

CHEMISTRY

International

The News Magazine of IUPAC

May-June 2013
Volume 35 No. 3

OUTLOOK ON LATIN AMERICA



INTERNATIONAL UNION OF
PURE AND APPLIED CHEMISTRY

Neglected Tropical Diseases ►
Green Chemistry in Teaching ►



From the Editor

CHEMISTRY International

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

www.iupac.org/publications/ci

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Printed by:

Cadmus Communications, Easton, PA, USA

Subscriptions

Six issues of *Chemistry International* (ISSN 0193-6484) will be published bimonthly in 2013 (one volume per annum) in January, March, May, July, September, and November. The 2013 subscription rate is USD 110.00 for organizations and USD 50.00 for individuals. Subscription orders may be placed directly with the IUPAC Secretariat. Affiliate Members receive *CI* as part of their Membership subscription, and Members of IUPAC bodies receive *CI* free of charge.

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Periodicals postage paid at Durham, NC 27709-9990 and additional mailing offices. POSTMASTER: Send address changes to *Chemistry International*, IUPAC Secretariat, PO Box 13757, Research Triangle Park, NC 27709-3757, USA.

ISSN 0193-6484

May is a month of many celebrations. As we have mentioned several times before in *CI*, 20 May is World Metrology Day, which commemorates the signing by representatives of 17 nations of The Metre Convention on that day in 1875. This year, the theme is "Measurements in Daily Life"—see more at www.worldmetrologyday.org.

While living in the states, but having grown up in Belgium, I have found that measurements in my daily life can be quite bewildering. A simple



length mentioned in inches, a travel distance referred to in miles, a quantity in a cook book specified in spoons or cups, or my own weight blurred in pounds on my bathroom scale make no sense to me. And, it is beyond me that this "New World" is stuck in a nonmetric system. If on 20 May I can convince just one friend that SI is the way to go, even for daily usage, it is

worth celebrating!

There are many more international and world days in May, several that are even recognized by the UN or UNESCO. My favorites include 3 May, World Press Freedom Day; 17 May, World Information Society Day; 21 May, World Day for Cultural Diversity for Dialogue and Development; and 22 May, International Day for Biological Diversity.

Looking beyond May, two days of relevance to educators and scientists are 5 October, World Teachers' Day, and 10 November, World Science Day for Peace and Development. According to UNESCO "The purpose of the World Science Day for Peace and Development is to renew the national, as well as the international commitment to science for peace and development and to stress the responsible use of science for the benefit of society. The World Science Day for Peace and Development also aims at raising public awareness of the importance of science and to bridge the gap between science and societies." In 2012, the theme was "Science for Global Sustainability: Interconnectedness, Collaboration, Transformation." It was chosen to highlight "the increasingly interconnected and interdependent economic, social, cultural, and political systems, both in terms of the pressure these place on the Earth system and of the potential for solutions that they provide." It seems to me that all chemists should rightfully take part in the 10 November celebrations.

Lastly, if one is desperately looking for a day to celebrate Chemistry, and IUPAC as well, then I think it should be 28 July, since it was on that day in 1919 that the Union was born after being registered by a plenary session of the International Research Council.

Fabienne Meyers

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Cover: *Boys from Paraguay's rural Chaco region learn more about Chagas disease and the so-called vinchuca, the bug that is the main vector of the parasite that causes the disease. Doctors Without Borders/Médecins Sans Frontières (MSF) works in isolated communities to educate people about the disease and screen them for it.*

Credit: © Anna Surinyach/MSF, reproduced with permission.

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Neglected Tropical Diseases in Latin America

by Antonio Monge and
C. Robin Ganellin

Neglected tropical diseases (NTD) affect millions of people, especially in Latin America, but the efforts of researchers around the world to find good, effective treatments have proved insufficient. The IUPAC project “A Survey of Research into New Drugs for Neglected Tropical Diseases in Latin America” (project 2009-033-1-700) aims to coordinate the efforts and interests of researchers in the Latin American region, and to connect them with research groups throughout the world, in an attempt to form a critical mass for finding new treatments for NTD.

Among the United Nation’s Millennium Goals, proposed by consensus in 2000 with the goal of completion by 2015,¹ is “eradicating or reducing malaria and other endemic diseases such as Chagas, tuberculosis, ...” However, research efforts so far have been inadequate for a variety of reasons, including low interest in developed countries, since the NTD don’t affect their populations, and a lack of funding from companies because of the difficulty in recovering investments from new drug discovery.²

In response to these challenges, a number of different initiatives are underway³ and the number of researchers throughout the world dedicated to studying these diseases has increased in recent years. This is evident in the growing number of papers on NTDs that appear in scientific journals.

NTDs are not just limited to isolated areas as they were in the past. Population movements in the last century have resulted in the introduction of tropical diseases into more populated areas. It is now not unusual to find malaria, for example, in countries where it had never appeared before.

