Lombardy region of Italy.

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2. D.I. Gustafson, "Groundwater Ubiquity Score: A Simple Method for Assessing Pesticide Leachability," *Environmental Toxicology and Chemistry* 8 (1989): 339–357.
3. D. Goss and R.D. Wauchope, "The SCR/ARS/CES Pesticides Properties Database: II; Using It with Soils Data in a Screening Procedure," In D.L. Weigmann, ed., *Pesticides in the Next Decade: The Challenge Ahead* (Blacksburg, VA: Virginia Water Resources Research Center, 1990), 471–493.
4. A. Green, K.A. Lewis, and J. Tzilivakis, "FOOTPRINT: Creating Tools for Pesticide Risk Assessment and Management in Europe," AAB Conference: Pollution from Pesticides—Point Source versus Diffuse, Harper Adams University, Newport, 25 November 2008.
5. D. Elsaesser and R. Schulz, "The ArtWET Tool: A Georeferenced Approach Assessing Runoff-Related Pesticide Pollution in Surface Waters across Europe," *Applied Geoinformatics for Society and Environment, 3rd International Summer School and Conference Proceedings* 109 (2010): 69–74.
6. R. Kookana and R. Correll, *The Tasmanian River Catchment Water Quality Initiative Pesticide Impact Rating Index (PIRI), Risk Indicator for Minimising Off-Site Migration of Pesticides*, CSIRO Land and Water Science Report 30/08 (2008).
7. International Centre for Pesticides and Health Risk Prevention (ICPS), The ASTERisk tool. Available at <http://www.icps.it/ixps/AuthFiles/login.asp>.

 <http://pesticides.iupac.org>

Conference Call

Biotechnology

by *Torbjörn Norin*

Under the auspices of IUPAC, the **International Biotechnology Symposium (IBS) and Exhibition** series is a premier international biotechnology event held every two years in different parts of the world. The Division of Organic and Biomolecular Chemistry with its Subcommittee on Biotechnology is responsible for the IUPAC engagement in this event.

The 14th IBS was held 14–18 September 2010 in Rimini, Italy, and was promoted by the Italian and European Technology Platforms of the Life Sciences area, together with EuropaBio, EFB, ISEB, and ESEB. The conference chair, Professor Fabio Fava (Alma Mater Studiorum, University of Bologna), and co-chair, Professor Francesco Nicotra (University of Milano-Bicocca and chair of the IUPAC Subcommittee on Biotechnology), are to be congratulated for a most successful conference.

The symposium was attended by 1600 delegates from 70 different nations. The program included 85 invited lectures, 330 oral communications, and 1 100 poster presentations, and 1 500 abstracts were published in a supplement of *Journal of Biotechnology* (vol. 150, supp. 1, pp. 1–578, November 2010). In addition, 6 hosted international satellite events were on the program.

The extensive scientific program of the 14th IBS provided information on the advances, frontiers, and applications of biotechnology for a healthier, more sustainable future and a knowledge-based international bioeconomy.

The importance of chemistry for the future development of a bio-based technology was clear from the

presentations delivered during the various sessions:

- systems biology for biotechnological innovation
- medical and pharmaceutical biotechnology
- animal biotechnology
- industrial biotechnology
- biotechnology for bioenergy
- food biotechnology
- plant biotechnology
- forest biotechnology
- environmental biotechnology
- contribution of chemistry to the development of a biotechnology-based economy

The session on the contribution of chemistry to biotechnology opened with a lecture by Professor Peter Seeberger (Max Planck Institute of Colloids and Interfaces, Potsdam, Germany), who presented part of his pioneering work on automated polysaccharide synthesis and his work on the development of diagnostics and vaccines. The session also offered a number of interesting presentations that demonstrated the importance of chemistry and chemical methods for the development of novel biotechnology-based processes, products, and applications.

The IBS 2010 Symposium clearly demonstrates the importance of scientific conferences with an interdisciplinary approach and many participants of different scientific and industrial backgrounds. Such conferences are useful complements to the biannual IUPAC congresses. The 15th IBS will be held in Daegu, Korea, 16–20 September 2012 <www.ibs2012.org>.

Torbjörn Norin <tnorin@kth.se> is professor emeritus, organic chemistry, Royal Institute of Technology, Stockholm, Sweden, and former president of the IUPAC Organic and Biomolecular Division.

Australasian Polymer Feast

by *Martina Stenzel*

The Royal Australian Chemical Institute (RACI) **32nd Australasian Polymer Symposium (APS)** was held in Coffs Harbour 13–16 February 2011. Chair of the conference was UNSW's A/Prof. Martina Stenzel from the School of Chemical Engineering. The Australasian Polymer Symposium is a feast of polymer science covering a range of topics, from polymer synthesis, characterization, physics of polymers, and engineering to materials. Topics run the gamut from fundamental polymer science, such as modeling, to applied materi-



als. A considerable number of the presentations at the symposium were dedicated to the interface of polymer science with other disciplines, such as biomaterials, nanomaterials, and surface science. Polymer science has grown as a stand-alone discipline into a mature area touching all areas of science and engineering, and thus, all areas of life, including medicine, energy, and the environment. The growth of polymer science highlights that today's challenges can be tackled only by the combined efforts of scientists and engineers.

