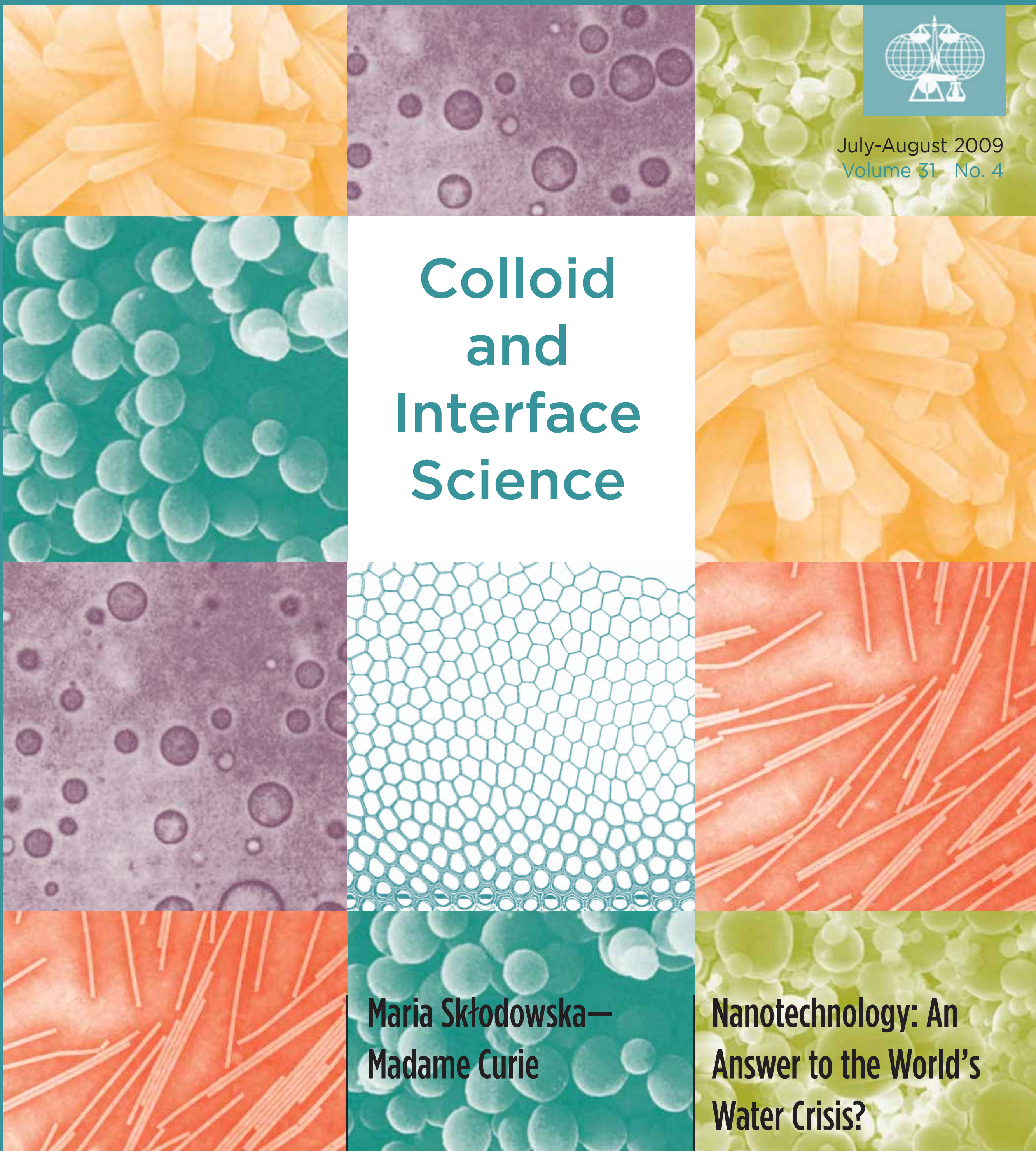
The News Magazine of the
International Union of Pure and
Applied Chemistry (IUPAC)

CHEMISTRY International



July-August 2009
Volume 31 No. 4

Colloid and Interface Science

Maria Skłodowska—Madame Curie

Nanotechnology: An Answer to the World's Water Crisis?

From the Editor

CHEMISTRY International

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Aside from its formal membership of National Adhering Organizations, IUPAC also actively maintains relationships with other international organizations whose "aims and activities are in harmony with those of the Union" (IUPAC Statutes). Currently, there are 30 such organizations which vary broadly in scope and reach. For a quick glance at these IUPAC associates, see <www.iupac.org/ao>.

Examples include:

- The Chemical Heritage Foundation, whose mission is to develop and maintain world-class collections of materials that document achievement in the chemical sciences.
- The International Organization for Chemical Sciences in Development, whose mission—inspired by a deeply-felt ethical concern for the disparities between industrial and developing countries—is to collaborate with chemists in developing countries to help them build capacity in the chemical sciences and serve their communities in practical ways.

- The Federation of Asian Chemical Societies, the European Association for Chemical and Molecular Sciences, and the Federación Latinoamericana de Asociaciones Química, whose missions are to promote the interests of professional chemists in their respective regions without infringing upon the autonomy of any of the member societies.
- The International Federation of Clinical Chemistry & Laboratory Medicine, whose mission is to enhance the science and quality of diagnosis and therapy for patients throughout the world.

Each of these organizations has a somewhat unique relationship with IUPAC. *CI* readers have, over time, been treated to articles about these organizations and about joint projects or activities with them, all of which attest to the harmony of these connections.

In this issue, Mieke Kleijn, secretary and treasurer of the International Association of Colloid and Interface Scientists (IACIS), reviews the history and objectives of the association. According to Kleijn, "colloid and interface science becomes more exciting every day!" and the feature she offers on page 8 surely makes that case.

CI continues to value such submissions illustrating the scope of other organizations. If you too are eager to share an article about the status and goals of your organization, or about recent developments or specific events, do contact us; we always like to hear from you.

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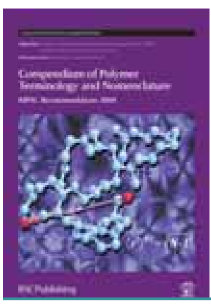

Vice President's Column

Did You Say IUPAC? What's That?

by Nicole J. Moreau

In no more than a year and a half, *it* will begin. Of course, you understand that *it* is the International Year of Chemistry (IYC). Last year at this time, everyone was on the starting blocks, and in a state of expectation. "What can I do to help, now?" was a common thought of those involved in the process of establishing the IYC. I had to ask my national chemical society's president to write to our country's delegate at UNESCO and then the UN. I did the same with my national Academy of Sciences. And why not ask the president of this important chemical industry to show support for this IUPAC initiative?

Now that the year is official, another kind of angst is growing: There are so many things to do, so many committees to manage, not to mention funds to be raised. Clearly, there is no shortage of good ideas: Nearly everyone you ask has many ideas to propose. The most difficult aspect of the IYC so far may be how to manage all this abundance.

Chemistry is very well known. The word says something to everybody, from the bookseller to the butcher, from the farmer to the mathematics teacher, from the journalist to the clergyman, from the unemployed person to the house painter. But how many meanings of this word are there? And, above all, how many misunderstandings? This is precisely why it is so exciting to prepare for the IYC. Life would be very sad without a challenge to take up. I think that many of us, in preparing for the IYC, start to develop an advocate's mind: We have matters to discuss, arguments to prepare, and people to convince. If you are like me, you might imagine yourself in front of a certain audience, a hostile one, of course, trying to find the best way to explain what chemistry is. It is not only organic synthesis for example, but above all it is "knowledge." Chemistry is the science that explains that everything, from our own hands to the bark of a tree, the water we drink, and the air we breathe, is made of molecules.

But, I let myself be carried away, and the preceding paragraphs do not correspond at all to the title of this issue's column. It is not about chemistry that I want to speak, but about IUPAC. As will become apparent, this column is a little joke and was written for fun, and all the "statistics" I mention below have no foundation, except in the author's mind.

So, let me replace the word "chemistry" with the acronym "IUPAC" in an earlier sentence: *IUPAC is very well known. The word says something to everybody, from the book seller to the butcher, from the farmer to the mathematics teacher, from the journalist to the clergyman, from the unemployed person to the house painter. But how many meanings of this word are there? And, above all, how many misunderstandings?* Obviously, the first sentence is now false, and the answer to the question "how many meanings?" would be "zero." And that is not exciting at all, and if you like IUPAC, as we all do, this fact might lead you to a nervous breakdown. However, it is a matter of fact: IUPAC is not well known.

So, who does know IUPAC, or, who at least knows what our acronym stands for, even if he or she doesn't know precisely what it corresponds to? We will eliminate the members of IUPAC from our count. Among chemistry professionals, young people do not know the name, except perhaps those whose supervisors suggested they apply for an IUPAC prize at a conference, or who are meticulous about nomenclature and who therefore make sure that young chemists also know about IUPAC rules. I would say that in the academic chemistry world, most of those older than 50 have heard about IUPAC. However, the number seems to rapidly decrease with the age of the chemist. From industry, I suspect that the number of people who know of IUPAC is probably lower by at least a factor of two or three.

It is my feeling that when it comes to who knows IUPAC in other areas of science, the number decreases, but the more knowledgeable of IUPAC are the disciplines at the frontier of chemistry: physics and biology. Despite our relationship with the International Union of Pure and Applied Physics, mainly involving the naming of new elements, physicists are less likely to know IUPAC than chemists. The same probably holds true for those in bio-related fields, with decreasing scores from biochemistry to biology, and then to genetics.

If we look at the humanities, we can probably find some persons knowledgeable about IUPAC, more likely historians of science. Perhaps there are a few sociologists who have heard of IUPAC, especially among those establishing statistics about the "associative sense in the intellectual population." In psychology, it is probably those interested in "the herd instinct and the need to live with your kind among poorly imaginative and excessively rationalizing populations" who know of us.

Let us now move to the nonscientific population. We may find some groups in which individuals have heard about IUPAC (e.g., ecology associations, farmers trade unions, the staff of state organizations, government ministers, UN bodies, etc.). However, the level is generally very low, particularly among politicians and lawyers (unless of course if they deal with chemistry related issues, most likely pertaining to nomenclature).

If we look at the balance sheet, knowledge of IUPAC is poor, very poor. But the worst is still to come, because we did not yet examine the opinion these people have about IUPAC. Needless to say, as we excluded from this putative survey members of IUPAC, the opinion is seldom, if ever, appreciative.

Let us first have a look at national chemical societies. In some cases, chemical societies are the national organization representing in IUPAC the chemists in that country, but alternatively it might also be a national chemical council, a national academy of science, or other institution or association of institutions representative of the national chemical interests. Except when such societies are National Adhering Organizations of IUPAC, it seems that there is some mistrust: Either they suspect IUPAC is trying to surpass them or attempting to take over their area of expertise, or they feel IUPAC is unworthy of consideration, useless. In their publications, the Union is only mentioned occasionally. Of course, it depends strongly on the membership of their boards, and may change, for better or worse.

It should be noted that historians of science have a good opinion of chemists; furthermore, our impact factor will increase when they find out we are planning a huge celebration of Marie Sklodowska Curie! Among physicists, those who work on IUPAC projects or who are members of IUPAC divisions know the Union quite well and appreciate it for its important contribution to nomenclature. The others are rather dubious about the usefulness of a Union dealing with something other than physics. The case of biologists is a special one: there are many small Unions dealing with biology, and as a consequence, biologists are not very aware of them; so, it is rare for them to know IUPAC, except for the ones working at the interface of chemistry and life sciences, generally affiliated with the International Union of Biochemistry and Molecular Biology. Their opinion about IUPAC will follow their opinion of their own union, and I hope it is a good one. Perhaps we could find some, albeit condescending, appreciation from sociologists, because "the tendency to association is a good cement for a solid society." Here too, we will observe a clear increase in positive opinions when they hear that we will celebrate women in science in 2011. We should expect the same opinion from psychologists because "feeble minds need the support of their kind to be able to live almost normally in our stressful society."

This was the best part of the matter, and it is now the moment to have a look at the opinion of nonscientific people. It seems that some policy makers and members of various nongovernmental organizations may have heard about IUPAC. In the case they know with no error the nature and mission of IUPAC, they cannot underestimate a scientific, international, nongovernmental, nonpolitical union. But unfortunately, they rarely think of turning to IUPAC when there is an issue the Union could help resolve. Generally, policy makers prefer to turn themselves toward well-known NGOs, those who supposedly work only for the benefit of humankind, while IUPAC is assumed to work for the benefit of chemistry.

In certain circumstances, some NGOs perceive IUPAC as a rival organization with which they are fearful of sharing influence or money. This fear is unfounded, since IUPAC is, first and foremost, a scientific organization firmly focused on the well-being of humankind. If our Union proposes to use its expertise for sustainable development, it is not to gain money or influence, it is to help people and the environment and to become better known as an organization that can help with such things.

Many people in IUPAC sincerely think that the Union can help the planet and its inhabitants share a better and more sustainable future. But how can we manage to move in this direction? It seems to me that the first step is to make the exact nature of IUPAC known and understood. This is easy to say, but very difficult to carry out: It is not the first time one of us has made such a statement, and the progress is still poor.

But, thanks to IYC, perhaps we can become much more optimistic than the author of this column seems to be. Clearly, it is more urgent than ever to make IUPAC known in more places and by more people. It is a challenge, and we all have a share of work toward that goal.

Nicole J. Moreau <nj.moreau@free.fr> has been vice president of IUPAC since January 2008. She has been an elected member of the Bureau since 2000 and a member of the Executive Committee since 2006. She is also general secretary of the French National Committee for Chemistry.

Maria Skłodowska Curie
Madame Curie

From Poland to France, from France to Poland

The young Maria Skłodowska who became Madame Curie, is shown standing at left, behind her father, Wladyslaw, with her sisters Bronya and Helena at right. Photo: Courtesy of the Curie and Joliot Association/Curie and Joliot-Curie Fund.

by Stanislaw Penczek and Malgorzata Sobieszczak-Marciniak

The year 2011 was proclaimed the International Year of Chemistry (IYC) by the General Assembly of the United Nations in December 2008. This IUPAC initiative was facilitated by UNESCO and brought to the General Assembly of the UN by Ethiopia, a member country of IUPAC. The year 2011 coincides with the centenary of Maria Skłodowska Curie's (Madame Curie) being awarded her second Nobel Prize, on that occasion for the discovery of two new elements that she named "polonium" and "radium." While starting to think about how to celebrate the Year of Chemistry, the authors offer a fast track version of Curie's journey, from her birth in 1867 to her first Nobel prize in 1903 to her impact on the field of chemistry.

The Nobel Prize in Chemistry is awarded every year with a few exceptions, but the impact of awarded contributions differ. Curie's discovery of polonium and radium was of revolutionary importance for chemistry, physics, and medicine. Prior to this discovery, Marie and Pierre Curie had properly described the nature of radiation as observed by Antoine Henri Becquerel a few years earlier—an accomplishment for which the three scientists were awarded the Nobel Prize in Physics in 1903. In physics, these discoveries opened the door for understanding the structure of an atom; in medicine, they enabled a novel approach to treating cancer. These breakthroughs established Marie Curie's place in the history of science. Moreover, she was not only a great scientist but a magnificent human being.

Early Years in Poland

Maria Salomea Skłodowska was born in Warsaw, 7 November 1867, the youngest of five children born to Wladyslaw Skłodowska and Bronislawa (née Boguska). Manya (as she was called by her family and friends) and her entourage believed that Poland could become free only through intellectual accomplishments. Like many of his compatriots, Maria's father, a physics professor, was convinced that education was the means for Poland to regain its independence.

Wladyslaw Skłodowska educated his children in science, mathematics, and literature at every opportunity. When Maria worked as a governess, far from home, to collect money to help her older sister Bronya in her studies, her father sent letters with mathematical problems, and Maria sent back solutions. He read his children poetry and literature in one of five languages he knew, simultaneously translating the work into Polish. This level of education and devotion to culture were common among Polish intellectuals.

Maria graduated from high school in Warsaw at 16, receiving a gold medal for finishing first among girls in the city. That was the atmosphere in which young Maria was raised, developing, thanks to her father, not merely interest but real enthusiasm for science. Her dream was to continue her education and then earn a position as a teacher in Poland.