The search for drugs for the treatment of NTD is special because it is developed countries that have the technology and yet it is the less developed countries where the diseases are found. This means that the pre-clinical aspect of research and development for new drugs can be carried out in any country, while the clinical part can only take place in the countries suffering these diseases. Simple consideration of this reality implies the need for collaboration in order to be effective.

The terms “developed” and “developing” are misleading because they only consider mean numbers in the classification of countries. Yet, in many of these countries one can find citizens with great purchasing power. A major characteristic of the developed countries, however, is the presence of a well-developed middle class, which is something that does not occur in the developing countries. It is in this context that we can place the search for new drugs for the treatment of NTD in Latin America.

Latin America has approximately 561 million inhabitants.⁴ The projected population for this area in the year 2050 is over 800 million.⁵ Comprising the Southern and Central American continent, the region possesses important, traditional knowledge about the use of natural products from terrestrial plants for the treatment of various diseases. Yet, there has been little development of compounds of synthetic origin based on natural products from Latin America.

A Latin American Point of View

Much has been written about NTDs and a great deal of research is being carried out in this area. It is important to note that when viewed from a distance, one only gets a partial view of the problem.

With generosity, and a certain degree of frequency, the advanced industrialized nations do try to help resolve the problems of less-developed countries. This is good, and the greater the aid, the better. However, a more valid approach for the 21st century is for countries that have these problems to also participate in their solution.

These less-developed countries are destined to always be dependent on others if they are not involved in the research and innovation. It should not be a mat-





Participating groups in the R&D network of novel drugs for Neglected Tropical Diseases (IUPAC: 2011-2012). For points of contact and research interests for each group, see <www.iupac.org/publications/ci/2013/3503/1_table.html>.

ter of providing people with fish, but rather teaching them how to fish. There is an important critical mass of well-trained scientists in many universities and centers in Latin America. However, they are sometimes unable to develop their ideas because they lack equipment and funds.

From the point of view of northern countries, these issues of the developing countries are often related to poverty. But this is only partly true. Poverty should not be viewed simply in terms of Gross National Product or economics. When considering NTDs, sociopolitical aspects are equally important. Other factors are more subtle, but just as decisive, such as race, gender, and children.

Race is important. Latin America is a melting pot of societies descended from ancient, indigenous civilizations, Europeans, and Africans, with each group of people having its own sociological and cultural behaviors, all of which should be taken into consideration.

Another important question is the role of the women and children in Latin American society, especially in rural areas. In these areas, farming and cattle raising are largely carried out by women and children,

in an intense relationship with the environment. In this context, for example, Chagas disease is most important because it leads to labor absenteeism and lower productivity. A clear example of a relationship between disease and poverty.

In 2002, Novartis established a National Institute for Tropical Diseases in Singapore to search for new compounds for the treatment of tuberculosis, dengue, and malaria. When Dr. P. Herrling was asked why, he said "... if you want to make medicines for patients, you need to know their environment."⁶ Astra Zeneca offers a similar rationale for its research site in Bangalore, India, that focuses on tuberculosis: "We've got about a quarter of the world's population of TB patients in India ...". In addition, the company stated that "the universities are globally competitive, the cost of research is cheaper and, perhaps most importantly, there is access to clinical material. But it is not just because it is cheaper; building a culture of drug-discovery takes time."

The same type of research arrangement that these companies have in India, could also be applied to Latin America. The region has a valid infrastructure for carrying out fundamental research, which is what ulti-

Neglected Tropical Diseases in Latin America

mately leads to the discovery of new effective drugs and their potential introduction into the pharmaceutical market.

Another very important aspect is the region's extensive knowledge of therapeutic properties of natural products obtained from regional plants. Latin America has some of the greatest biodiversity of anywhere in the world. The discovery of new drugs, based on traditional knowledge of plants in Latin America, raises issues of property rights that need to be resolved for the benefit of all parties involved, but especially to help these less-developed societies.

Drug Research and Developing Countries

Using indices such as publications and patents, it is clear that countries in Latin America are not as advanced as countries of the North, but nevertheless, they do have much scientific activity and considerable research potential.

In the present context, the term collaboration between societies is something in which each party can contribute work of great interest in searching for new drugs. This involves forming networks in which each country contributes that which it is able to give, with the total sum benefiting everyone.

This issue has been perfectly understood by society, and a good part of the funds made available for this

matter has a social origin. There are examples of purely philanthropic organizations such as the Bill & Melinda Gates Foundation⁷ or Wellcome Trust⁸ or other organizations of interest, either private or public, such as the Drugs for Neglected Diseases Initiative⁹ or Medicines for Malaria Venture,¹⁰ and even international organizations, such as UNESCO.¹¹ Pharmaceutical companies, including Novartis,

GlaxoSmithKline, Astra-Zeneca, and Merck, among others, are also collaborating in the study of NTDs.