The APS grew from a small Australian meeting in the late '50s to a large international meeting, with almost 300 delegates this year. Delegates from all over the world, including all continents, attended the meeting, with almost 40 percent of delegates coming from overseas. The broadly international nature of the meeting was also reflected in the variety of plenary and keynote speakers. Twenty-two plenary and keynote speakers from Europe, the United States, Africa, Asia, and Australia made this meeting a success.

Plenary speakers

- Takuzo Aida, University of Tokyo, Japan: Tailoring Functional Soft Materials through Advanced Molecular Design
- David Castner, University of Washington, USA: Characterization of Biomolecule Structure at Interfaces
- Ric Kaner, University of California, USA: Synthesis and Applications of Conducting Polymer Nanofibers
- Katharina Landfester, Max Planck Institute, Germany: From Stable Miniemulsions to Stimuli-Responsive Nanocapsules
- Christopher Ober, Cornell University, USA: Self-Assembly and Directed Assembly: Tools for Current Challenges in Nanofabrication
- Thomas Russell, University of Massachusetts, USA: Ultradense Dot and Line Patterns over Macroscopic Distances

Keynote speakers

- Kristi Anseth, University of Colorado, USA
- Christopher Bowman, University of Colorado, USA
- Michael Brook, McMaster University, Canada
- Neil Cameron, University of Durham, UK
- Marc Hillmyer, University of Minnesota, USA
- Richard Hoogenboom, Ghent University, Belgium
- Bert Klumperman, Universiteit Stellenbosch, South Africa
- Andrew Lowe, University of NSW, Australia

- Laurence Meagher, CSIRO, Australia
- Kohji Ohno, Institute for Chemical Research, Kyoto University, Japan
- Rachel O'Reilly, University of Warwick, UK
- Vivek Prahbu, Materials Science and Engineering Laboratory, National Institute of Standards and Technology, Gaithersburg, MD
- George Simon, Monash University, Australia
- Geoff Spinks, University of Wollongong, Australia
- Kelly Velonia, University of Crete, Greece
- Yusuf Yagci, Istanbul Technical University, Turkey
- Per Zetterlund, University of NSW, Australia



Some invited keynote speakers pose for a happy shot (left to right): Prof. Richard Hoogenboom (Ghent University, Belgium); Prof. Christopher Ober (Cornell University, US); conference chair Assoc. Prof. Martina Stenzel (UNSW); Dr. Rachel O'Reilly (Warwick University, UK); Prof. Kelly Velonia (University of Crete, Greece).

The strong student contingent at the conference showed that polymer science is truly alive. Postgraduates are the lifeblood of any country's research profile, and the conference benefited greatly from the enthusiasm, skills, and foresight of its student participants. The conference saw a significant percentage of presentations, both poster and oral, given by students. An additional session was dedicated to young, up-and-coming academics to provide them with the opportunity to present their work, and to draw attention to their creative polymer science.

To celebrate the International Year of Chemistry, the concluding session of the conference highlighted the achievements of polymer research and its impact on society. Professor Christopher Ober, president of the IUPAC Polymer Division, addressed the audience and greeted the delegates on behalf of IUPAC. His laudation of polymer science was complemented by

Conference Call

a plenary lecture by Professor Richard Evans (CSIRO, Australia), who shined a light on polymer research in Australia, celebrating Australian plastic money, plastic lenses, contact lenses, and other achievements of polymer research.

The conference concluded with a dinner, which was held in a picturesque setting at the Bonville Golf Course. The presentation of the RACI Polymer Division awards was part of the dinner. The Sangster Polymer Science and Technology Award, which is given to an outstanding polymer scientist under the age of 40, was awarded to Professor Michelle Coote from the Australian National University in Canberra. The 32nd APS was also the occasion of the inaugural presentation of the Bruce Guise Award. Bruce Guise, an outstanding industrial polymer scientist, dedicated his life not only to his research but also to the polymer community in Australia. Huan Toh from Carl Zeiss (former Sola) was the first recipient of this award, for his contribution to the development of plastic lenses. Traditionally, the APS awards the Trelor Prize for the best student oral and poster presentation. John Moraes (Sydney University) and Vien T. Huynh (University of New South Wales) received the Trelor Prize for best oral and best poster presentation, respectively.

Finally, the Australian Polymer Community had a small, surprise award to bestow. Occasionally, an award is given to an eminent international scientist who has supported the Australian Polymer Community over an extended period of time. This award was given to Professor Christopher Bowman from the University of Colorado, who has had various research collaborations with different Australian researchers over many years. He has frequently visited Australia and also attended many Australian Polymer Symposia, often together with his research group.

At the conclusion of the conference, the chair, Martina Stenzel, introduced Sebastien Perrier, who will be the chair of the 33rd Australasian Polymer Symposium <www.33aps.org.au/2012>.

Martina Stenzel <m.stenzel@unsw.edu.au> is an associate professor in the School of Chemical Engineering, the University of New South Wales, Sydney, Australia.

The New SI: Units of Measurement Based on Fundamental Constants

by Ian Mills

On 24 and 25 January 2011 a discussion meeting was held at the Royal Society of London. It was prompted by the upcoming presentation by the International Committee on Weights and Measures (CIPM) of a significant revision to the way in which the International System of Units, or SI, is defined and presented, for discussion and approval by the General Council on Weights and Measures (CGPM) at its meeting in Paris in October 2011.¹ The General Council is the controlling body for the approval of any changes to the SI. The Royal Society meeting was held to bring attention to these plans for revision so that they can be widely discussed before the General Council meets.