From Poland to France

In 1891, 24-year-old Maria received an invitation from her sister to join her in Paris at Sorbonne University. At that time, the Sorbonne was considered one of the most prestigious universities in Europe. Maria's sister had married a fellow Polish exile, Kazimierz (Casimir) Dłuski, while studying medicine at Sorbonne. It was common then for the most intellectual Poles to go to Paris. In this friendly country they received the education necessary for achieving Polish independence, which was finally established in 1918.

"If the existence of the new metal is confirmed, we propose to call it polonium from the name of the country of origin of one of us."

In France, Maria (sometimes written "Marya"—it can be found this way on the ceiling of the Sorbonne subway station in Paris) changed her name to the French "Marie." While attending Sorbonne, she met young Polish pianist Ignacy Paderewski, future prime minister of the Polish Republic, and young Stanislaw Wojciechowski, who later became the president of Poland.

In 1893, Marie graduated from Sorbonne with a degree in physics, becoming the first woman to graduate with such a degree from the university. The following year, she graduated with a degree in mathematics, made possible by a scholarship from Poland.

Her plan was to study physics and return to Poland to teach children. However, she was offered a position in Paris studying the magnetic properties of steel. Not having access to a proper laboratory, she was introduced by her friends to Pierre Curie, who worked on related topics at the School for Physics and Chemistry of the City of Paris. Pierre was an established scientist; by 1880, he and his brother had discovered piezoelectricity, a phenomenon used today in many areas, including quartz watches (in an electrical field, crystals become compressed).

Pierre was 35 when he met 27-year-old Marie. Their backgrounds and devotion to science were similar. Although they were born in different countries and received their primary education under different circumstances, it is interesting to note how both of their families developed similar ideas and attitudes about humanity and society. Both families believed that Poland should be a republic, and both were agnostic (although Marie's mother was a devout Roman Catholic). Pierre and Marie married a year later, in 1895.

Photo: © Museum of Maria Skłodowska-Curie. Used with permission.

Simulated photograph of the first Solvay Conference in 1911 at the Hotel Metropole. Seated (L-R): W. Nernst, M. Brillouin, E. Solvay, H. Lorentz, E. Warburg, J. Perrin, W. Wien, M. Curie, and H. Poincaré. Standing (L-R): R. Goldschmidt, M. Planck, H. Rubens, A. Sommerfeld, F. Lindemann, M. de Broglie, M. Knudsen, F. Hasenöhrl, G. Hostelet, E. Herzen, J.H. Jeans, E. Rutherford, H. Kamerlingh Onnes, A. Einstein and P. Langevin. The historic invitation-only 1911 Conseil Solvay was the first world physics conference. Following the initial success of 1911, the Solvay Conferences have been devoted to outstanding preeminent open problems in both physics and chemistry.

Marie Curie's Scientific Journey

At the end of the nineteenth century, Wilhelm Roentgen discovered what he called X-rays, which allowed him to see bones through soft matter. At the same time, Becquerel observed that when uranium salts were exposed to sunlight (which he assumed was necessary), they produced an exposure on a photographic plate. It was, however, the work of Marie (in her Ph.D. thesis) and Pierre that explained that this phenomenon is a genuine property of the atoms and does not require any exterior influence, such as sunlight.

Marie became interested in studying whether other elements behaved similarly; she found that pitchblende possessed a great degree of activity. Therefore, Marie assumed an element with much stronger radioactivity (a term she coined) than uranium should exist. She decided to extract this substance from the ore by ordinary methods of chemical analysis. Over the years, Curie stressed that successful separation was possible because she received a thorough education in chemical analysis at secondary school in Poland. Marie wrote, "If Professor Milicer and his assistant lecturer, Dr. Kossakowski, hadn't given me a sound grasp of analysis in Warsaw, I would have never separated out radium." During the same period, Curie separated another new element (although not in its pure form at that time): polonium. She wrote in her paper, "If the existence of the new metal is confirmed, we propose to call it polonium from the name of the country of origin of one of us."

"It has been your fortune, Madame Curie, to accomplish an immortal work for humanity."

The discovery of radium (Ra) as a new element was not accepted by some prominent scientists. Some of them (e.g., Lord Kelvin) insisted that it was merely a mixture of the already known elements. Marie, with help from her assistants (and after the untimely death of Pierre) during five years of research from 1906 until 1911, finally prepared metallic Ra and described its major properties. During these difficult years (including nationalistic attacks on Marie), she always had around her a group of close French friends from the highest levels of French society, such as Jean-Baptiste Perrin, Émile Borel, Pierre-Cécile Chavannes, and André-Louis Debierne.

Marie Curie's birthplace in Warsaw, Poland.

In 1910, during the International Congress of Radiology, it was decided to call the unit of radioactivity the "curie." This standard is still used worldwide.

After Pierre's death, Marie was offered his former chair at Sorbonne. She accepted, becoming the first woman to teach at the 800-year-old university. Then, in 1909, the idea of the Radium Institute (Institut du Radium) was developed. The institute, which opened in 1914, is located at Pierre and Marie Curie Street in Paris.

During World War I, Curie and her older daughter Irene helped train hundreds of physicians in the use of X-rays, and she organized an army of cars—known as "petit Curie"—equipped with the pertinent equipment. When the war ended, she began a search for radium to use for research. Unfortunately, Curie was unable to get the French government to pay for the expensive element. Help came from the USA during her first visit in May 1921. Marie received 1g of radium (worth more than USD 100 000 at the time) from President Warren Harding, who expressed profound respect for her and stressed the friendship between the USA and France, her adopted nation, and Poland, her native land:

"We welcome you as an adopted daughter of France, our earliest supporter among the great nations. We greet you as a native-born daughter of Poland. . . . In you we see the representative of Poland restored and reinstated to its rightful place. . . . It has been your fortune, Madame Curie, to accomplish an immortal work for humanity."

Curie became famous also because radium was found to cure numerous cases of cancer. However, it was her status as a scientist that led younger scientists to request references from her. One of them was Albert Einstein (12 years younger than Curie); in her letter of recommendation for his professorship at the University of Prague, she wrote, "I much admire the work which Mr. Einstein has published on matters concerning modern theoretical physics."

From France to Poland

In 1913, Curie opened the first radiology laboratory in Warsaw, at which she served as director. She was an honorary member of a few scientific societies, including the Warsaw Scientific Society and the Polish Chemical Society. In 1918, when Poland regained independence she wrote that "My greatest dream is to build a Radium Institute in Warsaw." In the 1920s, Curie and her sister Bronya were responsible for the construction of the Radium Institute in Warsaw, which received enthusiastic financial support from the Polish people. In 1926, Warsaw University of Technology presented Curie with an honorary doctorate.

Then, in 1929, when Curie visited the USA again, hoping to raise the necessary funds to buy radium for the Radium Institute in Warsaw, it was President Herbert Hoover who presented her with a check and referred to the discovery of radium: "And like all great discoveries of fundamental substance and fact it has found application to human use. In the treatment of disease, especially of cancer, it has brought relief of human suffering to hundreds of thousands of men and women."

Curie died of leukemia on 4 July 1934, but her legacy did not disappear with her death. She will always be known as "the woman who opened the nuclear age." A large number of institutions, particularly in Poland, bear her name. Maria Skłodowska Curie University is in Lublin (Poland); the large Museum of Maria Skłodowska Curie is in Warsaw, in the same building where Manya was born in 1867; there is also the Maria Skłodowska-Curie Memorial Cancer Center and Institute of Oncology, and the Society in Tribute to Maria Skłodowska Curie. About 50 schools in Poland are named after her.

She wrote about herself, "It is a short, simple story, lacking great events. I was born in Warsaw, in a professor's family. I married Pierre Curie and I had two children. My scientific work I did in France." Einstein said of her, "Marie Curie was the only one not spoiled by fame."

In 1935, one year after she passed away, her daughter Irene and son-in-law Frédéric Joliot-Curie were awarded the Nobel Prize for their discovery of artificial radioactivity.

A Google search of "Marie Curie" and "Maria Skłodowska Curie" generates results such as "Marie Curie Fellowship," "Marie Curie Scholarship," "Marie Curie Program," "Marie Curie Reintegration Grant," "Maria Curie Stipends," and "Marie Curie Programme" (which has 1 620 000 hits). In Paris, the largest French university (the former Department of Exact Sciences at Sorbonne) has been renamed University Pierre and Marie Curie, as proposed by the prominent French scientist Pierre Sigwalt.

Photo: © Museum of Maria Skłodowska-Curie. Used with permission.

Pierre and Marie Curie in their laboratory in 1899.

On 20 April 1995, more than 60 years after her death, Madame Curie was recognized for her achievements in a spectacular way. Under the chairmanship of the presidents of France (François Mitterrand) and Poland (Lech Walesa), the ashes of Marie and Pierre Curie were moved to rest under the famous dome of the Pantheon in Paris, not far from the Curie Institute, located at Pierre and Marie Curie Street. Madame Curie was the first woman to be buried at the Pantheon in recognition of her own accomplishments.

An abundant literature describes the life and scientific work of Maria Skłodowska Curie. Today, many of these sources are available on the Internet, and the interested reader may find there much more extensive texts than this short article. The best known is the *Maria Curie* biography, written by her daughter Eve (Ewa).

Parts of this article (e.g., texts of the speeches given by the American presidents) are based mostly on information borrowed from an article by Denise Ham, published in *21st Century Science & Technology Magazine*, Winter 2002–2003, pp. 30–68; *Nobel Lectures, Chemistry* (Elsevier 1966); and <www.nobelprize.org>.

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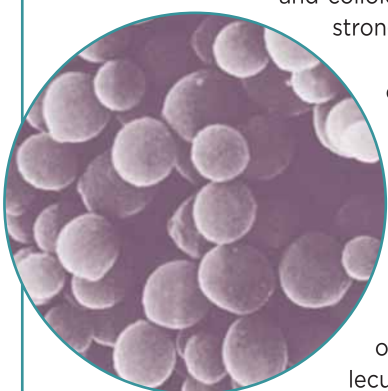
Alive and Kicking at the 30th Anniversary of IACIS

by Mieke Kleijn

On 21 August 1979, the International Association of Colloid and Interface Scientists (IACIS) was established as a nonprofit organization of individuals who are actively interested in the field of colloid and interface science. During its 30-year existence, the field has become more and more important and integrated with other disciplines and applied sciences. IACIS is still the leading international organization, keeping its members informed via the *IACIS Newsletter* and the Internet and organizing well-attended worldwide conferences every three years. This year's IACIS conference, organized with the American Chemistry Society Division of Colloid and Surface Chemistry, was 14–19 June, at Columbia University in New York, USA.

Mesoscopic Length Scales and Huge Interfaces

The term "colloid" (as both adjective and noun) refers to a particular state of matter in which at least one length scale falls into the *mesoscopic* domain—i.e., the range between atomic and macroscopic, from a few nanometers to a micron. From this, an important property immediately follows—i.e., the extremely large specific interfacial area between colloids and their surroundings. Any chemical or physical phenomenon that depends on the existence of an interface becomes very prominent in colloidal systems. Interface science and colloid science are thus by nature strongly related fields.

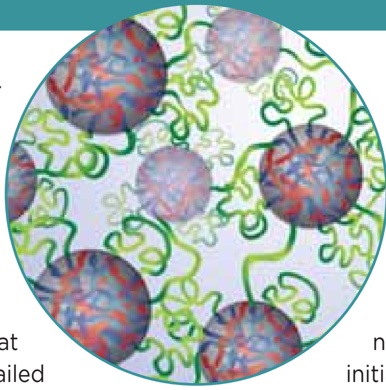


Colloids include a variety of complex materials, ranging from solid particles, droplets, or bubbles dispersed in a different medium (emulsions, dispersions, aerosols, or foams) and more intricate phase-separated systems to all kinds of self-assembled (supramolecular) structures. Colloids and colloidal systems have an impact on virtually every aspect of life. They are important components of a range of products that are used in everyday life; examples include cosmetics, food products, pharmaceutical preparations, paints, and paper. In addition, nearly all industrial processes involve colloidal systems or chemical reactions at surfaces. Last, but not least, colloids are also abundant in living cells in the form of proteins, DNA, RNA, and other macromolecules, membranes, and other molecular assemblies.

The first IACIS Council. From left: Alexi Scheludko (Bulgaria), Hans Lyklema (Netherlands), Tom Healy (Australia), Geoff Parfitt (UK), Lisbeth Ter-Minassian-Saraga (France), Erwin Wolfram (Hungary), Per Stenius (Sweden), Armin Weiss (West Germany), Božo Tezak (Croatia, Yugoslavia), and Egon Matijevic (USA). At the occasion that this photo was taken (Stockholm, 24 August 1979), Boris Derjaguin (USSR) and Eiji Suito (Japan), also members of this council, were not present.

Colloid and interface science is an interdisciplinary field combining aspects of physics, chemistry, mathematics, and, in some cases, biology. In the last decades, the field has become more and more integrated with applied sciences, such as food, environmental, and biomedical sciences. Recently, the conceptual framework of colloid and interface science has been essential in understanding and exploiting many aspects of nanotechnology. These concepts also help in understanding the intricacies of life processes.

Colloidal systems are nowadays also referred to as "soft condensed matter" or "soft matter," indicating that their structure and dynamics are governed by physical interactions, which are generally weak. The continued development of thermodynamics and statistical mechanics and advances in theories of liquids, together with computer modeling and simulations, have created a very powerful conceptual framework. On the experimental side, there has been a revolution in the resolution at which colloid experiments can be performed. For example, individual colloidal particles can now be visualized directly in real time using confocal microscopy. Furthermore, interaction forces between colloids and surfaces can be measured directly and very accurately. This means that a tremendous amount of new detailed information is available. Colloid and interface science becomes more exciting every day!



History of IACIS

In the 1970s, colloid and interface science was actively studied by keen and successful groups, and several national organizations—the oldest being the German Colloid Society (or "Kolloidgesellschaft")—were in existence. On an international level, there was the Commission 1.6 on Surface and Colloid Science of IUPAC, but this was a closed group with limited tasks. Several developments showed the need for an open international organization that would present and unite those active in the field of colloid and interface science and that could serve as an umbrella organization for several international activities in the field.

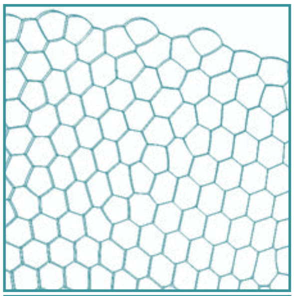
The first of these developments was the start of the series of biennial European Chemistry and Interfaces Conferences (ECIC) by British colloid scientist Geoffrey Parfitt in 1968. The first five of these meetings were affiliated with Euchema, the European Chemistry Organization, but when it was decided to have the sixth ECIC in Bulgaria (1978), Euchema did not agree to have the conference in an Eastern-Bloc country. Adjacent to that, on behalf of IUPAC, Erwin Wolfram from Hungary started in 1975 another important series of conferences, the International Conferences on Colloid and Surface Science (ICSCS). Lastly, at the 29th General Assembly of IUPAC in Warsaw in 1977, it was decided to start an international newsletter with the aim of promoting international cooperation in the field of colloid and interface science.

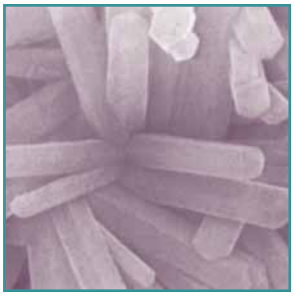
During the 2nd ICSCS, in San Juan, Puerto Rico (1976), it was decided that an international organization should be established. The initiative was taken by Geoffrey Parfitt, chair of the Standing Committee of ECIC. Together with Hans Lyklema, editor of the international newsletter, and Armin Weiss, president of the Kolloidgesellschaft, he composed a draft constitution and announced a general meeting during the 3rd ICSCS in Stockholm. As a result, on 21 August 1979, IACIS was formally established in the presence of 120 scientists from 22 countries. Parfitt served as the inaugural president and brought together a founding group to consider the draft constitution and to plan future directions of IACIS. This committee acted as the first council of IACIS. The main objectives of the association were, and still are, to promote international cooperation among colloid and interface scientists and to encourage advancement and understanding in the field of colloid and interface science. The responsibility for the ICSCS conferences and the newsletter were transferred from IUPAC to IACIS.