What piece is missing from the puzzle? Naturally, increased social involvement and more participation on the part of companies and businesses would be good as there can never be enough. In addition,

increased participation from supranational governments would also be most welcomed. But a new and determined participant needs to appear on the scene, namely the governments of the countries that are most directly suffering from these diseases. Financial aid for treating Chagas cannot be demanded by the countries suffering this disease if these same countries do not invest their own money, to the degree to which they are able, to solve their own problems.

Sometimes, it appears that these governments are content to rely on someone else to solve the problems at hand. When studying the funds allotted for R&D of these diseases in the countries that suffer from them, the impression one gets is not always favorable. In the hope of developing internationalized solutions, the involvement of the Latin American governments is an original approach that we propose in this study.

Neglected Tropical Diseases

In this work, we are referring to diseases which, according to The World Health Organization, affect one-sixth of the world's population, approximately 1 billion people, and to which worldwide dedicated efforts are less than they should be. According to the 2009 World Health Organization publication *Neglected Tropical Diseases: Hidden Successes, Emerging Opportunities*:

“NTD tend to be hidden below the radar screens of health services and politicians because they afflict populations that are marginalized, with little political voice. Although frequently causing severe pain and life-long disabilities, these diseases are generally not major killers. Under resource-limited conditions, high mortality diseases such as HIV/AIDS or tuberculosis are prioritized to the detriment of neglected tropical diseases. Less than 1 percent of the 1393 new drugs registered during 1975-1999 were for tropical diseases. Less than 0.001 percent of the USD 60-70 billion spent on new drugs went towards developing new and urgently needed treatments for tropical diseases.”

There are 149 countries and territories affected by at least one NTD. More than 70 percent of them are affected by two or more diseases; 28 countries are afflicted by more than six. Most of them are low-income economies experiencing humanitarian emergencies. NTDs thrive under conditions of poverty, poor sanitation, unsafe water, and malnutrition. However, a growing body of evidence clearly demonstrates that, even under these conditions, significant and



Rhodnius prolixus is the principal vector for Chagas disease in Colombia, Venezuela, Guatemala, Honduras, and some parts of Nicaragua and El Salvador.

Neglected Tropical Diseases in Latin America

sustainable gains can be made against NTDs in immediate and visible ways. The control of these diseases brings a number of collateral benefits in terms of improved health status of populations, increased worker productivity, and long-term increases in the domestic pool of resources, thus contributing to educational improvement and economic growth.”

Among the NTDs, the 13 most-widespread diseases are ascariasis, ankylostomiasis and trichuriasis, caused by helminths from the ground, lymphatic filariasis, onchocerciasis, dracunculosis, schistosomiasis, Chagas, human African trypanosomiasis, leishmaniasis, Buruli ulcer, lepra, and trachoma. This initial list can be expanded to include dengue, dengue hemorrhagic fever, trepanomatosis, leptospirosis, strongyloidiasis, neurocysticercosis, scabies, and trematodes transmitted by food.

An Original Approach

One aim of the project is to find research groups in Latin America that are interested in the discovery of new products for the treatment of NTDs. It is our hope to form a group with enough critical mass to do an effective job discovering new drugs.

In addition, we propose to make the philanthropic societies, pharmaceutical companies, and governments aware of these scientific groups to facilitate ties and establish relationships that could result in improved efficacy. One incentive behind this proposal is that the papers of Latin American research groups are not always published in higher-profile journals. Although their work is of high quality and based on good projects, they lack sufficient means for carrying out state-of-the-art research. Yet, in many other cases, Latin American research centers are just as advanced as in any other country.


One advantage for Latin American researchers is that they have these diseases within their borders and therefore know them first hand, especially with regard to the clinical setting. In addition, they have knowledge of their local factors such as climate and race. It is equally important that these countries keep in close contact with the technological developments, considered to be vital for this topic.

So far, approximately 30 universities and research centers from 10 Latin American countries have signed onto this project (see map on page 3 and table at www.iupac.org/publications/ci/2013/3503/1_table.html). The diseases represented by the different participat-

ing groups include Chagas, leishmaniasis, malaria, sickle cell disease, dengue, junin virus, plasmodium, trichomonas, amoebiasis, giardiasis, *Acinetobacter baumannii*, giardiasis, cysticercosis, African trypanosomiasis, and paracoccidiodomycosis.

Of the large variety of diseases represented in this project, there are research groups that concentrate on just a limited number of them. Joining this program is voluntary and does not imply that there are not other groups also working on NTDs.

The collection of data for this project was carried out based on documents developed by the Ciencia y Tecnología para el Desarrollo/Ibero-American Program of Science and Technology for Development, which was initially promoted by the Spanish government and in which all of the Latin American countries participate. Inevitably, there are gaps that can be covered in future successive approaches of this IUPAC study.

It is important that IUPAC initiate the diffusion of this project, which we anticipate will grow with new participants in successive reviews. 