The proposed changes to the SI are prompted by the need to adopt a new definition for the kilogram, which has been under discussion for many years. This need arises from our knowledge that the International Prototype of the Kilogram (kept in a safe at the Bureau International des Poids et Mesures at Sèvres), which is the present definition of the kilogram, is slowly changing in mass. The change is on the order of 50 micrograms or more over the last century; the change is not known exactly, although it is two orders of magnitude larger than the uncertainty with which kilogram masses may be compared. We do not even know whether it is getting heavier or lighter, because we have no absolute reference with which to compare it. The change is believed to be due to surface chemistry, wear and tear, and possibly gas leaching out of the platinum-iridium prototype trapped within it when it was cast.

The recommendation from CIPM is to adopt new definitions for four of the base units of the SI, relating them to the fundamental constants of physics. It is proposed that the kilogram, ampere, kelvin, and mole should be referenced to fixed numerical values of the Planck constant h , elementary charge e , Boltzmann constant k , and Avogadro constant N_A , respectively (just as the metre was redefined in 1983, referenced to a fixed numerical value of the speed of light in vacuum). The new definitions would be adjusted to preserve continuity with the previous definitions of

Conference Call



In this Sep.-Oct. 2005 CI cover, master optician Achim Leistner checks on an Avogadro's sphere. Such a perfectly spherical single crystal of silicon is needed for the X-ray crystal density experiment relevant to one of the proposed alternative definitions of the kilogram. (Image courtesy of CSIRO Industrial Physics, Lindfield NSW, Australia.)

the units. It is also proposed that the entire SI be presented in a revised format. This will be the most significant revision to the SI since it was established.

If the General Council approves these plans it is still likely to be several more years before the proposed changes are actually adopted, because new experimental results on the value of the Planck constant to be used in the definition are expected in the near future from watt balance and silicon crystal density experiments currently in progress.

At the Royal Society meeting there were 16 presentations from leaders in the field of metrology, including three Nobel Prize winners, followed by vigorous discussion from the 200 or so participants, who came from many different countries. The presentations covered both the underlying theoretical physics involved as well as recent experimental developments in the watt balance, the X-ray crystal density experiment using a silicon 28 sphere, new measurements of the Boltzmann constant, the use of ultra-cold atoms in precise time measurements, radiometric measure-

ments from space, and units for biological quantities. There were also fascinating discussions of the history of our developing units of measurement.

Of particular interest to chemists was a paper on the Avogadro constant, and the proposal for a new definition of the mole in terms of a fixed numerical value of N_A , which would fix the mole in terms of a fixed specified number of entities. All of the papers and the discussion at the meeting will be published later this year in a special issue of the *Philosophical Transactions of the Royal Society* devoted to a report of the meeting.

References

1. See BIPM 2010, Resolution A for the CGPM, *On the Possible Future Revision of the International System of Units, the SI*. Available on the website of the BIPM <www.bipm.org/utis/common/pdf/24_CGPM_Convocation_Draft_Resolution_A.pdf>. See also <www.bipm.org/cc/CCU/Allowed/20/Watermark_SI_Brochure_Draft_Ch2_29Sep10.pdf>.

Ian Mills <i.m.mills@rdg.ac.uk> is a professor at the School of Chemistry, University of Reading, Reading, UK. He is IUPAC Representative on BIPM-Consultative Committee on Units (BIPM/CCU) and ISO—Technical committee on Quantities and units (TC 12).

Call for Proposals

Any individual or group can submit a project proposal to IUPAC, with or without current affiliation with an IUPAC body. Projects can be submitted at any time. For detailed information, see the Guidelines for Completion of the Project Submission Form. Frequently Asked Questions on Project Submission and Approval Process are also available on the Union's website at www.iupac.org/projects.

The proposal template has recently been rearranged so that it presents "up front" the project's intended impact (purpose), the intended stakeholders and beneficiaries, the dissemination plan, and how the effectiveness of that plan can be evaluated.

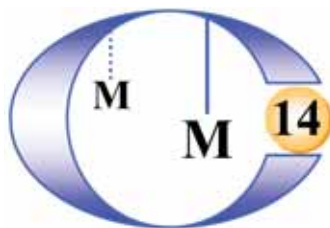
The revised form and guidelines are available at http://media.iupac.org/projects/form_guide.html.

Where 2B & Y

MacroMolecular Complexes

14-17 August 2011
Helsinki, Finland

Following the basic scientific design and tradition of the previous MMC symposia, we announce the **14th IUPAC International Symposium on MacroMolecular Complexes**, MMC-14, which is to take place at the University of Helsinki 14-17 August 2011. The symposium brings together leading scientists and engineers to discuss the latest advances in research on macromolecule-metal complexes, polynuclear complexes, capped metal nanoparticles, organic-inorganic hybrids, supramolecular complexes and self-assembled materials, and polyelectrolytes. Not only syntheses and characterization of those materials but also various properties and functions, such as conductive, photophysical, catalytic, electronic, optical, magnetic, and biological, as well as their application, are included for discussion. A new topic included in the symposium program is coordination programming.



MMC has previously been held in Beijing (1985), Tokyo (1987), New Jersey (1989), Siena (1991), Bremen (1993), Kuang-chou (1995), Leiden (1997), Tokyo (1999), New York (2001), Moscow (2003), Pisa (2005), Fukuoka (2007), and Conception (2009). The next conference, MMC-14, Helsinki (2011), is the first time MMC will be held in a Nordic European country, and is dedicated to the memory of Professor Eishun Tsuchida, the founder of the MMC Symposium series.