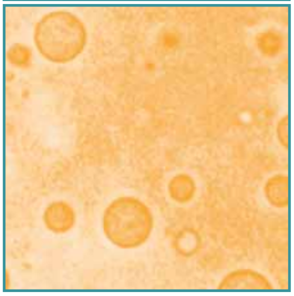
Organization

IACIS has a council that is responsible for the overall running of the association and for determining long-term policy. The council consists of a president, a president-elect (vice president), an immediate past president, an honorary secretary and treasurer, and twelve ordinary elected members. The council may co-opt additional members, and one of these is the newsletter editor. The other seats are used to ensure a regional balance, to allow representation of regional organizations with

The chemistry building at Wageningen University, The Netherlands, which houses the laboratory of physical chemistry and colloid science and the secretariat of IACIS.







objectives similar to those of IACIS, and to maintain a balance between fundamental and applied aspects. Responsibility for short-term and day-to-day running of the association is delegated to a standing committee consisting of the president, the president-elect, the immediate past president, the honorary secretary and treasurer, and the newsletter editor.

Elections for half the ordinary council members and for the president-elect are organized every three years and completed one month before the triennial IACIS conference. During this conference, a general assembly of members is called, the new council members assume office, and the former president-elect assumes the duties of president.

During the first two years (1979–1981), the IACIS secretariat was, together with the secretariat of the Kolloidgesellschaft, at the University of Munich, Germany. After that, the secretariat moved to Wageningen, The Netherlands, where it is embedded in the Physical Chemistry and Colloid Science group at Wageningen University (led by Hans Lyklema until 1995). The current honorary secretary and treasurer, Mieke Kleijn, is also a member of this group.

Columbia University, host of the IACIS Conference in June 2009.

Hans Lyklema edited the first 44 newsletters. This job just recently (in 2008) has been taken over by another Dutch colloid scientist, Ger Koper, who is also the IACIS webmaster. The first two newsletters, dated September 1978 and July 1979, respectively, were written under the auspices of the IUPAC Commission on Surface and Colloid Science before IACIS was formally established. Starting with NL-3 in June 1980, the newsletter has been published under IACIS auspices and has been sent to all IACIS members. They can also view the newsletter on the IACIS website, where up-to-date information on all conferences in areas related to colloid and interface science can be found as well.

Current Standing Committee of IACIS

President: Björn Lindman (Sweden)
President elect: Dennis Prieve (USA)
Immediate past president: Brian Vincent (UK)
Hon. secretary and treasurer: Mieke Kleijn (The Netherlands)
Newsletter editor: Ger Koper (The Netherlands)

IACIS has a dual membership scheme with the European Colloid and Interface Society (ECIS). IACIS members are able to join ECIS (and vice versa) through either parent organization at a reduced combined fee. Currently, the number of IACIS members is about 420.

Previous and Future International Conferences on Colloid and Interface Science

1.	1975: Budapest, Hungary
2.	1976:San Juan, Puerto Rico
3.	1979: Stockholm, Sweden
4.	1981: Jerusalem, Israel
5.	1985: Potsdam, NY, USA
6.	1988: Hakone, Japan
7.	1991: Compiègne, France
8.	1994: Adelaide, Australia
9.	1997: Sofia, Bulgaria
10.	2000: Bristol, UK
11.	2003: Iguaçu Falls, Brazil/Argentina
12.	2006: Beijing, China
13.	2009: New York, USA
14.	2012: Sendai, Japan
15.	2015: Germany

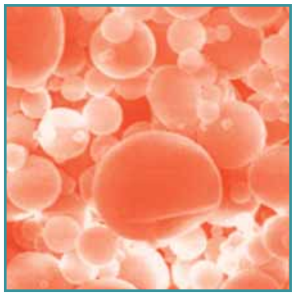
Conferences and Sponsoring Program

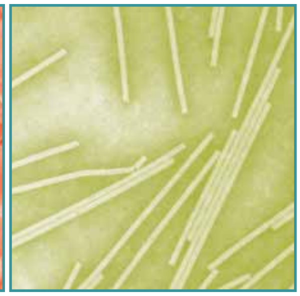
The first three ICSCS took place in Budapest (1975), San Juan (1976), and Stockholm (1979) and were organized under the auspices of IUPAC. With its foundation, IACIS took over the responsibility of organizing these conferences every three years. Recently, the name "ICSCS" has been dropped; the meetings are now called IACIS conferences. In practice, the organization is governed by a local organizing committee and supported by an international scientific program committee. IACIS members receive a discount on the conference fee.

Apart from its own conferences, IACIS sponsors other conferences in fields related to interface and colloid science. Reduced registration fees for IACIS members apply to these conferences as well. Nowadays, sponsoring is done through a travel bursaries program. For this program, IACIS makes available a number of bursaries each year for people with limited financial means to pay for the travel expenses to the meeting concerned.

References

The history of IACIS was described on the occasion of its 25th anniversary in the 250th volume of *Colloids and Surfaces A* (2004) by different people who had or still have an important role in the association:





- Thomas Healy, *Colloids and Surfaces A* 250 (2004): 9–10
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- Egon Matijević, ibid. 13–14
- Dimo Platikanov, ibid. 15–16
- Brian Vincent, ibid. 17–18

Mieke Kleijn <mieke.kleijn@wur.nl> has been honorary secretary and treasurer of IACIS since October 2006. She is an assistant professor in Physical Chemistry and Colloid Science at Wageningen University, The Netherlands.

Editor's note: Today, IACIS is an associated organization of IUPAC, maintaining links with chemists from all fields.

www.iacis.nl

An Answer to the World's Water Crisis?

by Alan Smith

As the world's population rises from 6.5 billion today to 9 billion by 2050, access to fresh water will become even more important in the near future. Unfortunately, 97 percent of the world's water is salt water; of the remaining 3 percent, two-thirds are frozen.[1] As well as being scarce, the remaining 1 percent of the world's water supply is not evenly distributed, and this shortage is clearly a serious problem for developing countries.

The World Health Organization (WHO) has estimated[2] that 80 percent of illnesses in the developing world are water related, resulting from poor water quality and lack of sanitation. There are 3.3 million deaths each year from diarrheal diseases caused by *E. coli*, salmonella and cholera bacterial infections, and parasites and viral pathogens. In the 1990s, the number of children who died of diarrhea was greater than the sum of people killed in conflicts since World War II.

In 2004, IUPAC held a conference in Paris on *Chemistry in Water* intended to address some of the WHO statistics relating to water supplies. At that conference, the use of nanotechnology was only mentioned briefly, but, in recent years, interest has escalated.

In a report,[3] the Organization for Economic Co-operation and Development and Allianz highlighted how nanotechnologies for water treatment are expected to impact the developing world. PLoS Medicine, a policy forum for improving healthcare in society, has also identified[4] the importance of improved water treatment as one of the top 10 ways nanotechnology will change lives. A third, more recent, paper also considered the top 10 ways nanotechnologies will affect us, and clean water is listed among them.[5] Clearly, nanotechnologies are set to make a considerable impact on the water sector, most likely through three main areas: purification and wastewater treatment, monitoring, and desalination.

Water Facts

- 215 tonnes of H_20 to produce 1 tonne of steel
- 300 tonnes of H_20 to produce 1 tonne of paper
- 1000 tonnes of H_20 to produce 1 tonne of grain
- 15 000 tonnes of H_20 to produce 1 tonne of beef

Purification and Wastewater Treatment

Water for People: Water for Life, a UNESCO study,[6] reports that disinfection of water at the point of use has consistently proven to be the most cost-effective treatment method, putting the onus on the poor to ensure their drinking water is clean. In the developed world, what is being described as nanofiltration is receiving a lot of attention from water-treatment companies. Nanofiltration purifies water not by forcing it through tiny holes but by using a positive charge to attract negatively charged viruses and bacteria. TriSep Corporation, based in the USA, offers two nanofiltration membranes developed by DuPont; one removes color, iron, and hardness, and the other removes divalent ions and low molecular weight compounds, such as sugars. Argonide Corporation, also in the USA, has developed a highly electropositive filter, NanoCeram, that rapidly absorbs particles, no matter how small. The company is also promoting a new virus- and protein-separation process with a nanoalumina fiber that they claim removes 99.9999 percent of bacteria, viruses, and protozoan cysts. FilmTec Corporation, a subsidiary of Dow Chemical Company, makes high-quality reverse osmosis and nanofiltration elements for a wide variety of industrial, municipal, commercial, and home drinking-water applications. A number of other U.S. companies, such as EMembrane, Inc., KX Industries, Taasi, and so forth, have also developed nanofiltration systems.

The suitability of the above examples for remote

locations is not clear, but nanofiltration membranes have been used in a rural village in South Africa[7] for providing drinking water where the community water was contaminated with nitrates, chlorides, phosphates, and sulfate pollutants. The process uses four flat-sheet nanofiltration membranes and a reverse osmosis membrane.

Other techniques use the high surface area of nanoparticles or nanoclays to absorb pollutants, while an additional method uses nanoparticulate catalysts to break down contaminants. A promising development from the University of South Australia[8] is the use of pure silica coated with an active material to remove toxic chemicals, bacteria, viruses, and other hazardous materials from water. The claims are that these particles, coated with a nanometer thin film of active material, are more effective and cost less than conventional water-purification methods and could be used for small and large quantities of water.

A further development is the use of carbon nanotubes, hollow carbon fibers only one nanometer in diameter. Seldon Laboratories of Vermont has developed a nanomesh fabric made of fused carbon nanotubes that it says can filter out all bacteria, viruses, and other waterborne pathogens to U.S. Environmental Protection Agency potable water standards. The company claims that the mesh also removes lead, arsenic, and uranium. Researchers at Rensselaer Polytechnic Institute in the USA and Banaras Hindu University in India claim to have devised a simple method of producing carbon nanotube filters that remove microscale to nanoscale contaminants, such as nanometer-size polio viruses from water, as well as larger pathogens, such as *E. coli* and *Staphylococcus aureus* bacteria.

The University of Aberdeen is working with partners to develop a new technology that uses sunlight to treat dirty water and generate electricity at the same time.[9] Proof of concept has been demonstrated, and now they are scaling up to verify earlier indications that the process is more cost effective and environmentally friendly than existing technology and can treat chemical and biological contaminants. A photoelectrocatalyst is mounted into an electrochemical cell; when it reacts with light, the catalyst interacts with any organic matter in the water, oxidizing them across the catalyst's surface.

Monitoring

The developed world is looking at the analysis of a wide variety of contaminants in water.[10] Nanotechnology offers the potential for faster and more sensitive measurements; for example, in the health-care sector, the goal is to detect diseases before they have taken hold on the body. Promising nanotechnology applications for monitoring water already exist, but they tend to be specific to industrial applications where ultrapure water is being used.

An exciting development on the detection front comes from NanoSight in the UK,[11] which has a system that can detect waterborne nanoparticles and viruses in real time.

Target Analytes—Australia

- Metals: Cd, Cu, Pb, Hg, Ni, Zn, As, Cr, Al, Be, Ag
- Nutrients: PO_4^{3-}, NH_3, NO_3^-, total P, total N
- Algae: cyanobacterial toxins
- Biological: biological agents for terrorism, E. coli, viruses, bacteria, parasites
- Other: cyanide, organics, antiobiotics, chlroacetic acid, PBDEs

Desalination

As noted before, most of the world's water is salt water, and, despite technologies having been around for many years now, desalination is a very energy-intensive procedure with costly infrastructure and it tends to be expensive. The conventional process uses reverse osmosis, where extremely high pressure forces saline or polluted waters through the pores of a semipermeable membrane. Water molecules under pressure pass through these pores, but salt ions and other impurities cannot, resulting in highly purified water. However, nanotechnology solutions can greatly reduce the costs of desalination and are actually being used in such places as Israel and U.S. municipalities (e.g., Long Beach, California). Researchers at University of California at Los Angeles have developed a new reverse osmosis membrane that promises to reduce the cost of seawater desalination and wastewater reclamation. The new membrane uses a uniquely cross-linked matrix of polymers and engineered nanoparticles designed to draw in water ions but repel nearly all contaminants. These new membranes are structured at the nanoscale to create molecular tunnels through which water flows more easily than contaminants.

The nanocoated silica system from Australia, mentioned above, has been suggested as a very attractive alternative for desalination.

Conclusions

The Meridian Institute in the USA has focused on how nanotechnologies can help the poor and has produced a report[7] with case studies entitled *Nanotechnology, Water Development*. The main issues that need to be resolved include the following:

- accessibility to technologies
- affordability
- ease of operation
- fair distribution

A number of conferences have addressed the need for improved water-treatment methods, but it is unclear what action or progress has been taken, and they are more focused on improving the situation in developed countries. With thousands of children dying each day, the issues for developing countries need to be addressed very rapidly by some of the leading organizations that should be helping solve the problems. At the earliest opportunity, an assessment comparing the costs of currently accessible technologies that generate clean water with those in development is needed. This would provide a better view of what target technologies governments should be chasing. Developments in nanotechnology for water treatment are merely drops in the ocean; a great deal of progress has been made in the last five years, but more is needed—quickly.

A current IUPAC project entitled **Analysis of the Usage of Nanoscience and Technology in Chemistry** will map and critically study the use of the prefix "nano" in various fields of chemistry. The last few years have shown a wide proliferation of the terminology related to nanotechnology and nanoscience in chemistry. Today, all high-impact chemistry journals contain a large number of papers devoted to this growing area, as many conferences include specific sessions on nanotechnology. This project is the first step toward recommendations on the use of chemistry terminology related to nanoscience and nanotechnology, in order to avoid confusion; for more information, see <www.iupac.org/web/ins/2007-040-2-200>.

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3. *Opportunities and Risks of Nanotechnologies,* Organization for Economic Co-operation and Development and Allianz report, June 2005.
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Toward the Safer Management of Chemicals*

by Astrid Schomaker and Cristina de Avila

When the European Chemicals Agency (ECHA) officially started its operations at the beginning of June 2008, it marked a sea change in the management of chemicals in Europe. Regulation (EC) No. 1907/2006 of the European Parliament and the Council of 18 December 2006, an intensely debated piece of legislation—closely monitored by stakeholders within and beyond the European Union (EU)—concerning the registration, evaluation, authorization, and restriction of chemicals (REACH),[1] replaces 40 pieces of previous European chemicals legislation. The most distinctive and innovative feature of REACH is the reversal of the burden of proof: It is no longer the task of public authorities to prove that certain substances present certain risks; rather, those who wish to manufacture or import these substances in the EU must provide sufficient information on the effects of their chemicals on human health and the environment (on registration). In addition, to minimize and control the risks associated with chemicals, the manufacturer or importer must request authorization for the use of the most dangerous chemicals, and those substances presenting unacceptable risks to human health or the environment are to be restricted.

REACH is designed to close the knowledge gap on some 30 000 substances in a staggered process over the next 10 years and is expected to have wide-ranging benefits in terms of better public and occupational health and reduced pollution of air, water, and soil. Its impact is not limited to the EU's borders: It affects a broad range of industrial manufacturing activity and trade with Europe. REACH constitutes one of the EU's main contributions to achieving global sustainable development, as mandated by the 2002 World Summit on Sustainable Development.[2]

Registration

Starting from a one-tonne threshold, REACH establishes the basic principle that substances on their own, in preparations or in articles, must not be manufactured in the EU or placed on the EU market unless they have been registered with ECHA.[3] In practical terms, registration requires that manufacturers and importers compile data on the intrinsic properties of their substances, as well as safety and exposure data, and recommend appropriate risk-management measures. This information must be included in a registration dossier and submitted to ECHA.

Although registration has been considered too burdensome by some industry and non-EU-country stakeholders, it is important to note that in the tonnage bands between 1 and 10 tonnes (which concerns 20 000 of the approximately 30 000 substances), the information requirements are quite limited and in fact less comprehensive than under legislation prior to REACH. If a substance is placed on the EU market in quantities above 10 tonnes, the manufacturer or importer must submit, in addition to the information on intrinsic properties, a chemicals safety report (CSR) that contains a safety assessment of the substance concerned. Details on the relevant information requirements can be found in annexes VI to XI of the REACH regulation. All registration dossiers are checked by ECHA for completeness.

The obligations of producers and importers of articles are more limited than those of manufacturers or importers of substances on their own or in preparations: Producers and importers of articles are required to register the substances used in those articles, particularly if the substance is present in quantities total-

* An earlier version of this article was first published in *Chemistry Australia*, Vol. 75, No. 9, October 2008, pp. 5–7; revised and updated version reproduced with permission.

ing more than one tonne per manufacturer or importer per year and if it is intended to be released under normal conditions of use of the article. ECHA can take the initiative and demand a registration of any substance contained in articles if it has grounds for suspecting that a substance present in articles in quantities totaling more than one tonne is released from an article and presents a risk to human health or the environment.

The impact of REACH will not be limited to the EU's borders, nor will its benefits.