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Federación Latinoamericana de Asociaciones Químicas

by Olga Lock

The Federación Latinoamericana de Asociaciones Químicas (FLAQ) is the representative body for scientific partnerships and/or chemical professionals of the nations of Latin America. Founded in 1959, FLAQ promotes exchanges between higher educational institutions to respond to urgent development responsibilities in Latin America, encourages research and international meetings on chemical problems, generates media coverage of advances in chemistry, and organizes the Latin American Chemistry Congress.

Different types of groups belong to the FLAQ. In some countries, such as Bolivia, Brazil, Colombia, Cuba, Chile, Mexico, Peru, and Venezuela, it is the Sociedades Químicas, which are of the member organizations. In other countries, it is the Colegios Profesionales de Químicos, as is the case with Costa Rica, El Salvador, Panama, and Puerto Rico. In Argentina and the Dominican Republic it is the Asociación Química that belongs to FLAQ. In Brazil and Colombia, two groups from each country participate: the Sociedade Brasileira de Química and the Associação Brasileira de Química from Brazil and the Asociación Química Colombiana and the Sociedad Colombiana de Ciencias Químicas from Colombia.

The FLAQ governing bodies are the General Assembly, the Board of Directors, the Executive Secretariat, divisions, and committees, the roles of which are described in the statutes, which can be found at www.flaq1959.org. The board is renewed every two years during the Latin American Chemistry Congress (CLAQ). Each president also serves as chair of the biennial Congress. Because of this, current FLAQ President Cecilia Anaya Berrios, from the Sociedad Química de México, was also chair of the Thirtieth CLAQ, held 27–31 October 2012. The FLAQ also has honorary presidents and a Permanent Council made up of past

presidents whose role is to be advisor to the board.

The Executive Secretariat is the governing body responsible for administering, promoting, and developing the institution. It is headquartered in Lima, Peru, leaving the Sociedad Química del Perú responsible for its location. The Executive Secretariat is composed of the Executive Secretary and Treasurer and is appointed by the General Assembly for a period of two years, renewable.

50 Years of FLAQ

In April 2009, the FLAQ celebrated its 50-year anniversary. Although the FLAQ was created in 1959 at the occasion of the 7th Latin American Congress of Chemistry in Mexico City (29 March–3 April 1959), the first South American Chemistry Congress was held in 1924 in Argentina. The second congress was held in Uruguay in 1930, the third in 1937 in Brazil, the fourth in Chile in 1948, and the fifth in Peru in 1951. Starting with the 6th Congress, the name of the event was changed to Congreso Latinoamericano de Química (CLAQ). The congresses are now held every two years, and the next CLAQ will be the thirty-first and will take place in October 2014 in Peru. (see www.sqperu.org.pe and <http://claq2014.blogspot.com>)

The 30 CLAQs held thus far have been true scientific meetings where exchanges and camaraderie among participants took place. The host country for the organization of these congresses is assigned during the General Assembly that takes place during each CLAQ; interested countries must express the reasons why they should host the next congress. Chile and Puerto Rico have organized four times; Argentina, Brazil, Mexico, and Peru on three occasions; Costa Rica and Colombia on two occasions, and Ecuador, Cuba, Panama, Santo Domingo, Uruguay, and Venezuela have organized the conference once. A detailed list can





In 2011, FLAQ countries celebrated the International Year of Chemistry with conferences, forums, workshops, experiments for school, and public events such as these.

be found at the FLAQ portal. The FLAQ is symbolized by the “Lamp of Wisdom,” which is transported from country to country that hosts the CLAQ.

Each country tries its best to outdo the organizers of the previous congress, publicizing the event widely, choosing an intriguing motto, inviting renowned speakers from Latin America and other continents, organizing symposia on various topics, offering refresher courses, and including exhibit halls featuring equipment, laboratory materials, and chemical reagents, and chemical literature. The slogans of the last two congresses have reflected the importance of chem-

istry to the welfare of humankind: “Chemical Industry and Natural Resources, Global Responsibility” (2010) and “Chemistry, Solutions for Humanity” (2012).

In recent years, FLAQ member countries committed themselves to projects far beyond the scope of the CLAQs. For the first time, one of our countries, Puerto Rico, organized the IUPAC World Chemistry Congress, held in August 2011. The 43rd IUPAC Congress was organized under the leadership of one of our most prominent members, Honorary FLAQ President Dr. Gabriel Infante, and by Vice President Dr. Carlos Tollinche, who is also the FLAQ director. This event was a major undertaking during the 2011 International Year of Chemistry and it saw the participation of seven Nobel laureates and about 2800 participants from around the world (see Nov-Dec 2011 *CI*, www.iupac.org/publications/ci/2011/3306/4_infante.html).