The conference will feature plenary and invited lectures and oral and poster presentations. English will be the working language of the conference. All participants should submit

their one-page abstracts electronically to mmc14.finland@gmail.com. The submission of an abstract is requested for confidential examination by the International Advisory Board.

See Mark Your Calendar on page 40 for contact information.

 www.helsinki.fi/polymeerikemia/MMC2011/

Solution Chemistry

28 August-2 September 2011
La Grande Motte, France

You are invited to participate in the **32nd International Conference on Solution Chemistry (ICSC 2011)**, which will be held in La Grande Motte, France, 28 August-2 September 2011 under IUPAC sponsorship.

ICSC 2011 will bring together university, governmental, and industrial researchers whose interests span the broad spectrum of modern solution chemistry. The conference will include theoretical, experimental, and simulation studies as well as practical applications. There will be plenary lectures, along with oral and poster presentations. The official language of the conference will be English.

A varied social program is planned for participants and accompanying persons. The meeting will be held in La Grande Motte, on the French Mediterranean coast. La Grande Motte is accessible by air (Montpellier Airport), by rail (Montpellier station), and of course by road. The conference excursion will include a visit to the Pont du Gard and the Palais des Papes in Avignon (both UNESCO World Heritage sites).

You are invited to indicate your interest in participating in this conference and to submit titles and abstracts for oral contributions or poster presentations at your earliest convenience.

Plenary lectures will be given by the following speakers:

- Werner Kunz (Regensburg, Germany)—Natural ionic liquids and green solution chemistry
- Paul Madden (Oxford, UK)—Modeling ionic liquids
- Toshio Yamaguchi (Fukuoka, Japan)—Structure and dynamics of liquids and solutions in confinement
- Christian Amatore (ENS CNRS, Paris, France)—Electrochemistry, the challenge of the 21st century: from living cells to energy production
- Majed Chergui (EPFL, Lausanne, Switzerland)—Ultrafast studies on chemical and biological systems, UV and X-ray based

See Mark Your Calendar on page 40 for contact information.

 www.icsc2011.fr



Advanced Polymers via Macromolecular Engineering

5-8 September 2011
Cappadocia, Turkey

APME 2011, IUPAC 9th International Conference on Advanced Polymers via Macromolecular Engineering, will be held at the Dedeman Cappadocia Hotel & Convention Center, Cappadocia, Turkey, 5-8 September 2011. Many distinguished scientists have been invited to deliver lectures and short communications. Poster presentation will be an important part of the program.

The symposium will cover the following topics:

1. **Macromolecular Design and Applications:** Radical, Ionic, Living Polymerization, Related Processes, Ring-Opening and Coordination Polymerization, Metallocene and Ziegler-Natta Systems, New Progress of Olefin, Diene and Vinyl Polymerization, Polymer Reactions, All Aspects of Polymer and Monomer Synthesis and Applications, Block and Graft Copolymers, Energy and Light-Induced Processes
2. **Macromolecular Architecture:** New Molecular Architecture, Star Polymers, Hyperbranched

Polymers, Dendrimers, Supramolecular Assembly, Macromolecular Thin Films, Molecular Composites and Assemblies, Inclusion Complexes

3. **Functional Polymers:** Functional and Telechelic Polymers, Electroactive and Photoactive Polymers, Polymers with Specific Functions, Liquid Crystalline Polymers, Polymer Membranes
4. **Bio-Related and Medical Polymers:** Bioactive and Bicompatible Polymers, Polymers for Medical Uses, Polymer Drug Carriers, Natural Polymers, Advanced Implants and Tissue Engineering
5. **Polymer Blends and Composites:**
6. **Structure and Properties of Polymers**
7. **Advances in Polymer Characterization and Modeling of Polymers:** Modern and Analytic Techniques, Spectroscopic, Chromatographic, and Microscopic Methods, Thermal Analysis Methods, X-Ray Techniques, Analysis and Properties via Molecular Modeling, Designed Polymers via Molecular Modeling of Chemical Reactions

See Mark Your Calendar on page 41 for contact information.

 <http://apme2011.itu.edu.tr>

Butlerov's Congress

18-23 September 2011
Kazan, Russia



The **International Congress on Organic Chemistry**, dedicated to the outstanding Russian chemist Alexander Butlerov (Butlerov's Congress), will be held 18-23 September 2011 in Kazan, Russia. Alexander Butlerov is one of the founders of the modern theory of the chemical structure of organic compounds. On 19 September 1861 A. Butlerov delivered his report "On Chemical Structure of Substances" at the Congress of German Physicians and Naturalists in Speier (Germany), in which he developed new concepts of the structure of organic compounds. Butlerov's Congress is devoted to the 150th anniversary of this remarkable event.

Alexander Butlerov was one of the most gifted graduates of Kazan University and later one of its professors. Professor Butlerov gave his first lectures on the theory of chemical structure at Kazan University. For that reason Butlerov's Congress will be held in Kazan. Historians call Kazan "a cradle of Russian

organic chemistry" because Kazan University, founded in 1804, was where many outstanding Russian scientists whose research now comprises the "gold fund" of the world's chemical science worked; these scientists include K.K. Klaus, N.N. Zinin, A.M. Butlerov, V.V. Markovnikov, A.M. Zaitsev, F.M. Flavitsky, E.E. Vagner, S.N. Reformatsky, A.E. Arbuzov, and B.A. Arbuzov.