Substances introduced for the first time on the EU market have been subject to registration since 1 June 2008; for most other so-called "phase-in" substances, REACH creates a transitional regime that foresees their registration by deadlines in 2010, 2013, or 2018. The applicable deadline depends on the tonnage manufactured or imported and the hazard profile of the substance. To benefit from these extended deadlines, REACH stipulates that phase-in substances had to be preregistered between 1 June 2008 and 1 December 2008. Preregistration was a simple process that was free and involved communicating to ECHA the name of the substance, its European Inventory of Existing Chemical Substances and Chemical Abstracts Service Registry numbers, and the tonnage band for the volume intended to be manufactured or imported. During the preregistration period, ECHA received about 2.75 million preregistrations for about 150 000 substances. A comparatively small number of registration dossiers (94) were submitted in 2008. It is worth noting that of these 94 registrations, only 10 passed the completeness check, which raises the questions about the quality of submissions prepared so far, a concern that may become more acute as dossiers are assessed for compliance (see "Evaluation," below).

ECHA also undertakes to put companies preparing registrations for the same substances in touch with each other in Substance Information Exchange Fora (SIEFs) to reduce duplicate testing of substances and to minimize the costs associated with registration. The challenges companies are facing in the coming months are forming SIEFs and agreeing on the necessary elements to prepare registration dossiers together. This task presents itself as urgent in the case of high-volume substances. So far, a total of 146 171 pre-SIEFs have been formed to cover the preregistrations submitted to ECHA. The size of the pre-SIEFs varies greatly: 88 percent have less than 25 members, versus 138 pre-SIEFs that have more than 1 000 members.

Evaluation

Evaluation is the process of examining and analyzing the information submitted by the registrants. It serves the dual purpose of ensuring high-quality registration dossiers and preventing unnecessary testing. REACH distinguishes between two types of evaluation: dossier evaluation and substance evaluation. Dossier evaluation is carried out by ECHA and in itself covers two distinct activities: (1) scrutinizing testing proposals to ensure that the data they set out to generate are reliable and adequate while avoiding using vertebrate animals as much as possible; and (2) checking compliance of the registration dossier—i.e., verifying whether the information in the technical report and the CSR correspond to the legal requirements in the REACH regulation. ECHA is required to carry out compliance checks on at least 5 percent of all dossiers received per tonnage band.

Substance evaluation is performed by the competent authorities of the EU member states in a process coordinated by ECHA. It aims to follow up on initial concerns for human health or the environment by requesting additional information from the industry and further assessing the information obtained. ECHA will produce a three-year rolling action plan for substance evaluation by December 2011.

Authorization

Authorization ensures that the risks associated with the use of substances of very high concern (SVHC) are properly controlled and that these substances are progressively substituted with safer alternatives. Substances requiring authorization include those meeting the criteria for classification as carcinogenic, mutagenic, or reprotoxic (CMR) categories 1 and 2; substances that are persistent, bioaccumulative, and toxic (PBT); and substances that are very persistent and very bioaccumulative (vPvB). Substances for which scientific evidence of probable serious effects on humans or the environment exists, which gives rise to equivalent concern as the aforementioned categories (e.g., endocrine disruptors), can be identified on a case-by-case basis.

Authorization is not an automatic consequence of falling into any of the above categories. Rather, it requires the identification of substances to be included in the system as a first step. This involves the establishment of a candidate list for eventual inclusion in the annex to the regulation listing substances subject to authorization (Annex XIV), based on dossiers prepared by member states or ECHA on request by the European Commission (an EU body representing the common EU interest). From that list, ECHA will prioritize a certain number of substances at regular intervals and recommend the commission to include them in Annex XIV. Manufacturers, importers, or users of substances eventually included in Annex XIV may only place them on the market for use or use them if an authorization has been granted. The authorization process is transparent, granting third parties the possibility to submit information at various stages of the process.

ECHA published a first candidate list in 2008 and will make its first recommendation of priority substances on the basis of this list by 1 June 2009. This first candidate list contains 15 substances, of which 5 are carcinogenic, 3 are toxic for reproduction, 1 is carcinogenic and toxic for reproduction, 1 is a full CMR, 3 are PBTs, 1 is vPvB, and 1 is both PBT and vPvB. This very modest operational start for authorization is disappointing given the number of substances already today identified as CMRs and opens the question of what is to happen in the short term with these substances that have long been identified as SVHC. This concern is shared by many and has led NGOs and trade unions to publish their own lists of substances for which they are seeking substitution.[4] A number of EU member states are now working together to reach agreement regarding which of the eligible substances are of most concern, with a view to increasing the number of dossiers they will submit over coming years.

Restrictions

The restriction title of REACH entered into force on 1 June 2009 and is intended to be the "safety net" of REACH. Restrictions can be imposed where an unacceptable risk needs to be addressed on an EU-wide basis. Restriction dossiers can be prepared by a member state or by ECHA (when requested by the European Commission). The dossiers have to include information on hazards and risks causing the concern, information on alternatives, and justifications regarding why action is needed on an EU-wide basis and why the other mechanisms in REACH are not sufficient to address the problem. Once a substance is subject to a restriction, it cannot be manufactured, placed on the market, or used unless it is in compliance with the conditions of the restriction. Final decisions on authorizations and restrictions are rendered by the European Commission, assisted by a committee of member states, while the preparatory work is carried out by ECHA.

Conclusions and Outlook

The impact of REACH will not be limited to the EU's borders, nor will its benefits. While engaging in the REACH debate, many companies and EU international partners focused on reducing the economic impacts of the regulation on companies. For example, some lobbying focused on lowering the information requirements for registration or exemptions for registration in annexes IV or V, while others focused on limiting the impact of the substitution principle enshrined in authorization. Yet little was said on the foreseen benefits of REACH for humans and the environment.

The outlook for REACH is at present still unclear in terms of the capacity of industry and government authorities to meet expectations. The European Commission also faces a number of challenges in 2009, including developing its proposal for revised rules governing the identification of PBTs as set out in REACH Annex XIII. Over the years, the EU has accumulated considerable experience in this regard, which points to the necessity of a broad-based approach, taking into account information from a variety of sources in a weight-of-evidence approach and using expert judgment.

A new challenge ahead for the implementation of REACH is its application to nanomaterials. Questions arise in relation to substance identification and tonnage thresholds, which may prevent REACH from generating in all cases the comprehensive information it is expected to produce. The REACH approach of using tonnage as a proxy for exposure and hence for risk may need careful examination when applied to nanomaterials.

Knowledge knows no borders; neither does pollution. The EU has taken a first step toward a safer management of chemicals, and, although much work still remains, we should welcome the changes that REACH will bring globally.

Notes

1 Regulation (EC) No 1907/2006 established the European Chemicals Agency (ECHA), amending Directive 1999/45/EC and repealing Council Regulation (EEC) No. 793/93 and Commission Regulation (EC) No. 1488/94 as well as Council Directive 76/769/EEC and Commission Directives

91/155/EEC, 93/67/EEC, 93/105/EC, and 2000/21/EC.

2 See the Implementation Plan of the World Summit on Sustainable Development, paragraph 23, <www.world-summit2002.org>.

3 Although the basic principle of registration is that all substances on their own, in preparations, or in articles must not be manufactured in the EU or placed on the EU market unless they have been registered, wide groups of substances are exempted from the registration (evaluation and downstream user) obligations under REACH. Annexes IV and V to REACH contain substances and group of substances exempted from those obligations (minerals and ores are among those exempted in Annex V). Food, feed, and medicinal products are also exempted from registration and evaluation (the latter is also exempt from authorization).

4 See the NGO list at <www.sinlist.org> and the trade unions' list at <www.etuc.org>.

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Stamps International

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

Sweet Chemistry

Sugar, the ubiquitous sweet stuff that we enjoy in our foods and drinks (sometimes too much!) is an important source of dietary carbohydrate, mainly sucrose, and is commercially obtained in a huge scale from sugar cane or sugar beets. Although it is produced today in more than 100 countries, about 50 percent of the world's annual output, currently estimated at 160 million tonnes, comes from only four: Brazil, India, Thailand, and China. The extraction of sugar from cane has been practiced in India and Southeast Asia for centuries and the plant was taken by Columbus to the West Indies, where it flourished due to the tropical weather in the region. However, it was only in 1747 that a German analytical chemist, Andreas Sigismund Marggraf (1709–1782) announced the discovery of sugar in beets and verified that its composition was essentially the same as that of sugar isolated from cane. The growth of beets as a source of sugar is favored in regions with more tempered climate, especially since it requires four times less water that sugar cane.

The stamp from Germany illustrated in this note was issued on 12 March 1992 to commemorate the 125th anniversary of the Sugar Institute in Berlin, now associated with the prestigious Technical University (TU Berlin), where the extraction and production of sugar from beets in an industrial scale has been investigated since 1867. The stamp features a sprightly specimen of white beet (Beta vulgaris) and the silhouettes of the three chemists who played key roles in the development of the sugar industry, namely Andreas Marggraf, his student Franz Karl Achard (1753–1821), who built the first beet sugar factory in 1801, and Carl Scheibler (1827–1899), one of the founders of the Sugar Institute in Berlin. And if you find yourself in Berlin looking for a sweet treat, don't hesitate to visit the local Sugar Museum!

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

Discovery of the Element with Atomic Number 112

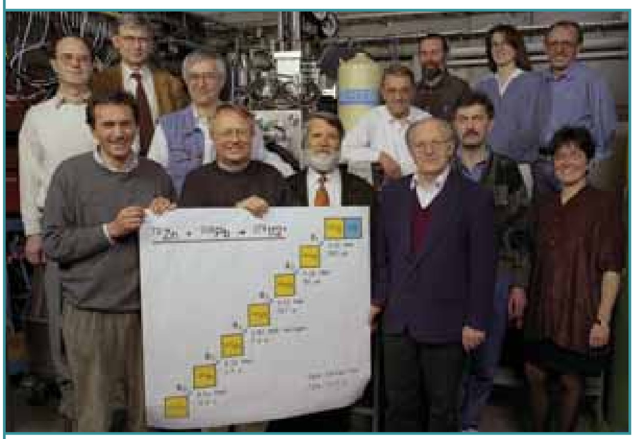
Priority for the discovery of the element with atomic number 112 has been assigned, in accordance with the agreed criteria, to Gesellschaft für Schwerionenforschung (GSI) (Center for Heavy Ion Research) in Darmstadt, Germany. The discovery evidence was recently reviewed and recognized by a IUPAC/IUPAP joint working party. IUPAC confirmed the recognition of the element in a letter to the head of the discovering team, Sigurd Hofmann.

The IUPAC/IUPAP Joint Working Party (JWP) on the priority of claims to the discovery of new elements has reviewed the relevant literature pertaining to several claims. In accordance with the criteria for the discovery of elements previously established by the 1992 IUPAC/IUPAP Transfermium Working Group, and reiterated by the 1999 and 2003 IUPAC/IUPAP JWPs, it was determined that the 1996 and 2002 claims by Hofmann et al. research collaborations for the discovery of the element with atomic number 112 at GSI share in the fulfillment of those criteria.

A synopsis of the relevant experiments and related efforts is presented in a technical report published online in *Pure and Applied Chemistry* on 25 May 2009. The new element is approximately 277 times heavier than hydrogen, making it the heaviest element in the periodic table.

With the priority for this discovery established, the laboratory at Darmstadt will be invited to propose a name for the super-heavy element. The suggested name will then go through a review process before adoption by the IUPAC Council.

doi:10.1351/PAC-REP-08-03-05 or see IUPAC project 2006-046-1-200



The international team of scientists presents the production of the element with atomic number 112 for the first time <www.gsi.de/portrait/Pressemeldungen/10062009-1_e.html>.

2009 Winners of the IUPAC Prizes for Young Chemists Announced

On 3 April 2009, IUPAC announced the winners of the 2009 IUPAC Prizes for Young Chemists, awarded for the best Ph.D. theses in the chemical sciences as described in 1 000-word essays. The five winners are:

- **Faisal A. Aldaye**, McGill University, Montréal, Canada
- **Christopher Bettinger**, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA
- **Xinliang Feng**, Max Planck Institute for Polymer Research, Mainz, Germany
- **Xing Yi Ling**, University of Twente, Enschede, Netherlands
- **Shengqian Ma**, Miami University, Oxford, Ohio, USA

The winners will each receive a cash prize of USD 1 000 and will be invited to travel and take part in the IUPAC Congress, 2–7 August 2009, in Glasgow, Scotland. Each prizewinner will also be invited to present a poster at the IUPAC Congress describing his or her award-winning work and to submit a short critical review on aspects of his or her research topics to be published in *Pure and Applied Chemistry*. The awards will be presented to the winners of the 2008 and 2009 prizes during the Opening Ceremony of the Congress.

The essays describing the 2009 winners' theses—which can be found on the IUPAC website—cover a wide range of subjects:

- **Aldaye**: "Supramolecular DNA Nanotechnology: Discrete Nanoparticle Organization, Three-Dimensional DNA Construction, and Molecule-Mediated DNA Self-Assembly"
- **Bettinger**: "Synthesis and Microfabrication of Elastomeric Biomaterials for Advanced Tissue Engineering Scaffolds"
- **Feng**: "C_3-Symmetric Discotic Liquid Crystalline Materials for Molecular Electronics: Versatile Synthesis and Self-Organization"
- **Ling**: "From Supramolecular Chemistry to Nanotechnology: Assembly of 3D Nanostructures"
- **Ma**: "Gas Adsorption Applications of Porous Metal-Organic Frameworks"

Thirty-six applications from 19 different countries were received. The Prize Selection Committee was composed of members of the IUPAC Bureau who provided a wide range of expertise in chemistry. The committee was chaired by Bryan Henry, IUPAC past president.

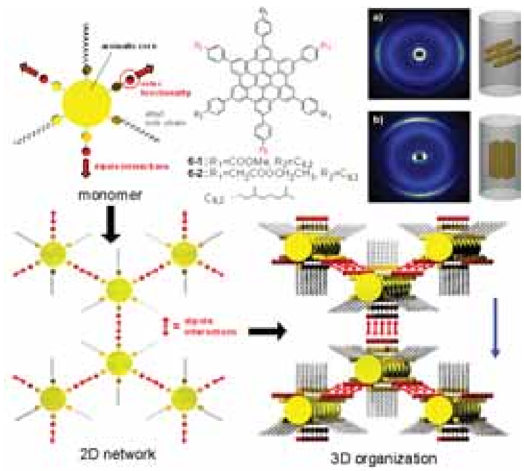


Figure 5, from Xinliang Feng's essay, is a schematic illustration of self-assembly and orientation during mechanical processing of various assemblies.

Because so many applications were of high quality, the committee decided to give five **honorable mentions** to:

- **Ludovico Cademartiri**, University of Toronto, Toronto, Canada
- **Alexandre Côté**, Université de Montréal, Montréal, Canada
- **Jason Philip Holland**, University of Oxford, Oxford, UK
- **David J. Payne**, University of Oxford, Oxford, UK
- **Yu Zhang**, Zhejiang University, Zhejiang, China

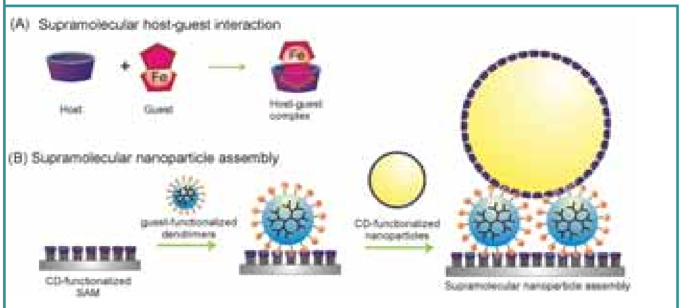


Figure 1, from Xing Yi Ling's essay, is a scheme of (A) one-to-one host-guest complexation, and (B) supramolecular nanoparticle assembly.

The recipients of the honorable mentions will each receive a cash prize of USD 100 and a copy of *Quantities, Units, and Symbols in Physical Chemistry*, the IUPAC Green Book.

Applications for the 2010 prizes are now being solicited. Visit the IUPAC website <www.iupac.org> for more information.

RSC Acquires ChemSpider

In May 2009, the Royal Society of Chemistry acquired ChemSpider, a free online service providing a structure centric community for chemists. Providing access to almost 21.5 million unique chemical entities sourced from over 200 different data sources and integration to a multitude of other online services, ChemSpider is the richest single source of structure-based chemistry information.