Another highlight was how our countries celebrated the International Year of Chemistry with conferences, forums, workshops, experiments for school, and public events. One example is the 2011 calendar produced by the Sociedad Química del Perú, the pages of which illustrated and described the importance of chemistry with examples of everyday products. In a similar way, the Forum “Chemistry: Society and Sustainable Development” and the Agenda Química Virtual dis-



cussed different issues involving chemistry in simple language accessible to any person. The Brazilian Society of Chemistry organized a series of activities, including “365 Days of Chemistry,” “Chemistry and Art,” and “Where’s Chemistry?: Chemistry is Everywhere,” that engaged hundreds of collaborators from various institutions. Likewise, the Cuban Chemical Society organized conferences and experiments for children and young people.

The online networking event “Women Sharing a Chemical Moment in Time,” a “prequel” to the official launch of the International Year of Chemistry held 18 January 2011 involved female chemists from 44 countries, including a number in Latin America. Worldwide there were close to 100 breakfasts, involving roughly 5000 women chemists. In honor of IYC, Peru issued a unique stamp on 1 August 2011 crammed with chemical imagery representing the multiple links between chemistry and the Peruvian coat of arms. Some FLAQ



The FLAQ is symbolized by the “Lamp of Wisdom,” which is transported from country to country that hosts the CLAQ.

Special Outlook on Nanotechnology

by Ana María Osorio Anaya

The first Peruvian Nanotechnology Symposium was organized by the Chemical Society of Peru on 26–28 June 2012 in Lima, at the Peruvian Institute of Nuclear Energy. The success of this symposium was reflected in its 2 international courses and 13 lectures, all of which were at a high academic and scientific level. About 50 participants attended from different academic institutes, not only from Lima, but also from provinces such as Arequipa, Moquegua, Ica, Trujillo, Piura, Cajamarca, and Chimbote.

Thirty-eight research papers for oral presentation were presented, with the participation of three levels of research: preliminary research papers by undergraduate students, thesis research by graduate students, and research papers by renowned lecturers and research teachers. Topics included molecular modeling (3 research

papers); synthesis, characterization, and study of inorganic nanomaterials (27 papers); synthesis, characterization, and study of biomaterials (4 research papers); and applications of nanomaterials in the initial phase (4 papers). Most of the papers were from universities in Lima, most notably from the Universidad Nacional Mayor de San Marcos and Universidad Nacional de Ingeniería.

It is clear that in Peru, we are in the construction stage of basic knowledge of nanoscience and nanotechnology, and that typically most research papers are related to inorganic nanomaterials, including metallic nanoparticles of gold, silver, copper, and nickel, as well as nonmetallic nanoparticles of carbon. Other research papers dealt with the exploration and development of nanocomposites as iron oxides, titanium oxides, tin oxides, copper oxides, nickel oxides, and metallic nanoalloys. A small num-

ber of research papers involved nanobiomaterials.

Thanks to the valuable experience acquired organizing the First Peruvian Symposium of Nanotechnology, the Chemical Society of Peru held a symposium on “Materials Science: Nano-technology” within the 30th Latin-American Congress of Chemistry, which took place in Cancun, Mexico, 30 October 2012. This important event featured the following lectures:

- Carlos R. Cabrera (Puerto Rico): “Nanostructure, Surfaces, Electrochemistry: Synthesis of Catalytic for Combustible Cell”
- Maria Quintana Cáceda (Peru): “Synthesis of Nanostructured ZnO for Photovoltaic Applications”
- Roberto Candal (Argentina): “Nanotubes of Carbon and Hybrid Nanoalloys: Applications in the Synthesis

countries, such as Brazil, were able to secure state support for IYC activities, while others, such as Cuba and Peru, were not.

FLAQ has long-standing and important relationships with IUPAC and the American Chemistry Society. Delegations from both institutions, led by their presidents, have attended recent CLAQs. Both organizations have provided support to our young people, either by organizing fairs and/or festivals during CLAQs or by facilitating the participation of young Latin American chemists in conferences (read more in CCE Projects in Latin America, p. 20).

The FLAQ also participates in the IUPAC Committee CHEMRAWN—Chemical Research Applied to World Needs; current members of that committee include representatives from Puerto Rico, Brazil, and Cuba. The interest of this committee is to find solutions to specific problems affecting the region using the chemical sciences.

Facing the Future

Having celebrated its golden anniversary, and facing the future, FLAQ must position itself as a value for its member organizations. In order to better promote the image and visibility of the chemical sciences, within a regional and global context, we have started a strategic exercise to develop a vision for the future and a platform for the next 50 years of the FLAQ.

FLAQ encourages all chemists, chemical engineers, pharmacists, and other professionals to actively participate in CLAQ 2014, which is being organized by the Sociedad Química del Perú and which will take place in Lima, Peru, 14–17 October 2014. 🏆

Olga Lock <flaq_se@yahoo.es> is executive secretary of FLAQ.

👉 www.flaq1959.org



Speakers at the Materials Science: Nanotechnology Symposium held at the 30th CLAQ (from left): Carlos Cabrera, María Quintana Cáceda, Javier García Martínez, Ana María Osorio Anaya, Roberto Candal, and José Vega Baudrit.