Butlerov's Congress is planned as a worldwide forum for presentation of major advances in organic chemistry in all fields. We look forward to welcoming some 500 scientists, both distinguished chemists and young scientists, from all regions of the world and hope that many scholars of international repute will present their most recent findings at Butlerov's Congress. We look forward to seeing you in September 2011!

 www.butlerov-iopc.com

Where 2B & Y

Frontier of Medicinal Science

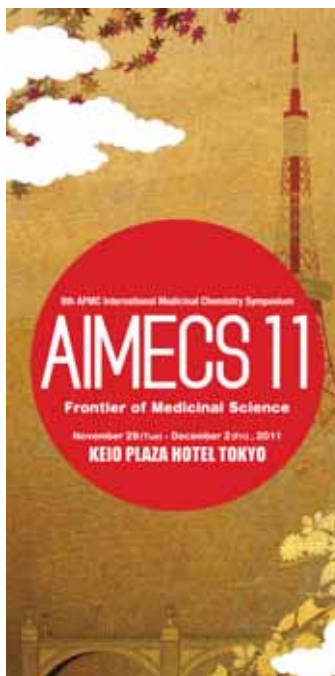
29 November–2 December 2011
Tokyo, Japan

The **8th AFMC International Medicinal Chemistry Symposium** (AIMECS 11), to be held 29 November–2 December 2011 at the Keio Plaza Hotel, Tokyo, will bring together researchers from around the world to share and discuss the most important and critical developmental challenges in medicinal chemistry. The symposium is focused on the subject “Frontier of Medicinal Science,” including drug discovery chemistry, regenerative medicine, innate immunity, frontier methods for drug discovery, and other topics. The scope of medicinal chemistry has undergone noteworthy, scientifically intriguing expansion to the many fields of science. “Drug Discovery and Development” is an extremely important and challenging theme, and its solution will bring tremendous practical benefits to humanity.

A number of distinguished scientists have been invited as plenary speakers. They are Prof. E.J. Corey (Harvard University, USA), Prof. Shinya Yamanaka (Kyoto University, Japan), Prof. Shizuo Akira (Osaka

University, Japan), Prof. K.C. Nicolaou (The Scripps Research Institute and University of California, USA), Prof. Chi-Huey Wong (Academia Sinica, The Scripps Research Institute, Taiwan), and Dr. John C. Lechleiter (Eli Lilly and Company, USA). In addition, invited speakers will introduce their latest research in 21 sessions, including the ACS-Med Chem session (Diabetes/Obesity) and the EFMC Session (Oncology).

AIMECS 11 welcomes all industrial and academic scientists to participate in this international event. The symposium also offers an excellent opportunity for young professionals and students to learn from and interact with professionals in the field. Online registration will be available beginning 1 April 2011. Participants who wish to contribute through presentation of the results of their recent research are also invited to submit an abstract for oral and/or poster presentations. The online abstract submission will be open until 31 May 2011.



See Mark Your Calendar on page 41 for contact information.

 www.aimecs11.org

Eurosoil 2012

2–6 July 2012
Bari, Italy

EUROSOIL 2012, the **4th International Congress of the European Confederation of Soil Science Societies** (ECSSS), will be held in Bari, Italy, 2–6 July 2012. The conference has been organized by the Italian Society of Soil Science (SISS) and will be presided over by Prof. Nicola Senesi of the University of Bari.

The conference will focus on and develop the various aspects of fundamental and applied soil science and technology, field approaches, and social, economic, and political implications in relation to the present and future needs and emergencies of man-

kind and the environment. The conference will consist of symposia, workshops, and other events, including short courses, business meetings, open debates, roundtables, technical specialized meetings and/or demonstrations. It will be structured primarily on bottom-up proposals received from scientists, educators, and decision makers involved in soil science and related disciplines. Any interested person is cordially invited to visit the EUROSOIL 2012 website and is encouraged to submit proposal(s) for convening symposia and/or workshops and/or organizing any other kinds of events through the appropriate form available on the website.

 www.eurosoil2012.eu

Mark Your Calendar

Upcoming IUPAC-sponsored events
See also <http://www.iupac.org/indexes/Conferences>
for links to specific event websites

2011 *later than 1 June*

 IUPAC poster prizes to be awarded

6-10 June 2011 • Molecular Mobility and Order • St. Petersburg, Russia

7th International Symposium on Molecular Mobility and Order in Polymer Systems

Prof. A.A. Darinskii, Russian Academy of Sciences, Institute of Macromolecular Compounds, Bolshoi Pr. 31, RF-199004 St. Petersburg, Russia, Tel.: +7 812 328 56 01, Fax: +7 812 328 68 69, E-mail: adar@imc.macro.ru

6-10 June 2011 • Organic Chemistry • Novosibirsk, Russia

Current Topics in Organic Chemistry (dedicated to Professor Valentin Koptuyug)

Prof. Igor Grigoriev, Russian Academy of Sciences Siberian Branch, Vorozhtsov Institute of Organic Chemistry, 9 Acad. Lavrentiev Avenue, RF-630090 Novosibirsk, Russia
Tel.: +7 383 330 8850, Fax: +7 383 330 9752, E-mail: benzol@nioch.nsc.ru