Alan McNaught, coordinator of the IUPAC International Chemical Identifier project, feels the RSC is committed to expanding this important online resource: "I am immensely pleased that ChemSpider's ground-breaking initiative, developed on a wing and a prayer and much individual goodwill, is now supported by the most innovative of national chemical societies."

Antony Williams, the original host of ChemSpider, is excited by the new possibilities: "What originally started as a hobby project to give back something to the chemistry community has become one of the primary Internet resources for chemistry. And this from home-built computers in a basement, with no funding and a team of volunteers. With the resources, reputation, and vision of the RSC to support ChemSpider, our long-term goal is to deliver the primary online platform where chemists will resource information and collaborate with a worldwide community of scientists."

The ChemSpider development team will continue to be located in the USA and the ChemSpider website will be relaunched later in the year.

www.chemspider.com

Marking the Centenary of Houben-Weyl

Since 1909, *Houben-Weyl* has been used by chemists working in academia and industry. This influential work, available in print and electronic editions (available online through *Science of Synthesis* <www.science-of-synthesis.com>), has been made possible by the worldwide collaboration of renowned chemists, including several Nobel laureates. In order to mark the *Houben-Weyl* centenary, 100 selected articles from *Houben-Weyl*, *Science of Synthesis*, *SYNLETT*, and *SYNTHESIS* that cover a variety of themes—including stereoselective synthesis, fluorine, peptides, and heterocyclic and organometallic chemistry—have been collocated and can be downloaded for free through 2009 on the Thieme Chemistry website <www.thieme-chemistry.com>.

The first topic covered in March 2009 was "fluorine." *Houben-Weyl* and *Science of Synthesis* exhaustively cover fluorine compounds. Alone, fluorine gas is extremely poisonous, but, when combined with other atoms, it forms compounds that are versatile. Consequently, it is used for a variety of applications, including solvents, anticancer agents, agricultural chemicals, dyes, and polymers. The key contributions from this seminal work that are being made available for download have been chosen by experts and should help assist the organic chemist in understanding some of fluorine chemistry's different aspects.

"We are delighted to be able to make freely available a sample of the content from *Houben-Weyl* and *Science of Synthesis* so that a wider audience can begin to appreciate both the high quality of the author contributions and the relevance of the science covered in the series to research in organic chemistry today. We are also happy to be able to offer selected *SYNTHESIS* and *SYNLETT* journal articles, which relate to the chosen themes, for free download," said Dr. M. Fiona Shortt de Hernandez, managing editor at *Science of Synthesis/Houben-Weyl*.

100 YEARS 1909 – 2009 Houben-Weyl and Science of Synthesis

www.thieme-chemistry.com/en/our-service/houben-weyl-centenary.html

PI-IUPAC Award 2009—Call for Nominations

The executive editors of *Polymer International* and the IUPAC Polymer Division are pleased to announce the second award open to scientists under age 40: The *PI*-IUPAC Award for Creativity in Applied Polymer Science or Polymer Technology. The award will be presented at the upcoming IUPAC World Polymer Congress—MACRO 2010, to be held 11–16 July 2010 in Glasgow, Scotland, UK.

The winner will be awarded USD 5 000, plus travel and accommodations to attend MACRO 2010, where he or she will present a keynote lecture. A Scientific Committee representing *Polymer International* and the IUPAC Polymer Division will select the winner on the basis of scientific merit after 30 November 2009.

Please send your nominations by e-mail to *Polymer International* at <polyint@wiley.com> before **30 October 2009**.

Details for Nominations

Nominees must be under age 40 on 31 December 2010 and available to present a keynote lecture at MACRO 2010. Self-nominations will not be accepted. Please include the following with your nomination:

- your name and address
- full name and date of birth of nominee
- business address of nominee
- nominee's academic background and education (college or university, location, major field, degree, year awarded)
- nominee's employment history (position, organization, duties, dates)
- nominee's publications, patents, unpublished reports, papers presented at meetings (please include a list of those you deem pertinent)
- nominee's honors and awards
- scientific achievements for which the candidate is nominated for this award

www3.interscience.wiley.com/journal/117946201/grouphome/News.html

Election of IUPAC Officers and Bureau Members

On 1 January 2010 Nicole Moreau (France), vice president and president-elect of IUPAC will become president. Jung-Il Jin (Korea), current president, will become past president and remain an officer and a member of the Bureau for a period of two years. Meanwhile, Bryan Henry (Canada), current past president, will retire, while Secretary General David StC. Black (Australia) and Treasurer John Corish (Ireland) who were elected to four-year terms, 2007-2011, will continue their service for two more years.

At its assembly in Glasgow on 5–6 August 2009, the Council will be asked to elect a vice president and members of the Bureau to fulfill the vacancies created by retiring members. This year, the candidates are as follows:

Election Ballot

Vice President

- ❑ Srinivasan Chandrasekaran (India)
- ❑ Kazuyuki Tatsumi (Japan)

Bureau

- ❑ Colin Humphris (UK)
- ❑ Stanislaw Penczek (Poland)—*reappointment*
- ❑ Elsa Reichmanis (USA)—*reappointment*
- ❑ Maria C.E. van Dam-Mieras (Netherlands)—*reappointment*
- ❑ Itamar Willner (Israel)
- ❑ Qi-Feng Zhou (China/Beijing)

Details on the election of officers and Bureau members, including bios of the nominees, are available online. To make your voice heard, contact your National Adhering Organization and get involved!

www.iupac.org/web/act/Glasgow_2009-07-31

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
- 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 committees
- to take all other steps necessary for the good conduct of the affairs of the Union

See the Bylaws for more details.

Chemistry Research Funding

by Edwin Becker, Christopher Ober, and Bryan Henry

Science knows no international boundaries, but *funding* for support of scientific research is mostly provided by national organizations. This is particularly true for the chemical sciences, where most research projects are relatively small—not the megaprojects characteristic of high energy physics, astronomy, space science, oceanography, ecological sciences, and biomedical research. In 2004, a group of representatives of organizations from several countries that support research in chemistry met under the auspices of IUPAC. They exchanged information and began discussions of the development of better mechanisms to encourage international research collaboration.

These discussions led to two IUPAC projects, 2004-014-1-020 and 2006-013-1-20, which brought representatives of major funding agencies together for meetings and workshops in London, Beijing, Budapest, Torino, Philadelphia, and Washington, D.C., from 2004 to 2008. Individuals from 16 countries participated in at least one of these meetings. Topics included:

- national research funding philosophies, conditions, and guidelines
- trends and priorities in chemical research
- methods for tracking chemical research and measuring its impact

- programs in chemical research that encourage international partnerships
- resources that can be shared through international partnerships
- education and workforce in the chemical sciences

A second theme focused on transnational funding programs. Although many formal bilateral agreements between nations encourage scientific collaboration, practical implementation of joint research funding has been difficult, partly because the policies, fiscal years, procedures, application forms, and sometimes languages used vary from one country to another. Nevertheless, several successful funding arrangements have been developed in the chemical sciences. These arrangements were examined with the goal of developing broader international funding programs. Ultimately, the hope is that these mechanisms can be used to facilitate funding chemical research in developing countries.

Science knows no international boundaries, but funding for support of scientific research is mostly provided by national organizations.

As a result of these projects, the Committee on Chemistry Research Funding (CCRF) was established in December 2007 as a body reporting directly to the IUPAC Bureau. Membership in the CCRF is open to people nominated by any national organization that provides substantial funding to research (including training and public outreach) in the chemical sciences. Most such organizations are governmental agencies, but some are not. For some countries, more than one such major organization may wish to participate. Also, an organization representing a large national region or a multicountry region may be eligible to participate. Appointments are made formally by the president of IUPAC or his or her designee on nomination by appropriate organizations. Each participating organization is expected to maintain its principal representative as a current staff member engaged in chemistry research funding. Either the immediate past president of IUPAC or an individual designated by the IUPAC president will chair the CCRF.

Within the context of IUPAC's overall activities, the CCRF is expected to improve communications among the funding organizations and to help develop best practices for international research collaboration. For example:

- CCRF could catalyze the whole process of developing international funding mechanisms, with the objectives of increasing collaborative research projects and facilitating international exchange of scientists.
- CCRF might help with standardization of terminology in processing, reviewing, and funding. IUPAC might recommend principles for grant applications for international projects and for review of those applications.
- CCRF could help clarify internationally accepted definitions of and guidelines for such topics as science-driven versus industry-related research, bottom-up versus top-down approaches, peer review, conflicts of interest, scientific misconduct, and so forth.
- As this area develops, CCRF might be well positioned to provide shared guidance, especially to developing countries, on mechanisms for review and support of research in the chemical sciences.
- Workshops under the aegis of IUPAC would attract attention internationally and might include such topics as:
  - needs of small versus large countries
  - needs of developed versus developing countries
  - intellectual property issues
  - methods for tackling "grand challenges" in the chemical sciences
  - ways to encourage greater participation and recognition of women in chemistry
  - means of fostering interdisciplinary studies involving chemistry
  - enhancement of dialogue between scientists and program officers

An early result from CCRF discussions is a pilot project in polymer chemistry. This project is an innovative first step in the development of international funding programs. The IUPAC Polymer Division Committee, in cooperation with several national funding organizations, has initiated a project to encourage and to support international research collaboration in several aspects of polymer chemistry. This project builds on successful bilateral projects among the National Science Foundation (USA), the Deutsche Forschungsgemeinschaft (German Research Foundation), and other organizations, but it is intended to bring together researchers from at least three countries. This project is an effort to identify and to refine best practices in international research funding.

A call for preproposals to be submitted through IUPAC as a "neutral" international establishment will be issued in August 2009. Preproposals will be evaluated by teams appointed by IUPAC through the Polymer Division and the participating funding organizations, and full proposals will be solicited. Review will begin by e-mail, with the selection panel to meet at the World Polymer Congress in July 2010. Funding should start by August 2010. Results of this pilot project will guide further developments in soliciting multinational proposals in the chemical sciences.

CCRF will meet as part of the IUPAC General Assembly in Glasgow. CCRF is an exciting new IUPAC initiative, and input from any interested members of the IUPAC community is most welcome.

Please send suggestions to Bryan Henry <chmhenry@uoguelph.ca>, chair of the Committee on Chemistry Research Funding.

Methods of Measurement and Evaluation of Natural Antioxidant Capacity/Activity

The chemical diversity of natural antioxidants makes it difficult to separate, detect and quantify individual antioxidants from the complex matrix. Moreover, the total antioxidant power is often more meaningful to evaluate health beneficial effects because of the cooperative action of individual antioxidant species. Currently there is no single antioxidant assay for food labeling because of the lack of standard quantification methods.

Antioxidant assays may be broadly classified as the electron transfer (ET)- and hydrogen atom transfer (HAT)-based assays. The results obtained are usually

hardly comparable because of the different mechanisms, redox potentials, pH- and solvent-dependencies, etc., in various assays.

This project will help identify and quantify properties and mutual effects of antioxidants, to bring a more rational basis to the classification of antioxidants and antioxidant assays and to make the results more comparable and understandable. This project will bring in terms of definitions or definition-like characterization and classification of the chemical and biochemical methods of antioxidant assays as well as related antioxidant chemistry and provide analytical, food chemical, biomedical/clinical, and environmental communities with critical evaluation on this topic.

The task group members are experienced in various methods of antioxidants assay. The chairperson has developed a novel CUPRAC (cupric reducing antioxidant capacity) method[1] which has been successfully applied to antioxidants assay in food plants, human serum, and to hydroxyl radical scavengers.[2]

References

1. R. Apak, K. Güçlü, M. Özyürek, S. E. Karademir, J. *Agric. Food Chem.* 52 (2004) 7970-7981. doi:10.1021/jf048741x
2. M. Özyürek, B. Bektaþoðlu, K. Güçlü, R. Apak, *Anal. Chim. Acta*, 616 (2008) 196-206. doi:10.1016/j.aca.2008.04.033

For more information and comments, contact Task Group Chair Resat Apak <rapak@istanbul.edu.tr>.

www.iupac.org/web/ins/2008-031-1-500

Development of a Pesticide Ecological Risk Assessment and Training Module

The Chemistry and the Environment Division Committee has agreed to support continued development of "e-Valuate," an Internet-based pesticide ecological risk-assessment and training module. Under the first part of this project (2004-011-1-600), a draft pesticide ecological risk-assessment and training module was funded by the U.S. Environmental Protection Agency (EPA) Office of Pesticide Programs with support from FAO/AGPP (Plant Protection Service of FAO, the Food and Agriculture Organization of the United Nations), the FAO-IAEA Joint Division for Agriculture, and IUPAC. This early version used a relative risk exposure assessment paradigm.

The current version of e-Valuate is designed to follow the EPA methodology for ecological risk assessment. In this version, the relative-risk methodology has been replaced with the user-friendly EXPRESS (EXAMS-PRZM Exposure Simulation Shell) modeling platform. The Pesticide Root Zone Model (PRZM) and Exposure Analysis Modeling System (EXAMS) are pesticide fate and transport models developed by EPA. EXPRESS is designed to make complex pesticide fate and transport models much easier to use and to bring more sophisticated levels of risk assessment within reach of many countries.

e-Valuate includes descriptions of methods for ecological risk assessment and risk characterization, models and tools for simulation of pesticide exposure, methods of risk management, information on safe usage and disposal of pesticides, risk-assessment training materials and presentations, a pesticide glossary, and a library of pesticide websites. English and Spanish versions have been developed.

The second phase of this project will provide support for development of PRZM cropping scenarios in conjunction with regulatory officials and others from developing countries. These new scenarios will be designed to incorporate soil, weather, and agricultural practices in developing countries. IUPAC leadership in this project is ideal because of its long history of working on international pesticide issues.

For more information and comments, contact Task Group Chair Ronald Parker, <parker.ronald@epa.gov>.

www.iupac.org/web/ins/2008-011-2-600

Basic Guidelines for Polymer Nomenclature

IUPAC has a long history of carefully tailoring rules to help polymer scientists name the polymers that they are using and synthesizing. While many scientists are aware of the importance of correctly applying nomenclature, it is apparent to journal managers and editors that polymer names are not always properly used in submitted articles. The case for exactly naming polymers is all the stronger in this day of computer-based searches.

This project's goal is to help close this gulf by widely distributing, through the portals of polymer-interested journals, a short (two-page), easily assimilated document that will describe basic rules that can be applied to most polymers. The guidelines will not detail all the available rules—far from it!—but they should help polymer scientists, especially those who have had little prior contact with polymer nomenclature, understand how some basic conventions can be applied to most common and novel polymers. Hyperlinks will be placed in the PDF file to allow authors to explore in greater detail the wealth of documents already made available by IUPAC.

Representatives from American Chemical Society , Elsevier, Wiley, and IUPAC will come together to build the document and to ensure its distribution. These basic guidelines to polymer nomenclature should be easily accessible to anyone who wants to write a paper on polymer science. It is also hoped that the guidelines will make life easier for those working behind the scenes in polymer publishing.

For more information and comments, contact Task Group Chair Roger Hiorns <hiorns@enscpb.fr>.

www.iupac.org/web/ins/2008-032-1-400

Laboratory Test Terminology Trial-Run Begins

On 1 April 2009, the owners of three standards that contain laboratory test terminology—Logical Observation Identifiers, Names, Codes (LOINC); Nomenclature, Properties, and Units (NPU); and Systematized Nomenclature of Medicine—Clinical Terms (SNOMED CT)—began an operational trial of prospective divisions of labor in the generation of laboratory test terminology content. This trial will provide practical experience and important information on opportunities to decrease duplication of efforts in the development of laboratory test terminology and to ensure that SNOMED CT works effectively with LOINC or NPU.

During the trial:

- New laboratory test terminology content will be created by the Regenstrief Institute (RI) and the LOINC Committee, which owns LOINC, or by the International Federation of Clinical Chemistry (IFCC) and the International Union of Pure and Applied Chemistry (IUPAC), which owns NPU, but not by the International Health Terminology Standards Development Organization (IHTSDO), which owns SNOMED CT.
- SNOMED CT modeling of such content will be done as a by-product of creating new content for LOINC or NPU and then incorporated into SNOMED CT.
- SNOMED CT codes will be used to represent appropriate parts of LOINC and NPU entities.

Designed to last six months or less, the trial will also provide an opportunity to assess the robustness of the new SNOMED CT Observables Model as a structure for representing LOINC and NPU laboratory test terminology content; to gain a clearer picture of the differences between LOINC and NPU as background for future discussions about the feasibility of a more unified effort between them to further reduce duplication of efforts; and to identify any country-specific aspects of laboratory test terminology that may not be suitable for inclusion in the international release of SNOMED CT. During this period, users can continue to submit requests for laboratory test terminology to any of the three organizations involved in the trial.