- of Composite Materials”
- Javier García Martínez (Spain): “Nanostructured Catalysts for the Refinement of Petrol, from the Lab to the Refinery”
- José Vega Baudrit (Costa Rica): “National Program of Development of the

Nanotechnology in Costa Rica: Role of LANOTEC”

The further development of nanotechnology in Latin-America, and the entire world, involves the integration of knowledge from physics, biology, medicine, electronics, engineering, and other

fields. Therefore, the Sociedad Química del Perú recommends that the various academic and scientific institutions in Peru collaborate to secure government funding for a nanotechnology project aimed at improving the quality of life of Peruvians. Certainly, a country that does not invest in science and technology is condemned to economic scarcity. Five years from now, with the support of national and international institutes, the development of nanomaterials in our region, could be within our reach.

The Chemical Society of Peru is now planning to organize the second Peruvian Nanotechnology Symposium, which would be held in November 2013; and for during CLAQ-2014, the plan is to host the First Ibero-American Symposium Nanotechnology. 🏆

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Using Green Chemistry in Teaching

A Brazilian Case Study

by Renan Bertolin, Milena Avancini, Andréia Matos, and Vânia Gomes Zuin*

Since its emergence in the 1990s, the scientific philosophy called Green Chemistry has become relevant all over the world. This relatively new perspective, especially in the field of education, focuses on the development and improvement of processes and products to reduce or to eliminate the use and generation of hazardous substances.^{1,2} According to some researchers, Green Chemistry and its 12 principles can provide compelling ways for teachers to interest students in science.³

This article considers the application of the principles of Green Chemistry in the context of environmental education.⁴ First, by focusing on a local community (such as a school) and then on wide area networks, environmental education aims to stimulate a collaborative and critical approach to environmental realities and possible solutions of local problems.⁵ In order to adapt the scientific knowledge that is planned to be taught, a specific content will be transformed from its production at university level to its teaching in basic education. This phenomenon is known as the didactic transposition and became necessary because the goals of the scientific community and school are different, so the knowledge needs to be treated differently considering the didactic dimension.⁶

The authors report some results of a case study conducted at a rural school in São Carlos (São Paulo State, Brazil).

The main objective of the project was to investigate the potential to educate Brazilian primary and secondary students about Green Chemistry using a pedagogic activity plan considering environmental topics. The Knowledge Fairs, as part of this project, were based on the control of corn armyworm (*Spodoptera frugiperda*), an important issue in the school's region.

S. frugiperda is the major pest of many crops in the Americas and one of the most devastating to tropical maize, causing up to a 34 percent reduction in the overall productivity of this crop in Brazil. Armyworm larvae are usually controlled using pesticides such as

piretroids and organophosphates when defoliation is noted in the field.^{7a,b} However, there are many problems associated with using some of these synthetic pesticides; mainly, the likelihood that the worms develop a resistance to the pesticide or that it interferes with natural controls by reducing insect predators and parasitoids of the worms.⁸ Alternative pest control methods are being pursued, such as botanical insecticides. These insecticides of botanical origin may be an efficient alternative, since they have low mammalian toxicity, lack of neurotoxic action, low persistence in the environment and high biodegradability.^{9a,b} The didactic activity proposed focused on the environmental contamination caused by the indiscriminate use of synthetic pesticides (as organochlorines) and the introduction of new products or methods considered to be less harmful to the environment.

The Knowledge Fairs

The case study, conducted from 2010–2012, included knowledge fairs, regular classes, and extra-class activities. The research team worked at a rural public school in São Carlos (São Paulo State) as part of the Institutional Scholarship Program for Teaching of the Coordination for the Improvement of Higher Education

Personnel program conducted by the Chemistry area of the Federal University of São Carlos (PIBID-CAPES). The fairs encouraged students to consider how knowledge from university research can effect what they learn in school.

For this project, several approaches were used by the research team to teach students about the pest *S. frugiperda* and its cycle of development, its role in the plantations, and the possibility of using an alternative method for its control. The goal was to spark the students' interest and curiosity through meaningful learning and how they could understand and apply Green Chemistry in everyday life.

During the fairs and related activities, the students were able to follow the worms' different stages of development and learn about selected compounds extracted from plants that can control this pest. For instance, azadirachtin, a complex tetranortriterpenoid limonoid from the neem seeds, causes toxic effects in insects. The activities promoted a discussion among the students, researchers and their teachers about how an alternative "greener" process of pest control might be used to combat the armyworm.



Larvae of *S. frugiperda* used in the case study.