19-22 June 2011 • Trace Elements in Food • Aberdeen, UK 

4th International IUPAC Symposium on Trace Elements in Food

Prof. Jörg Feldmann, University of Aberdeen, Department of Chemistry, Meston Walk, Aberdeen AB24 3UE, United Kingdom, Tel.: +44 122 427 2911, Fax: +44 122 427 2921, E-mail: j.feldmann@abdn.ac.uk

24-27 June 2011 • Applied Thermodynamics • St. Petersburg, Russia

25th European Symposium on Applied Thermodynamics

Prof. Alexey Victorov, Saint Petersburg State University, Department of Chemistry, Universitetsky Prospekt 26, RF-198504 Saint Petersburg, Russia, Tel.: +7 812 328 2713, Fax: +7 812 428 6939, E-mail: victorov_a@yahoo.com

26 June-1 July 2011 • Polymers • Granada, Spain

European Polymer Congress 2011

Professor Julio San Roman, Consejo Superior de Investigaciones, Institute of Polymers, Juan de la Cierva 3, E-28006 Madrid, Spain, Tel.: +34 915 618 806, FAX: +34 915 644 853, E-mail: jsroman@ictp.csic.es

26-30 June 2011 • Solid State Chemistry • Bangalore, India

10th International Conference on Solid State Chemistry

Prof. T.N. Guru Row, Indian Institute of Science, Solid State and Structural Chemistry Unit, Bangalore 560 012 India, Tel.: +91 80 2293 2796, Fax: +91 80 2293 1310, E-mail: iccss20@gmail.com

3-7 July 2011 • Photophysics and Photochemistry • Strasbourg, France

XIXth International Symposium on Photophysics and Photochemistry of Coordination Compounds

Dr. Chantal Daniel, Université de Strasbourg, CNRS-Institut de Chimie, 4, Rue Blaise Pascal, F-67070 Strasbourg, France, Tel.: +33 368 85 13 14, Fax: +33 368 85 15 89, E-mail: c.daniel@chimie.u-strasbg.fr

3-7 July 2011 • Carbohydrates • Sorrento, Italy

16th European Carbohydrate Symposium

Prof. Antonio Molinaro, Università di Napoli Federico II, Complesso Universitario Monte Santangelo, Via Cynthia I-80125 Napoli, Italy, Tel.: +39 081 674 123, Fax: +39 081 674 123, E-mail: molinaro@unina.it

6-8 July 2011 • Food Chemistry • Gdansk, Poland

EuroFoodChem XVI

Prof. Jacek Namiesnik, Gdansk University of Technology, Department of Analytical Chemistry, 11/12 G. Narutowicza Street, PL-80 233 Gdansk, Poland, Tel.: +48 58 347 1345, Fax: +48 58 347 2694, E-mail: jacek.namiesnik@pg.gda.pl

10-14 July 2011 • Biodiversity and Natural Products • Brisbane, Australia 

7th International Conference on Biodiversity & 27th International Symposium on the Chemistry of Natural Products

Prof. Mary J. Garson, School of Chemistry & Molecular Biosciences, University of Queensland, Chemistry Building, Room 307, Brisbane, QLD 4072, Australia
Tel.: +61 7 3365 3605, Fax: +61 7 3365 4273, E-mail: m.garson@uq.edu.au

10-15 July 2011 • Ionic Polymerization • Akron, Ohio, USA 

International Symposium on Ionic Polymerization

Prof. Judit E. Puskas, University of Akron, Department of Polymer Science, Akron, OH 44325-3909, USA
Tel.: +1 330 972 6203, Fax: +1 330 972 5290
E-mail: jpuskas@uakron.edu

Conference Call

10–14 July 2011 • Macromolecules • Prague, Czech Republic 🌐

75th Prague Meeting on Macromolecules: Conducting Polymers

Dr. Jaroslav Stejskal, Academy of Sciences of the Czech Republic, Institute of Macromolecular Chemistry, Heyrovský Sq. 2, CZ-162 06 Praha, Tel.: +420 296 809 351, Fax: +420 296 809 410, E-mail: stejskal@imc.cas.cz

24–29 July 2011 • Plasma Chemistry • Philadelphia, Pennsylvania, USA

20th International Symposium on Plasma Chemistry

Professor Alexander Fridman, Drexel University, A. J. Drexel Plasma Institute, Philadelphia, PA, USA
Tel.: +1 215 895 1542, Fax: +1 215 895 1478, E-mail: fridman@drexel.edu

24–28 July 2011 • Organic Synthesis • Shanghai, China 🌐

16th International Conference on Organometallic Chemistry Directed Toward Organic Synthesis

Dr. Shuli You, Chinese Academy of Sciences, Shanghai Institute of Organic Chemistry, State Key Laboratory of Organometallic Chemistry, 345 Fenglin Lu, Shanghai 2000032, China
Tel.: +86 21 6223 7360, Fax: +86 21 6260 9305, E-mail: slyou@mail.sioc.ac.cn

24–29 July 2011 • Novel Aromatic Compounds • Eugene, Oregon, USA 🌐

14th International Symposium on Novel Aromatic Compounds

Prof. Michael M. Haley, Department of Chemistry, University of Oregon, Eugene, OR 97403-1253, USA
Tel.: +1 541 346 0456, Fax: +1 541 346 0487, E-mail: haley@uoregon.edu