Martin Severs, chair of the IHTSDO Management Board, stated, "The IHTSDO is extremely pleased to have reached the point of an operational trial of cooperative terminology development with the Regenstrief Institute and IFCC-IUPAC. Some of IHTSDO's member countries use both LOINC and SNOMED CT, some use both NPU and SNOMED CT, and others expect SNOMED CT to include the level of laboratory test terminology required to meet their needs. Patients and health-care providers need these standards to work together. We are therefore committed to minimizing patient risk and supporting effective communication, decision support, and health data analysis by ensuring that SNOMED CT can work effectively in combination with either LOINC or NPU in computer systems that support electronic patient records."

Daniel Vreeman, research scientist at RI and assistant research professor at the Indiana University

School of Medicine, said, "We are delighted to have an opportunity to 'just do it' for a trial period, so that a long-term agreement between LOINC and SNOMED CT can be informed by a real understanding of the specific technical and policy issues involved in cooperative development of standard terminology. It is an added bonus that the trial may also help identify opportunities to reduce duplication of effort in LOINC and NPU development."

Speaking on behalf of IFCC and IUPAC, Graham Beastall, IFCC president, said, "The current economic environment gives us an even stronger motivation to minimize international duplication of efforts in standards development and to facilitate international exchange and interpretation of laboratory examination data."

For more information and comments, contact Task Group Chair Urban Forsum <urban.forsum@imk.liu.se>.

www.iupac.org/web/ins/2009-005-1-700

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.

www.iupac.org/reports/provisional

Glossary of Terms Used in Biomolecular Screening

Biomolecular screening is now a crucial component of the drug discovery process and this glossary of terms 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 in the cases where they are, the definitions are often not 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 of authoritative definitions will be useful not only for regular practitioners, but also for those who make use of the data generated during the screening process.

Comments by 30 September 2009

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www.iupac.org/reports/provisional/abstract09/proudfoot_300909.html

Explanatory Dictionary of Key Terms in Toxicology, Part II

The objective of the Explanatory Dictionary of Key Terms in Toxicology is to give full explanations of the meaning and usage of toxicological terms chosen for their importance and complexity with regard to the merging of chemistry into toxicology. This requires a full description of the underlying concepts, going beyond a normal dictionary definition. Often, linguistic barriers lead to problems in obtaining a common understanding of terminology at an international level and between disciplines. The explanatory comments should help to break down such barriers. This dictionary is a follow up and continuation of part I published in 2007 (*Pure Appl. Chem.*, 2007, Vol. 79, No. 9, pp. 1583-1633; doi:10.1351/pac200779091583). It consists of a collection of terms chosen from the IUPAC Glossary of Terms Used in Toxicology.

Comments by 31 August 2009

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www.iupac.org/reports/provisional/abstract09/nordberg_310809.html

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

Thermodynamic and Thermophysical Properties of the Reference Ionic Liquid: 1-Hexyl-3-methylimidazolium bis[(trifluoromethyl)sulfonyl]amide (including mixtures). Part 1. Experimental Methods and Results (IUPAC Technical Report)

Kenneth N. Marsh, Joan F. Brennecke, Robert D. Chirico, Michael Frenkel, Andreas Heintz, Joseph W. Magee, Cor J. Peters, Luis Paulo N. Rebelo, and Kenneth R. Seddon
Pure and Applied Chemistry, 2009
Vol. 81, No. 5, pp. 781–790

This article (and the following part 2*) summarizes the results of IUPAC Project 2002-005-1-100 (Thermodynamics of Ionic Liquids, Ionic Liquid Mixtures, and the Development of Standardized Systems). The methods the contributors used to measure the thermophysical and phase equilibrium properties of the reference sample of the ionic liquid 1-hexyl-3-methylimidazolium bis[(trifluoromethyl)sulfonyl]amide and its mixtures are summarized, along with the uncertainties the contributors estimated. Some results not previously published are presented. Properties of the pure ionic liquid included thermal properties (triple-point temperature, glass-transition temperature, enthalpy of fusion, and heat capacities of condensed states), volumetric properties, speeds of sound, viscosities, electrolytic conductivities, and relative permittivities. Properties for mixtures included gas solubilities, solute activity coefficients at infinite dilution, liquid-liquid equilibrium temperatures, and excess volumes. The companion article (part 2) provides a critical evaluation of the data and recommended values with estimated combined expanded uncertainties.

http://dx.doi.org/10.1351/PAC-REP-08-09-21

*Part 2. Critical Evaluation and Recommended Property Values (IUPAC Technical Report)

Robert D. Chirico, Vladimir Diky, Joseph W. Magee, Michael Frenkel, and Kenneth N. Marsh
Pure and Applied Chemistry, 2009
Vol. 81, No. 5, pp. 791–828

http://dx.doi.org/10.1351/PAC-REP-08-09-22

Glossary of Terms Used in Ecotoxicology (IUPAC Recommendations 2009)

Monica Nordberg, Douglas M. Templeton, Ole Andersen, and John Henderson Duffus
Pure and Applied Chemistry, 2009
Vol. 81, No. 5, pp. 829–970

This glossary's objective is to provide clear definitions for those who contribute to studies relevant to ecotoxicology but are not themselves ecotoxicologists. This situation applies especially to chemists who need to understand the ecotoxicological literature without recourse to a multiplicity of dictionaries. The glossary includes terms related to chemical speciation in the environment, sampling, monitoring, and environmental analysis, as well as terms related to adverse ecological effects of chemicals, ecological biomarkers, and the environmental distribution of chemicals. The dictionary consists of 1 139 terms. In addition to chemists, the authors hope that pharmacologists, toxicologists, ecotoxicologists, risk assessors, regulators, medical practitioners, and regulatory authorities will find this glossary helpful. In particular, the glossary should facilitate the use of chemistry in relation to environmental risk assessment.

http://dx.doi.org/10.1351/PAC-REC-08-07-09

Glossary of Terms Related to Pharmaceutics (IUPAC Recommendations 2009)

Eli Breuer, Mukund Shankar Chorghade, János Fischer, and Gershon Golomb
Pure and Applied Chemistry, 2009
Vol. 81, No. 5, pp. 971–999

The idea of constructing a glossary of terms related to pharmaceutics was first raised at the meeting of the Section on Medicinal Chemistry of the Division of Chemistry and Human Health in 1999 and became a recognized project in 2001.

Prior to this glossary, the Division of Chemistry and Human Health did not deal with the areas of pharmacy and pharmaceutics, although the Section on Medicinal Chemistry has dealt with closely related subjects, such as toxicology, drug metabolism, pharmaceutically acceptable drug salts, training and research in medicinal chemistry in developing countries, and the glossary of terms used in medicinal chemistry, as well as other topics.

"Pharmaceutics" is defined in this glossary as the science of the preparation of drugs, dosage forms, and drug delivery systems, taking into account the pharmacokinetics and pharmacodynamics of the drug as well as its physical and chemical properties. Thus, many branches of chemistry, such as organic, inorganic, solid state, colloid, and surface chemistry, as well as nanotechnology and others, play roles in pharmaceutics. Even the more biologically oriented branch of pharmaceutics—i.e., biopharmaceutics—draws on chemical concepts, such as (pharmaco)kinetics, absorption, dissolution, diffusion, and others. Therefore, it is timely for IUPAC to publish recommendations in this area.

The field of pharmaceutics itself is of a multidisciplinary nature, as its practitioners come from a variety of disciplines, such as chemistry or various biological sciences; thus, a glossary containing authoritative definitions would be useful for them. The terms used in pharmaceutics are rarely covered by existing glossaries; the few glossaries that do include them provide definitions that are often inappropriate for the field of pharmaceutics and require new or modified definitions to better fit the new context.

This glossary of terms related to pharmaceutics is needed by practitioners in the field, because it fulfills an important and crucial role that is different from the roles of other scientific disciplines involved in the drug-making process. The glossary contains 168 definitions used in pharmaceutics. These terms are related to various aspects of this discipline, such as (1) physicochemical characterization of pharmaceutical preparations and the active ingredients they contain, (2) unit operations used in the practice of pharmaceutics, (3) terms related to the various dosage forms, (4) terms related to the various modes and routes of drug delivery, (5) terms used in pharmacokinetics and biopharmaceutics in general, and (6) additional miscellaneous terms.

Considerable effort was made to make all the terms in the glossary compatible with similar terms (where they exist) in the online IUPAC Gold Book. Readers are invited to point out any errors or inconsistencies to the authors.

For more information and comments, contact Task Group Chair Eli Breuer <elib@ekmd.huji.ac.il>.

http://dx.doi.org/10.1351/PAC-REC-04-10-14

Reference Matrices: An Essential Tool for Testing Extrinsic Substance Properties

Werner Kördel, et al.
Trends in Analytical Chemistry, 2009
Vol. 28, Issue 1, pp. 51–63

Within a substance-oriented concept in environmental testing (e.g., the European legislation on chemical—REACH—or pesticide and biocide registration) or a preventive approach to environmental protection, the occurrence, fate, and exposure processes and the adverse effects imposed by toxicants have to be elucidated and assessed. This means having to consider processes that depend on the properties of the substance, the properties of the environmental compartments, and the habitat and sensitivity of the organisms tested. To derive tolerable concentrations of substances (pollutants) in environmental compartments (e.g., soils or sediments), it is necessary to measure both intrinsic properties and extrinsic response functions.

The concept of reference matrices does not deal with the "static" physical and chemical properties of a matrix but with dynamic functions (e.g., transformation, sorption or desorption, transport and effects on fauna and flora). It is important to mention that reference matrices are designed for laboratory testing. This means matrices are sampled in a specific environmental compartment, treated, stored, and characterized. By this, the original sample becomes a specific lot of a reference entity (e.g., a true soil). The idea behind the reference system is to reduce the complexity of the natural environment to a level where it becomes controllable from an experimental point of view without losing the ability to commute the results obtained back to the reality of the original environment.

The concept supports standardization in measurement and testing of chemicals in the environmental or in biological systems, thus leading to:

- comparability of experimental data
- traceability to the common reference point, thus introducing the notion of quality control over measurement and testing
- the ability to extrapolate laboratory findings to the "real world" or the natural environment by using models

The concepts and the philosophy of reference matrices were developed within the IUPAC project on reference soils, and their feasibility was proven using this example. Well-defined reference matrices offer interesting perspectives for increasing environmental realism in chemical risk assessment. The legislation and regulation of various groups of biologically active substances, such as pesticides, biocides, and pharmaceuticals, and the new chemical regulation (REACH) emphasizes the need to have available well-defined reference matrices. This need parallels the need to test environmental fate and effects and new materials (e.g., artificially produced nanomaterials).

The concept that we outline provides suitable guidelines for selecting reference matrices. However, we note that agreement on optimal application of reference matrices and interpretation of results obtained in tests using reference matrices needs to be reached between scientists, risk assessors, reference laboratories, and international standard organizations.

For more information and comments, contact Werner Kördel <werner.koerdel@ime.fraunhofer.de>; Willie Peijnenburg <wjgm.peijnenburg@rivm.nl>; or Bernd Gawlik <bernd.gawlik@jrc.it>.

www.iupac.org/web/ins/2001-026-1-600

Comprehensive Inter-Laboratory Calibration of Reference Materials for δ^{18}O Versus VSMOW Using Various On-Line High-Temperature Conversion Techniques

W.A. Brand, T.B. Coplen, A.T. Aerts-Bijma, J.K. Böhlke, M. Gehre, H. Geilmann, M. Gröning, H.G. Jansen, H.A. J. Meijer, S.J. Mroczkowski, H. Qi, K. Soergel, H. Stuart-Williams, S.M. Weise, and R.A. Werner

Rapid Comm. Mass Spectrom, 2009
Vol. 23, Issue 7, pp. 999–1019
doi:10.1002/rcm.3958

Internationally distributed organic and inorganic oxygen isotopic reference materials have been calibrated by six laboratories carrying out more than 5 300 measurements using a variety of high-temperature conversion techniques (HTC) in an evaluation sponsored by IUPAC. To aid in the calibration of these reference materials, which span more than 125 per mille, an artificially enriched reference water (δ^{18}O of +78.91 per mille) and two barium sulfates (one depleted and one enriched in ^{18}O) were prepared and calibrated relative to VSMOW2* and SLAP reference waters. These materials were used to calibrate the other isotopic reference materials in this study, which yielded:

Isotopic reference material	$10^3\ \delta(^{18,16}O_{\ VSMOW\text{-}SLAP})$ reference value
IAEA-602 benzoic acid	+71.28
USGS35 sodium nitrate	+56.81
IAEA-NO-3 potassium nitrate	+25.32
IAEA-601 benzoic acid	+23.14
IAEA-SO-5 barium sulfate	+12.13
NBS 127 barium sulfate	+8.59
VSMOW water	0
IAEA-600 caffeine	–3.48
IAEA-SO-6 barium sulfate	–11.35
USGS34 potassium nitrate	–27.78
SLAP water	–55.5

A primary conclusion of this study is that nitrate samples analyzed for $\delta(^{18,16}O)$ should be analyzed with internationally distributed isotopic nitrates, and likewise for sulfates and organics. Authors reporting relative differences of oxygen-isotope ratios [$\delta(^{18,16}O)$] of nitrates, sulfates, or organic material should explicitly state in their reports the $\delta(^{18,16}O)$ values of two or more internationally distributed nitrates (USGS34, IAEA-NO-3, and USGS35), sulfates (IAEA-SO-5, IAEA-SO-6, and NBS 127), or organic material (IAEA-601 benzoic acid, IAEA-602 benzoic acid, and IAEA-600 caffeine), as appropriate to the material being analyzed, had these reference materials been analyzed with unknowns. This procedure ensures that readers will be able to normalize the $\delta(^{18,16}O)$ values at a later time should it become necessary. The high-temperature reduction technique for analyzing $\delta(^{18,16}O)$ and $\delta(^{2,1}H)$ is not as widely applicable as the well-established combustion technique for carbon and nitrogen stable isotope determination. To obtain the most reliable stable isotope data, materials should be treated in an identical fashion; within the same sequence of analyses, samples should be compared with working reference materials that are as similar in nature and in isotopic composition as feasible.

*In 2007, VSMOW2 replaced the almost exhausted VSMOW as the primary reference material and anchor to the VSMOW scale (for details, see <http://www-naweb.iaea.org/NAALIHL/> and <http://www-naweb.iaea.org/NAALIHL/docs/ref_mat/InfoSheet-VSMOW2-SLAP2.pdf>). For 18O, VSMOW2 and VSMOW are indistinguishable. The scale itself remains unaltered and keeps its name (“VSMOW”).

www.iupac.org/web/ins/2005-022-1-200

Arsenic Pollution and Remediation: An International Perspective

Hemda Garelick and Huw Jones (editors)
Reviews of Environmental Contamination
Volume 197, 2008
ISBN: 978-0-387-79283-5 (print)
doi: 10.1007/978-0-387-79284-2

Exposure to arsenic-contaminated drinking water is a major threat to human health. Millions of people across the world are exposed to arsenic-contaminated drinking water with concentrations far in excess of the 10 µg/L maximum permissible level established by the World Health Organization (WHO).

The major arsenic exposure pathway is believed to be via natural (geological) sources of contaminated groundwater. In addition, arsenic is introduced into the environment from anthropogenic sources, primarily metal mining and smelting activities, which pollute soils, sediments, and surface waters and groundwater worldwide. The implications for human health of arsenic exposure are serious, but they are not fully understood nor are solutions for mitigation adequately evaluated or communicated.

The purpose of the six papers comprising this volume is to address this knowledge gap. These papers result from a project supported by IUPAC.* They are consonant with and underpin the key IUPAC objectives of advancing the chemical sciences and the application of chemistry in service to mankind. IUPAC, in its role as an objective scientific, international, and non-governmental body, in collaboration with international governmental bodies (e.g., United Nations Educational, Scientific and Cultural Organization (UNESCO) and the WHO), addresses many global issues involving the chemical sciences as well as issues that transcend pure science and have important sociopolitical implications. Arsenic contamination clearly has such implications.