Biological Material

Neonate larvae of *S. frugiperda* were obtained from the Insect Bioassay Laboratory of the Federal University of São Carlos and reared on artificial diets. They were maintained in an incubation chamber with a light phase of 12:12 h L:D, $70 \pm 5\%$ relative humidity, and $25 \pm 1^\circ\text{C}$. The worms' diets were placed in previously sterilized glass tubes ($8.5\text{ cm} \pm 2.5\text{ cm}$) into which larvae of *S. frugiperda* were introduced individually. The obtained pupae were weighed after pupation and were transferred to plastics cups, where they were kept until the emergence of adults.¹⁰

Outcomes

The teaching of Green Chemistry as part of environmental education helped students gain a better understanding of the science behind insect-plant interactions. This case study demonstrates that when a didactic activity is transferred to the students' lives a deeper comprehension of their reality and the improvement of their critical capacity are achieved.^{11,12} Before and after the fairs, the scientific background to the experiments was dealt with in other forums, including showing documentaries, activities in class, and the demonstration of specimens during the project. It has been shown that class exercises based on local, controversial issues with socio-scientific dimensions have a greater potential to promote scientific literacy.¹³ The students clearly found the project stimulating as they searched for answers to questions such as "What other chemistry research is carried out by the Federal University of São Carlos?", "Is it always green?", "How do the researchers know that their projects are within the scope of Green Chemistry?", "Is it possible to see green products (pesticides) on the Brazilian market?"

It was possible to observe that the didactic approach used in the case study gave the majority of students a better understanding of the recent scientific research programs developed in their own country. Previously, many did not realize that there are green technologies developed in Brazilian universities that can be used to confront our specific environmental problems.

The activities proposed, especially the Knowledge Fairs, provided students with the tools to critically reflect on the issue of pesticide use and opportunities for pest control based on the principles of Green Chemistry and also allowed them to interact with university students, hopefully encouraging them to pursue higher education.



A demonstration at a Knowledge Fair held at a rural school in São Carlos, Brazil.

Acknowledgements

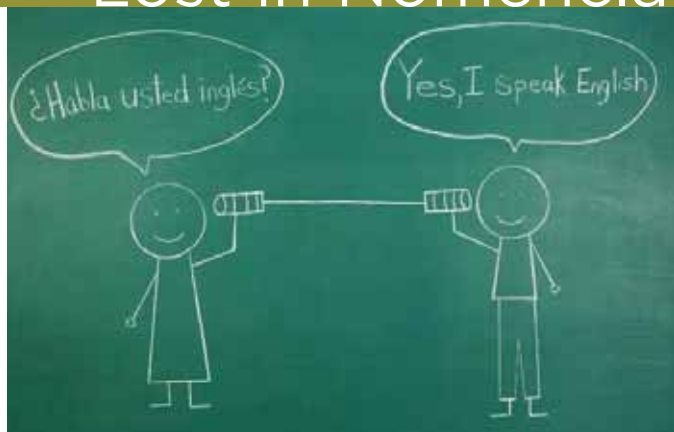
The authors thank the following organizations for their support and assistance: Coordination of Improvement of Higher Education Personnel, the Institute for Biorational Control of Insect Pests, the National Council for Scientific and Technological Development, and the members of the Research and Study Group in Green Chemistry, Sustainability and Education. 🌱

***This paper is based on an award winning poster presented at the 4th International IUPAC Conference on Green Chemistry (ICGC-4), Foz do Iguaçu, Brazil, 25–29 August 2012. Corresponding author, Vânia Gomes Zuin <vaniaz@ufscar.br>, is a professor in the Chemistry Department of the Federal University of São Carlos, São Carlos, São Paulo, Brazil.**

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Lost in Nomenclature Translation



by Bernardo Herold

Why Translate Nomenclature?

International organizations, such as the European Union, make extensive use of IUPAC nomenclature to organize and maintain huge databases of chemical substances. However, this task can be quite difficult when the data in question is multilingual, as is the case with the EU.

Although English is the official language of IUPAC and it therefore does not make any recommendations on how to name chemical substances in other languages, some of the most important nomenclature books or recommendations have been translated into other languages. A list of these translations compiled by Dr. Gerard P. Moss can be found at www.chem.qmul.ac.uk/iupac/bibliog/books.html. Such translations are of great value to those in charge of translating the names of substances at international organizations. If there are no translated nomenclature rules in a given language, the task of translating, name by name, in a database with tens of thousands of entries, becomes very difficult and arbitrary. There is a great risk that such translated terms will be inconsistent or ambiguous.

The Rules

The publication of a translation of IUPAC Nomenclature Recommendations is subject to the following rules, found at www.iupac.org/home/publications/technical-reports/procedure-for-publication.html:

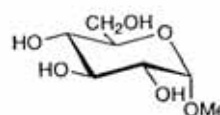
- Republication or reproduction of any Recommendation or Technical Report or its storage and/or dissemination by electronic means. No formal IUPAC permission is needed on condition that an acknowledgment, with full reference to the source along with use of the copyright symbol ©,

the name of IUPAC, and the year of publication are prominently visible.

- Publication of a translation into another language is subject to the additional condition of prior approval from the relevant IUPAC National Adhering Organization.