29 July–4 August 2011 • IUPAC 46th General Assembly • San Juan, Puerto Rico 🌐

IUPAC Secretariat

Tel.: +1 919 485-8700, Fax: +1 919 485-8706, E-mail: secretariat@iupac.org

30 July–7 August 2011 • 43rd IUPAC Congress • San Juan, Puerto Rico 🌐

Chemistry Bridging Innovation Among the Americas and the World

Gabriel A. Infante, Pontifical Catholic University of Puerto Rico
E-mail: ginfante@iupac2011.org, www.iupac2011.org



30 July–5 August 2011 • Heterocyclic Chemistry • Glasgow, UK 🌐

23rd International Conference on Heterocyclic Chemistry

Prof. Colin J. Suckling, University of Strathclyde, Department of Pure and Applied Chemistry, Glasgow G1 1XL, UK
Tel.: +44 141 548 2271, Fax: +44 141 548 5743, E-mail: c.j.suckling@strath.ac.uk

14–17 August 2011 • Macromolecular Complexes • Helsinki, Finland

14th International Symposium on Macromolecular Complexes

Prof. Heikki Tenhu, University of Helsinki, Department of Chemistry, Postbox 55, FIN-00014 Helsinki, Finland
Tel.: +358 919 150 334, Fax: +358 919 150 330, E-mail: heikki.tenhu@helsinki.fi

28 August–2 September 2011 • Solution Chemistry • La Grande Motte, France 🌐

32nd International Conference on Solution Chemistry

Prof Pierre Turq, Université Pierre & Marie Curie, Laboratoire Liquides Ioniques & Interfaces, 4 Place Jussieu, F-75005 Paris, France, Tel.: +33 1 44 27 31 08, Fax: +33 1 44 27 31 08, E-mail: pierre.turq@umpc.fr

28 August–2 September 2011 • Spectroscopicum • Armação de Búzios, Brazil

Colloquium Spectroscopicum Internationale XXXVII

Prof Bernhard Welz, Universidade Federal de Santa Catarina, Departamento de Química, Florianópolis 88040-900, Brazil, Tel.: +55 48 3733 8876, Fax: +55 48 3733 8876, E-mail: welz@qmc.ufswc.br

31 August–3 September 2011 • Chemistry for Life Sciences • Budapest, Hungary

4th European Conference on Chemistry for Life Sciences

Prof Tamas Kiss, University of Szeged, Department of Chemistry, P.O. Box 440, H-6701 Szeged, Hungary
Tel.: +36 62 544 337, Fax: +36 62 420 505, E-mail: tkiss@chem-u.szeged.hu

5–8 September 2011 • Sustainability & Economic Sufficiency • Bangkok, Thailand

14th Asian Chemical Congress

Prof. Supa Hannongbua, Kasetsart University, Department of Chemistry, 50 Phaholyothin Road, Chatuchak, Bangkok 10900, Thailand, Tel.: +66 2 562 5555 x 2140, Fax: +66 2 579 3955, E-mail: fscisph@ku.ac.th

Conference Call

5–8 September 2011 • Advanced Polymers • Cappadocia, Turkey

9th International Conference on Advanced Polymers via Macromolecular Engineering

Prof. Yusuf Yagci, Istanbul Technical University, Department of Chemistry, TR-34469 Maslak, Istanbul
Tel.: +90 212 285 3241, Fax: +90 212 285 6386, E-mail: yusuf@itu.edu.tr

11–15 September 2011 • Boron Chemistry • Niagara Falls, Canada

XIVth International Meeting on Boron Chemistry

Prof. John F. Valliant, McMaster University, Department of Chemistry, 1280 Main Street West, Hamilton, ON L8S 4M1, Canada, E-mail: valliant@mcmaster.ca

11–15 September 2011 • Analytical Chemistry • Belgrade, Serbia

Euroanalysis XVI

Prof. Slavica Ražić, University of Belgrade, Department of Analytical Chemistry, P.O. Box 146, SRB-11001 Belgrade, Serbia, Tel.: +381 11 3951 208, Fax: +381 11 3951 208, E-mail: slavica.razic@pharmacy.bg.ac.rs

18–22 September 2011 • Drug Discovery • Zadar, Croatia

2nd World Conference on Physico-Chemical Methods in Drug Discovery and Development

Professor Biserka Cetina-Cizmek, PLIVA d.o.o., Zagreb, Croatia

Tel.: +385 98 196 6807, Fax: +385 1 373 3640, E-mail: Biserka.Cetina-Cizmek@pliva.com

18–23 September 2011 • Nuclear Chemistry • Palermo, Italy

3rd International Nuclear Chemistry Congress

Prof. Flavia Groppi, Università degli Studi di Milano, LASA Laboratory, Via F. Cervi, 201, I-20090 Segrate, Milano, Italy, Tel.: +39 250 319 568, Fax: +39 250 319 543, E-mail: 3rdINCC@mi.infn.it

25–30 September 2011 • General and Applied Chemistry • Volgograd, Russia

XIXth Mendeleev Congress on General and Applied Chemistry

Prof. Alexander Navrotsky, Volgograd State Technical University, Polymer Chemistry Department, Lenin Avenue, 28, RF-400131 Volgograd, Russia, Tel: +7 1 44 27 31 08, Fax: +7 1 44 27 38 34, E-mail: navrotsky@vstu.ru