The papers presented in this volume aim to review and analyze the status of arsenic pollution and consequential human exposure and to provide a practical guide to available arsenic remediation technologies. Moreover, we endeavor to advise on tools that support informed decision making when choosing avenues for arsenic mitigation. Such decision making cannot be solely concerned with arsenic treatment technologies, and the papers therefore seek to highlight and provide guidance on arsenic treatment technologies in the context of varying scenarios that can inform effective mitigation policies.

The authors of these papers have a diversity of knowledge, research experience, and interests, all of which contributed to assembly of this volume. The team's expertise in epidemiology (Harry Caussey); risk assessment and toxicology (Nick Priest); environmental chemistry (Hemda Garelick, Huw Jones, and Zoltán Galbács); environmental geochemistry (Eugena Valsami-Jones and Agnieska Dybowska); analytical chemistry (Joerg Feldmann); bioremediation (Pornsawan Visoottiviseth); environmental engineering (Feroze Ahmed, Rita Földényi, Nora Kováts, and Gábor Borbély); and environmental management (Bryan Ellis, Hemda Garelick, and Md. Khoda Bux) was critical in analyzing effects of and solutions to arsenic water pollution on exposed populations.

*Project 2003-017-2-600; see also July-Aug 2008 *CI*, pp. 7–12.

Mark Your Calendar

Analytical and Risk Considerations for Emerging Environmental Issues

Tuesday 4 August 2009
42nd IUPAC Congress, Glasgow, Scotland, UK

This symposium is supported by the IUPAC Division of Chemistry and the Environment (VI) and focuses on the complex interrelationship between environmental chemistry and sustainable environmental management with specific reference to areas of human activities such as industrial and agricultural activities as well as the effects of naturally occurring materials of toxicological significance.

The full understanding of chemical processes in the environment should involve:

- Consideration of the underlying natural processes
- Introduction of new materials
- Sources of pollution
- Risk that chemical pollution can pose both to human and ecological health
- The interactions between the different environmental compartments of air, soil and water also play a major role in the above interactions and strongly influence potential routes of human exposure via inhalation and/or consumption of food and water.

The above issues and interactions will be addressed in a range of papers presented by speakers from different chemical disciplines and geographical locations with the aim to identify coherent themes from analytical and risk considerations that impinges on emerging environmental issues.

www.iupac2009.org

Key points addressed by each successive paper are these:

- The health risks of arsenic contamination, with reference to the technical challenges associated with optimizing arsenic remediation approaches that are acceptable to arsenic-polluted communities, are described in this paper.
- An overview is given in this paper of the global status of arsenic pollution sources, both natural and anthropogenic, and the behavior of arsenic in groundwater and surface waters. Information is provided on modes of formation and release of arsenic and the corresponding implications to environmental mobility and toxicity of different arsenic chemical species.
- In this paper, the effects of high spatial and temporal variation of arsenic contamination and the consequential need for cheap, quick, onsite (field kits) analytical techniques that accurately portray the degree and nature of contamination so critical to remediation efforts.
- A variety of potential remediation technologies for arsenic removal are described in this paper. To be effective, particularly in developing countries with the greatest arsenic contamination, such methods must be reliable, cost-effective, and sustainable.
- The range of mitigation options available for arsenic reflects the complexity of its chemistry. Appraising suitable arsenic remediation technologies is itself a sizable challenge. This paper addresses, through multi-criteria approaches, the factors relevant to evaluating mitigation options.
- The final paper of the series shares the challenges faced by three countries with arsenic-contaminated regions in addressing and remediating sources of arsenic contamination.

"Access to safe water is a fundamental human need and, therefore, a basic human right. Contaminated water jeopardizes both the physical and social health of all people. It is an affront to human dignity. Yet even today, clean water is a luxury that remains out of the reach of many." These words, spoken by Kofi Annan, then secretary general of the United Nations, on World Water Day, 22 March 2001, sadly remain equally relevant in 2007.

Compendium of Polymer Terminology and Nomenclature, IUPAC Recommendations 2008

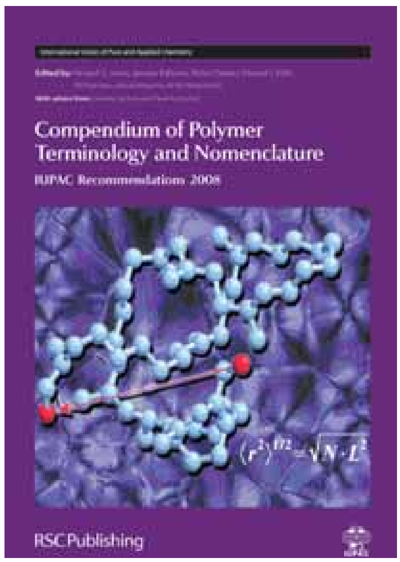
Richard G. Jones, Edward S. Wilks, W. Val Metanomski, Jaroslav Kahovec, Michael Hess, Robert Stepto, Tatsuki Kitayama (editors)

ISBN: 978-0-85404-491-7, RSC 2009

reviewed by Richard G. Jones

In 2002, the newly constituted Subcommittee on Macromolecular Terminology of Division IV of IUPAC set about the task of revising the *Compendium of Macromolecular Nomenclature* (the Purple Book) which was published in 1991 under the auspices of the Commission on Macromolecular Nomenclature of the then Macromolecular Division of IUPAC. Since then, the names of the division (now the Polymer Division), the sub-committee (now the Subcommittee on Polymer Terminology) and the Purple Book have all changed after the shear scale of the task was realized at a meeting of the editorial panel in Prague in the spring of 2006.

The *Compendium of Polymer Terminology and Nomenclature* as it now titled, is an expansion and revision of the earlier compendium. The 1991 Purple Book, which would have been more appropriately dubbed the Lilac Book, contained only nine chapters, whereas the new compendium has 22 chapters and is truly purple. Only four of the chapters of the early edition are retained in their original form and one chapter (nomenclature for regular single-strand and quasi-single-strand inorganic and coordination polymers) has been excluded from the new book pending major revisions in accordance with the 2005 edition of the *Nomenclature of Inorganic Chemistry* (the Red Book). Otherwise, except for Chapter 14, which is an introduction to polymer nomenclature, and Chapter 23, dealing with abbreviations for names of poly-



meric substances, the other chapters of the present compendium, after significant editorial corrections to conform with current IUPAC practice and style, are reproductions of official IUPAC recommendations originally published in *Pure and Applied Chemistry*.

The 1991 edition of the Purple Book contained two main sections, namely Definitions, having four chapters, and Nomenclature, having an introduction and five chapters. In keeping with the expansion of the work of the Polymer Division into topics related to polymeric and polymer-based materials, the first section of the present edition is renamed Terminology and increased to 13 chapters, and the second, the Nomenclature section has 10 chapters. In addition, the present edition retains a bibliography of biopolymer-related IUPAC-IUBMB nomenclature.

Basic Guidelines to Polymer Nomenclature
A new task group of the Polymer Division has started a project to draft more basic guidelines to polymer nomenclature. The goal is to disseminate broadly a shorter and more easily assimilated guide to the essentials of polymer nomenclature. See description on page 26.

It is expected that later editions of the Purple Book will be released in electronic format over the Internet. This will enable ready incorporation of new chapters as they become available, an unparalleled means of remaining up to date.

In conclusion, I should like to thank my co-editors Jaroslav Kahovec, Bob Stepto, Ted Wilks, Michael Hess, Tatsuki Kitayama, and Val Metanomski for their sterling efforts over the long period of time over which the book was being prepared for publication. Leaving aside the many hours of consultation, each played significant identifiable roles: it was Ted who volunteered to embark on the process of preparing the various chapters for publication and in so doing brought to light the scale of the task inherent in the incompatibilities of the styles used for journal manuscripts and those for book chapters; Jaroslav amazed us all as the ultimate proof reader and thereby probably the only person who will ever have read every word in the book; Bob assumed a similar responsibility for the terminology chapters but also constructed the indexes; Tatsuki prepared many of the chemical structures in the nomenclature section and Michael assumed responsibility for the cover; I took on the task of securing consistency of presentation and formatting throughout, and Val as the editor in chief of the first edition served as the elder statesman whose wise counsel was always available. In addition we are also very grateful to Aubrey Jenkins and Pavel Kratochvíl, past chairmen of the Commission on Macromolecular Nomenclature, for their invaluable contributions during the final stages of the editorial labors. However, my thanks to these colleagues are inevitably tinged with great sadness at the death in December 2008 of Val Metanomski who was only survived by his wife, Helena, for about a month before she too passed away. We hope that this new Purple Book serves as a fitting tribute to Val, maintaining the standards set by him within the 1991 edition, for clear and precise communication in polymer science.

For a listing of the table of contents, please visit the website below.

www.iupac.org/web/ins/2002-048-1-400

Richard G. Jones is chair of the IUPAC Subcommittee on Polymer Terminology.

The IUPAC Green Book in Japanese

The Japanese translation of the Green Book (*Quantities, Units and Symbols in Physical Chemistry*, Third Edition, RSC Publishing, Cambridge, UK, 2007) is now available. The translation was accomplished through the joint efforts of the National Institute for Advanced Industrial Science and Technology and the Chemical Society of Japan's Subcommittee on Units and Symbols. The book was published in April 2009 by Kodansha, Tokyo.

The Japanese translation retains the form and spirit of the original and will contribute to the dissemination of the common language of science and technology. Ian Mills and Kozo Kuchitsu, co-authors of the third edition, wrote the preface.

Sustainable Water

25–28 August 2009, Nairobi, Kenya

Africa is acutely sensitive to water issues. Several countries have lost as much as 25 percent of their water resources from their lakes and reservoirs. The state of groundwater is poorly mapped and the pattern of rainfall is changing due to climatic change. Above all, Africa has a rapidly growing population that needs water for food production and industrial uses.

To address this issue, the Kenyan hub of the Pan Africa Chemistry Network (PACN) is holding a conference 26–28 August 2009 at the University of Nairobi. **The Sustainable Water Conference** will review critical water issues and cover both theoretical and applied water knowledge. Sessions will include:

- Water quality and contamination, focused on rivers, lakes, reservoirs, and groundwater, and new sensor technologies and environmental monitoring
- Water usage for human consumption, including industrial use, recreation, and agriculture
- Sustainable water management and treatment, including recycling and use, desalination, treatment processes, infrastructure, planning and management, and purification technology
- Climate change and water

The conference will be preceded by a satellite workshop on Green Chemistry and Sustainability on the morning of 25 August at the same venue.

The PACN Kenyan hub is also planning for a series of activities, which include international conferences in areas of key importance to the continent, travel grants to attend conferences in Africa and in the UK, short-term training for scientists, support for the existing African chemistry networks, and the creation of research and collaboration facilities to increase the numbers of scientists emerging from the continent. Initially, two hubs were established: one at the University of Nairobi, Kenya, and the other at Addis Ababa University, Ethiopia. Both aim to work across the continent to promote the chemical sciences.

For more information, visit the website below, or contact:

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www.rsc.org/pacn

Biopesticides

21–26 September 2009
La Palma, Canary Islands

The **8th Meeting of the PSE & 2nd RSEQ-GEQPN Congress** will be held in La Palma, Canary Islands, Spain. The congress will take place at the Convention Center La Palma–Teneguía Princess, 21–26 September 2009.

The organizers plan to bring together leading experts, scientists, and professionals from the areas of natural-product-based biopesticides, agrochemicals, natural product biotechnology, new extraction techniques, structure elucidation and target-oriented synthesis to present their research work and to describe current scientific trends.

All correspondence concerning registration, accommodations, and scientific or organizational issues should be addressed to the Congress Secretariat <pse@magnacongresos.com>.

www.pselapalma2009.es

Molecular Environmental Soil Science

10–14 October 2009, Hangzhou, China

The International Symposium of Molecular Environmental Soil Science at the Interfaces in the Earth's Critical Zone, co-sponsored by Zhejiang University, IUPAC, and the International Union of Soil Sciences will be held 10–14 October 2009 in Hangzhou, China.

The objective of this symposium is to provide a forum in which soil chemists, mineralogists, microbiologists, physicists, pure chemists, biologists, environmental scientists, ecologists, and ecotoxicologists can address the current state of the art regarding molecular environmental soil science. It is hoped that the symposium will help identify gaps in knowledge, provide new research directions, and promote research at the interfaces of molecular level soil processes. The conference will explore the biophysico-chemical processes in soil and related environmental systems and their biogeochemical and ecological impacts.

The symposium's five sessions are as follows: (1) The Role of Mineral Colloids in Carbon Turnover and Sequestration and the Impact on Climate Change; (2) Biogeochemical Interfacial Reactions and the Transformation, Transport, and Fate of Vital and Toxic Elements; (3) Anthropogenic Organics, Crop Protection, and Ecotoxicology; (4) Environmental Nanoparticles: Distribution, Formation, Transformation, Structural and Surface Chemistry, and Biogeochemical and Ecological Impacts; and (5) Environmental Processes and Ecosystem Health.

D.L. Sparks and G.M. Gadd have accepted invitations to serve as IUPAC lecturers and to give plenary lectures. In addition, 19 world-renowned scientists have beem invited to give lectures.

Jian-ming XU of Zhejiang University, China, is chairman, and Pan Ming HUANG of the University of Saskatchewan, Canada, is co-chairman of the symposium. The organizers welcome scientists from all over the world to participate. The cut-off date for early-bird registration is 31 July 2009. Full paper submissions are due by 10 October 2009.

See Mark Your Calendar on page 38 for contact information.

http://zjklsp.zju.edu.cn/ismess

The Transmediterranean Colloquium on Heterocyclic Chemistry

5–7 November 2009, Hammamet, Tunisia

The **Transmediterranean Colloquium on Heterocyclic Chemistry (TRAMECH 6)**, to be held 5–7 November 2009 in Hammamet, Tunisia continues this important series of conferences previously held in France (2000), Italy (2002), Morocco (2004), Portugal (2006), and Jordan (2007).

As with prior conferences, TRAMECH 6 offers participants the opportunity to discuss research on heterocyclic chemistry. It also offers a chance for participants from both sides of the Mediterranean to stimulate cooperation and to start new joint scientific programs.

At TRAMECH 6, young chemists will enjoy the ambiance of an international congress and practice their English through discussions of their work. Such an opportunity is rare in the Maghreb Countries.

The Chemical Society of Tunisia is organizing the conference. The colloquium will be held at the LAICO-KARTHAGO Hotel in Yasmine Hammamet.

The abstract submission deadline is 15 September 2009.

For further details, contact:

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E-mail: tramech6@sctunisie.org

http://sctunisie.org/tramech6/

Green Chemistry

15–19 August 2010, Ottawa, Canada

The Canadian Green Chemistry and Engineering Network (CGCEN) and the Chemical Institute of Canada (CIC) invite researchers, educators, business representatives, and policy experts from around the world to hear and share the latest advances in green chemistry at the **3rd IUPAC International Conference on Green Chemistry**. It will be held 15–21 August 2010 in Ottawa, Ontario, Canada. This will be the first time that the conference in this biennial series has been held outside of Europe. In keeping with the theme of the conference, "The Road to Greener Industry," industry researchers and representatives are particularly encouraged to attend.

Topics at the conference will include:

- benign synthesis (catalysis, solvents, reagents)
- green chemistry for energy production (hydrogen, fuel cell, greener energy production, fuels from biomass)
- chemicals from renewables (chemicals from biomass, waste plastics, waste CO_2)
- green engineering (process intensification, energy savings, separations)
- policy (corporate and governmental)
- education in green chemistry and engineering

Ottawa is home to two universities, the National Research Council, many government labs, and private-sector companies working on green chemistry and sustainable development. As the capital of Canada, Ottawa offers unique attractions that celebrate the nation's history and achievements, its cultural diversity, and its immense natural beauty. The venue's location on the Rideau and Ottawa Rivers, at the border of the provinces of Ontario and Quebec, creates a unique blend of English and French cultures, adding a special flair and charm to a safe, clean, and spectacular environment. From renowned museums and galleries, to an extensive and thriving restaurant scene, and a broad range of entertainments, there is much to discover.

See Mark Your Calendar on page 39 for contact information.

www.icgc2010.ca

Mark Your Calendar

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

2009

IUPAC poster prizes to be awarded

5–9 July 2009 • Polymers and Organic Chemistry • Montréal, Canada
13th International IUPAC Conference on Polymers & Organic Chemistry (POC-'09)
Prof. Will Skene, Université de Montréal, CP 6128, Succ. Centreville, Montréal, QC H3C 3J7, Canada
Tel.: +1 514 340-5174, Fax: +1 514 340-5290, E-mail: w.skene@umontreal.ca

5–9 July 2009 • Macromolecular Science • Prague, Czech Republic
New Frontiers in Macromolecular Science: From Macromolecular Concepts of Living Matter to Polymers for Better Quality of Life
Dr. Miroslava Dušková, Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, Heyrovského Náměstí 2, CZ-162 06 Praha 6
Tel.: +420 296 297, Fax: +420 296 410, E-mail: m.duskova@imc.cas.cz

12–17 July 2009 • Polymer • Graz, Austria
European Polymer Congress 2009
Prof. Franz Stelzer, Institut für Chemische Technologie, Technische Universität Graz, Stremayrgasse 16/I, A-8010 Graz, Austria, Tel.: +43 01 427 751 108, Fax: +43 01 427 795 11, E-mail: franz.stelzer@tugraz.at

19–24 July 2009 • Novel Aromatic Compounds • Luxembourg City, Grand Duchy of Luxembourg
International Symposium on Novel Aromatic Compounds (ISNA-13)
Prof. Carlo Thilgen, ETH Zürich, Laboratorium für Organische Chemie, Wolfgang-Pauli-Strasse 10, CH-8093 Zürich, Switzerland, Tel.: +41 1 632 2935, Fax: +41 1 6321109, E-mail: thilgen@org.chem.ethz.ch

26–30 July 2009 • Organometallic Chemistry • Glasgow, UK
15th International IUPAC Conference on Organometallic Chemistry Directed Towards Organic Synthesis
Prof. Pavel Kocovsky, University of Glasgow, Department of Chemistry, Glasgow, G12 8QQ, United Kingdom
Tel.: +44 141 330 4199, Fax: +44 141 330 4888, E-mail: pavelk@chem.gla.ac.uk

26–31 July 2009 • Ionic Polymerization • Lodz, Poland
19th IUPAC International Symposium on Ionic Polymerization (IP '09)
Prof. Stanislaw Penczek, Polish Academy of Sciences, Centre of Molecular and Macromolecular Chemistry, Sienkiewicza 1123, PL-90 363 Lodz, Poland
Tel.: +48 42 681 9815, Fax: +48 42-684 7126, E-mail: ip09@bilbo.cbmm.lodz.pl

26–31 July 2009 • Plasma Chemistry • Bochum, Germany
19th International Symposium on Plasma Chemistry (ISPC-19)
Prof. Achim von Keudell, Ruhr University Bochum Universitstrasse 150, D-44780 Bochum, Germany
Tel.: +49 234 322 3680, Fax: +49 234 321 4171, E-mail: Achim.vonKeudell@rub.de

31 July–6 August 2009 • IUPAC 45th General Assembly • Glasgow, UK
IUPAC Secretariat, Tel.: +1 919 485 8700, Fax: +1 919 485 8706, E-mail: secretariat@iupac.org
www.iupac.org/symposia/conferences/ga09/

2–7 August 2009 • IUPAC 42nd Congress • Glasgow, UK
Chemistry Solutions
IUPAC 2009, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK, Tel.: +44 (0) 1223 432380, Fax: +44 (0) 1223 423623, E-mail: iupac2009@rsc.org
www.iupac2009.org

2–7 August 2009 • Heterocyclic Chemistry • St. John's, NewFoundland and Labrador, Canada
22nd International Congress on Heterocyclic Chemistry (ICHC-22)
Prof. Mohsen Daneshtalab, School of Pharmacy, Memorial University of Newfoundland, St. John's, NL A1B 3V6, Canada, Tel.: +1 709-777-6958, Fax: +1 709-777-7044, E-mail: mohsen@mun.ca

21–25 August 2009 • Solution Chemistry • Innsbruck, Austria
31st International Conference on Solution Chemistry (ICSC 2009)
Prof. Bernd M. Rode, University of Innsbruck, Theoretical Chemistry Division, A-6020 Innsbruck, Austria
Tel.: +43 512 507 5160, Fax: +43 512 507 2714, E-mail: bernd.m.rode@uibk.ac.at

Mark Your Calendar

13–17 September 2009 • Infrared Microscopy & Spectroscopy • Banff, Canada
5th International Workshop on Infrared Microscopy & Spectroscopy with Accelerator Based Sources
Dr. Brant Billinghurst, University of Saskatchewan, Canadian Light Source, Inc.
Saskatoon, SK S7N 0X4, Canada
Tel.: +1 306 657 3554, Fax: +1 306 657 3535, E-mail: brant.billinghurst@lightsource.ca

14–18 September 2009 • High Temperature Materials • Davis, CA, USA
High Temperature Materials Chemistry Conference–XIII (HTMC-XIII)
Alexandra Navrotsky, University of California at Davis, One Shields Avenue, Davis, CA 95616 USA
Tel.: +1 530 752-3292, Fax: +1 530 752-9307, E-mail: ANavrotsky@UCDavis.edu

28 September 2009–2 October 2009 • Frontiers of Polymers • Santiago, Chile
10th International Conference on Frontiers of Polymers and Advanced Materials
Prof. Guillermo González, Department of Chemistry, Universidad de Chile, Las Palmeras 3425, Santiago, Chile
Tel.: +562 978 7404, Fax: +562 271 3888, E-mail: ggonzale@uchile.cl

10–14 October 2009 • Molecular Environmental Soil Science • Hangzhou, China
International Symposium of Molecular Environmental Soil Science at the Interfaces in the Earth's Critical Zone
Prof. Jianming Xu, Zhejiang University, College of Environmental & Resource Sciences, Hangzhou, 310029, China
Tel.: +86 571-8697-1955, Fax: +86 571-8697-1955, E-mail: jmxu@zju.edu.cn

18–22 October 2009 • Novel Materials and Their Synthesis • Shanghai, China
International Symposium on Novel Materials and Their Synthesis (NMS-V)
Prof. Yuping Wu, Fudan University, Department of Chemistry, Shanghai, 200433 China
Tel.: +86 21 55 664 223, Fax: +86 21 55 664 223, E-mail: wuyp@fudan.edu.cn

9–12 November 2009 • Crop Protection • Rio de Janeiro, Brazil
3rd International Workshop on Crop Protection Chemistry in Latin America: Environment, Safety and Regulation
See IUPAC Project 2007-057-1-600 or E-mail: secretariat@iupacrio2009.org

15–18 November 2009 • MacroMolecular Complexes • Termas de Chillán, Chile
13th International Symposium on MacroMolecular Complexes
Prof. Bernabé L. Rivas, Universidad de Concepción, Facultad de Ciencias Químicas, Concepción, Chile
Tel.: +56 412 204 109, Fax: +56 412 245 974, E-mail: mmc13-chile@udec.cl

2010

IUPAC poster prizes to be awarded

7–10 March 2010 • Heterocyclic Chemistry • Gainesville, Florida, USA
11th Florida Heterocyclic and Synthetic Conference
Prof. Alan R. Katritzky, University of Florida, Department of Chemistry, Gainesville, FL 32611-7200, USA
Tel.: +1 352-392-0554, Fax: +1 352-392-9199, E-mail: katritzky@chem.ufl.edu

7–9 April 2010 • Polymer Characterization • Siegen, Germany
18th International Conference on Polymer Characterization; World Forum on Advanced Materials
Professor Werner Mormann, Universität Siegen, FB-8, Makromolekulare Chemie, Adolf Reichwein Strasse 2
D-57068 Siegen, Germany
Tel.: +49 271 740 4713, Fax: +49 271 740 2226, E-mail: mormann@chemie.uni-siegen.de

4–8 July 2010 • Pesticide Chemistry • Melbourne, Australia
12th IUPAC International Congress of Pesticide Chemistry
Dr. Elizabeth Gibson, RACI, 1/21 Vale Street, North Melbourne, VIC 3051, Australia
Tel.: +61 0 3 9328 2033, Fax: +61 0 3 9328 2670, E-mail: elizabeth@raci.org.au

11–16 July 2010 • Macromolecules • Glasgow, UK
43rd International Symposium on Macromolecules—IUPAC World Polymer Congress (Macro 2010)
Prof. Peter A. Lovell, School of Materials, The University of Manchester, Grosvenor St. Manchester, M1 7HS, UK
Tel.: +44 (0) 161-306-3568, FAX: +44 (0) 161-306-3586, E-mail: pete.lovell@manchester.ac.uk

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11–16 July 2010 • Photochemistry • Ferrara, Italy
XXIII IUPAC Symposium on Photochemistry
Prof. Franco Scandola, Dipartimento di Chimica, Università di Ferrara
Via L. Borsari 46, I-44100 Ferrara, Italy, Tel.: +39 05 32 455 160, Fax: +39 05 32 240 709, E-mail: snf@unife.it

25–30 July 2010 • Solubility Phenomena • Leoben, Austria
14th International Symposium on Solubility Phenomena and Related Equilibrium Processes
Prof. Heinz Gamsjäger, Montanuniversität Leoben, Lehrstuhl für Physikalische Chemie, Franz Josef Strasse 18, A-8700 Leoben, Austria
Tel.: +43 (0) 3842 402 4804, Fax: +43 (0) 3842 402 4802, E-mail: heinz.gamsjaeger@mu-leoben.at

1–6 August 2010 • Organic Synthesis • Bergen, Norway
18th International Conference on Organic Synthesis
Prof. Leiv K. Sydnes, Department of Chemistry, University of Bergen, Allégaten 41, N-5007 Bergen, Norway
Tel.: +47 55 58 34 50, Fax: +47 55 58 94 90, E-mail: leiv.sydnes@kj.uib.no

8–13 August 2010 • Chemical Education • Taipei, Taiwan
21st International Conference on Chemical Education—Chemistry Education and Sustainability in the Global Age
Prof. Mei-Hung Chiu, National Taiwan Normal University, No. 88, Ding-Zhou Road, Section 4, Taipei, 116, Taiwan
Tel.: + 886 2-2932-2756, Fax: + 886 2-2935-6134, E-mail: mhc@ntnu.edu.tw

15–19 August 2010 • Green Chemistry • Ottawa, Canada
3rd IUPAC Conference on Green Chemistry (ICGC-3)
Prof. Philip Jessop, Department of Chemistry, Queen's University, 90 Bader Lane, Kingston, ON, K7L 3N6, Canada,
Tel.: +1-613-533-3212, Fax: +1-613-533-6669, E-mail: info@icgc2010.ca

22–27 August 2010 • Physical Organic Chemistry • Busan, Korea
20th International Conference on Physical Organic Chemistry
Prof. Dae-Dong Sung, Department of Chemistry, Dong-A University, Saha-Gu, Busan 604-714, Korea
Tel.: +82 51 200 7243, Fax: +82 51 200 7259, E-mail: ddsung@dau.ac.kr

6–10 October 2010 • Eurasia Chemistry • Amman, Jordan
11th Eurasia Conference on Chemical Sciences
Dr. Amal Al-Aboudi, Chemistry Department, University of Jordan, Amman 11942
Jordan, Tel.: +962 6 535 5000, Fax: +962 6 535 5522, E-mail: alaboudi@ju.edu.jo

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www.iupac.org/symposia/application.html

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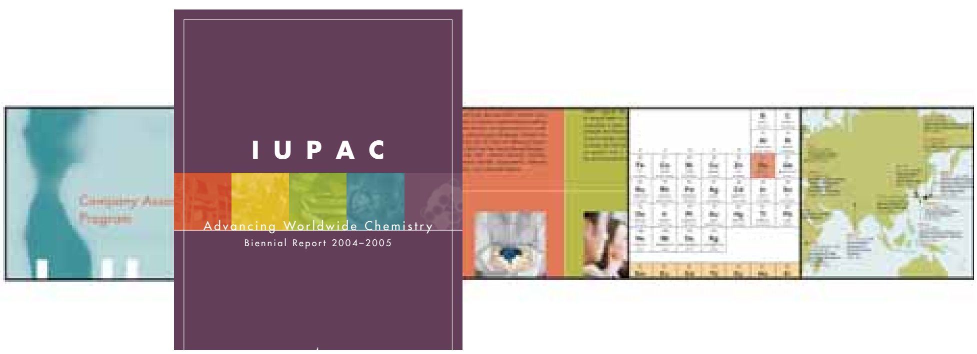

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Bulgarian Academy of Sciences *(Bulgaria)*
National Research Council of Canada *(Canada)*
Sociedad Chilena de Química *(Chile)*
Chinese Chemical Society *(China)*
Chemical Society located in Taipei *(China)*
Croatian Chemical Society *(Croatia)*
Sociedad Cubana de Química *(Cuba)*
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National Committee for IUPAC *(Egypt)*
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Caribbean Academy of Sciences—Jamaica Chapter *(Jamaica)*
Science Council of Japan *(Japan)*
Jordanian Chemical Society *(Jordan)*
Korean Federation of Science and Technology Societies *(Korea)*
Kuwait Chemical Society *(Kuwait)*
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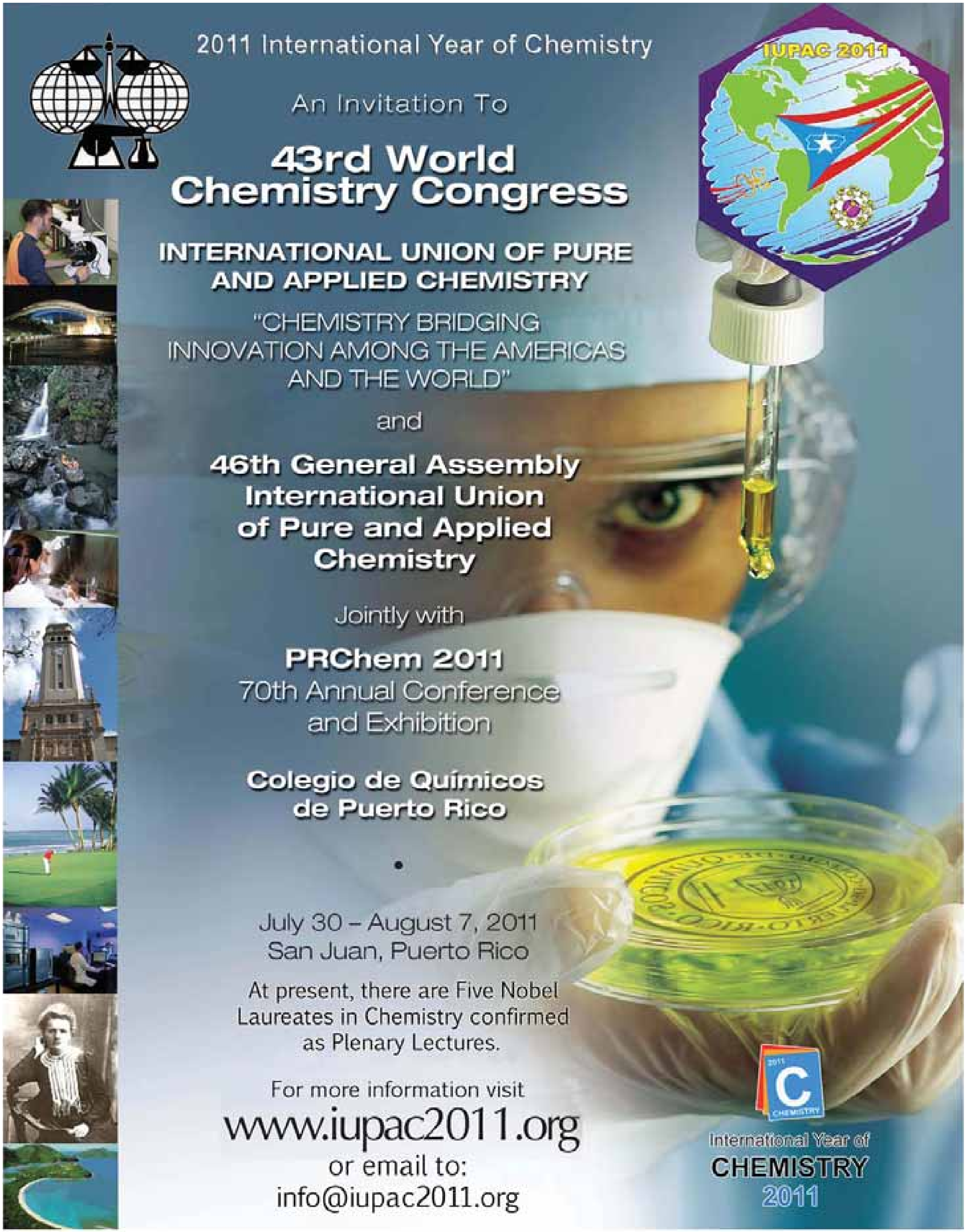

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