27–29 September 2011 • Renewable and Sustainable Energy • Kuala Lumpur, Malaysia

19th International ChemRAWN Conference on Renewable and Sustainable Energy from Biological Sources

Prof. Ting-Kueh Soon, Institut Kimia Malaysia, 127 B Jalan Aminuddin Baki, Tam Tun Dr Ismail, 60000 Kuala Lumpur, Malaysia, Tel.: +60 3 7728 3272, Fax: +60 3 7728 9909, E-mail: soontk@ikm.org.my

11–14 October 2011 • Novel Materials and Their Synthesis • Shanghai, China

7th International Symposium on Novel Materials and Their Synthesis

Prof. Yuping Wu, Fudan University, Department of Chemistry, New Energy and Materials Laboratory, Shanghai 200433, China, Tel.: +86 21 545 664 223, Fax: +86 21 545 664 223, E-mail: wuyp@fudan.edu.cn

29 November–2 December 2011 • Medicinal Chemistry • Tokyo, Japan

8th International Medicinal Chemistry Symposium

Professor Yuusako Yokoyama, Toho University, Chiba, Japan

Tel: +81 47 472 1589, Fax: +81 47 472 1595, E-mail: yokoyama@phar.toho-u.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.

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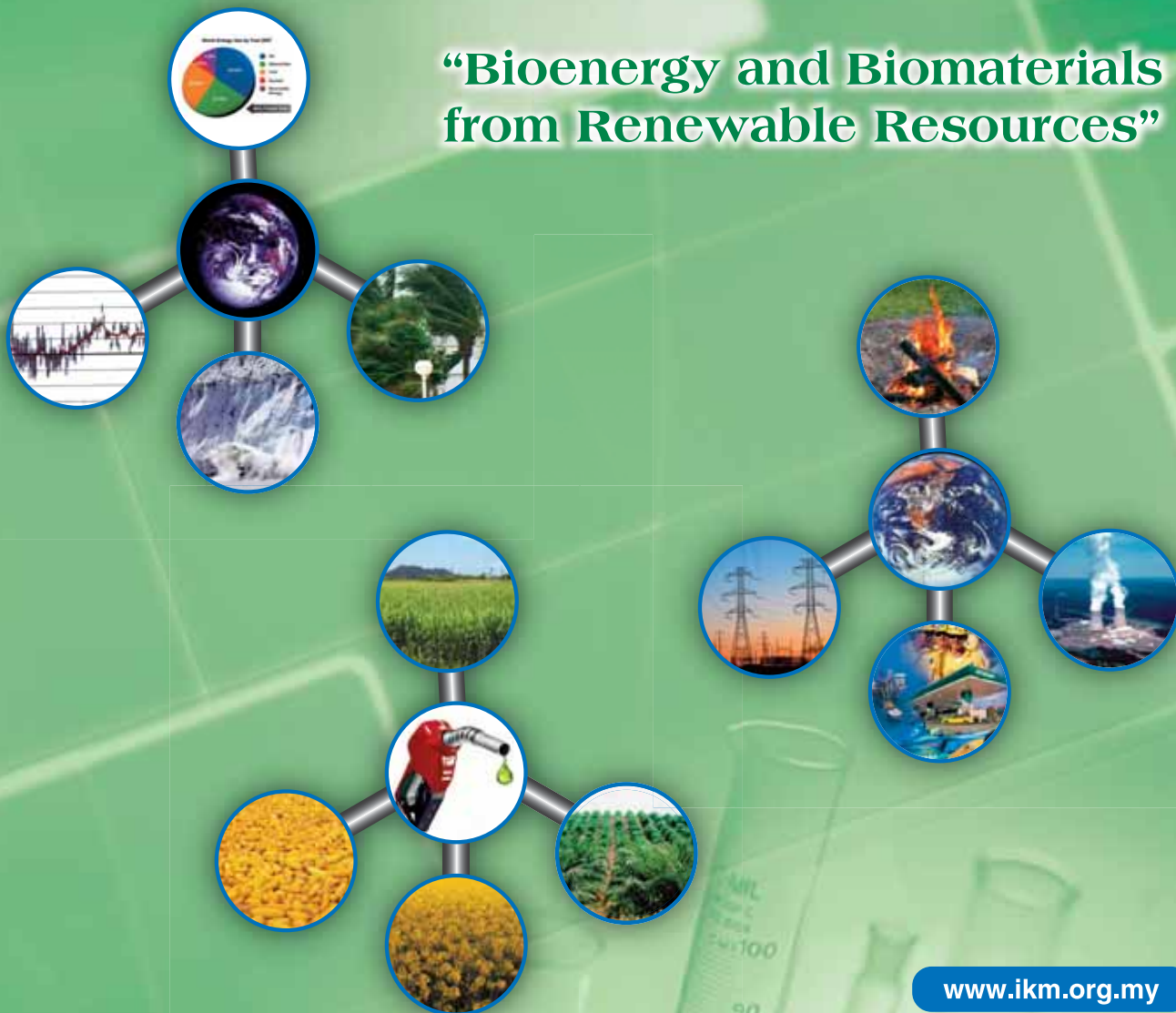
 www.iupac.org



CHEMRAWN XIX

19th IUPAC International Conference on Chemical Research Applied to World Needs 2011

“Bioenergy and Biomaterials
from Renewable Resources”



www.ikm.org.my

September 27-29, 2011
Putra World Trade Centre, Kuala Lumpur, Malaysia

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