These rules, however, do not explicitly address cases in which two or more countries use the same language. The Interdivisional Committee on Terminology and Symbols filled this gap by insisting that in such cases the translation must be approved by all National Adhering Organizations (NAOs) relevant to that language. However, there are cases where the chemical communities of the involved countries had little contact with each other during the period in which chemical nomenclature developed and were subject to different cultural influences. This is the case for Brazil and Portugal. During the first half of the 20th century, the dominant foreign cultural influence on the chemists in Portugal came from France, whereas, in Brazil, German-speaking immigrants and Brazilian chemists trained in the USA left their footprints on the way chemical nomenclature was adapted to the Portuguese language. The Portuguese translations of IUPAC nomenclature books obtained the approval of both concerned NAOs. The translator teams had members of both countries, who collaborated successfully in minimizing the differences between both versions. In the cases where no unification was possible, both the European and the Brazilian version were displayed in the translation. The following example, taken from the Portuguese translation of *Carbohydrate Nomenclature*, illustrates this practice:

The English name methyl α -D-glucopyranoside for



was translated in two versions as follows: α -D-glucopiranosídeo de metilo, (*bras.* α -D-glucopiranosídeo de metila). Fortunately, only one version was necessary for the great majority of the examples.

If IUPAC were to publish multilingual glossaries (either of substance names or other chemical terms), the same rules that apply to translations would have to be followed. In other words, such a glossary would require the approval of all involved NAOs, which could be a large number. For example, the 10 languages

Language ^a	Number of countries with the same official language	Number of IUPAC NAOs relevant to each language
Chinese	3	1
Czech	1	1
French	29	5
German	6	6
Italian	2	2
Japanese	1	1
Polish	1	1
Portuguese	9	3
Russian	8	1
Spanish (Castilian)	20	5
	80	26

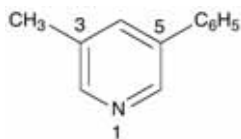
a. The choice of languages and any deviation from official numbers in the second column have to be considered accidental and with no political intention.

most important to the chemical literature (see table) are official languages in 80 countries, 26 of which are NAOs of IUPAC. In principle, they would each have to be asked for approval of the glossary.

Technical Aspects of Translating Nomenclature

There are many technical aspects to the translation of nomenclature rules and names, which translators who have no training in chemistry, or chemists who are not trained as translators, may overlook. Some of the most important pitfalls for translators are presented below, but the most important recommendation is not to try to translate names of substances before the relevant rules have been translated.

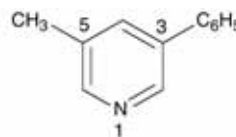
The following is an example of the type of error made when attempting to translate substance names without knowing the translated rules:¹



3-methyl-5-phenylpyridine, numbering in accordance with the EN name.

For the compound named “3-methyl-5-phenylpyridine” in English (*EN*), the following translation in Spanish (*ES*), Italian (*IT*), and Portuguese (*PT*) is wrong: “3-metil-5-fenilpiridina” (wrong alphabetical order of substituents) and “5-fenil-

3-metilpiridina” (wrong numbering of ring). First, one has to draw the structure, based on the English name, order the substituents alphabetically in the target language and then number the ring atoms. The correct translation (*ES*, *IT*, *PT*) is thus “3-fenil-5-metilpiridina”.



3-fenil-5-metilpiridina, numbering in accordance with the IUPAC rules translated in *ES*, *IT*, *PT*.

It is curious to note that, if one derives the structural formula from any of the above quoted names, be they the correct or the wrong ones, one always arrives, nevertheless, at the same structural formula.

This example is only one of the many consequences of these three languages not using “ph” for the consonant “f”. Another case is the absence of the letter “y” in Italian, Portuguese, and Spanish, which does not allow any distinction between the translations of the retained names benzyl ($C_6H_5-CH_2$) and benzil ($C_6H_5-CO-CO-C_6H_5$).

Another potential hazard for translators can be found in the new rules for coordination nomenclature (2005 edition of the Red Book). According to these new rules, the anion formerly called “tetrachloropalladate(2-)” is now named “tetrachloridopalladate(2-)”. But when translating into Portuguese, some have thought they should now use “tetrachloridopaladato(2-)” instead of “tetrachloropaladato(2-)”. This typical error resulted from attempting to translate a name without having yet translated the relevant rules. The general rule in additive nomenclature applied to coordination compounds is that the (only sometimes modified) names of the ligands themselves are used as prefixes of the name of the central atom. The modifications recommended in English do, however, not always make sense in other languages: In English, the names of the anionic ligands ending with “ide”, “ate” and “ite” have to be changed to “ido”, “ato” and “ito”. In Portuguese and Spanish the last letter of the anion endings is already “o” (“eto”, “ato”, and “ito” in Portuguese and “uro”, “ato”, and “ito” in Spanish). Therefore, no modification has to be made, and thus, the part of the rules stating that the letter “e” should be changed to “o” does not need to be translated.

In the above example, the name of the anionic ligand is “cloreto” in Portuguese and “cloruro” in

Lost in Nomenclature Translation

Spanish. Therefore, the name of the complex anion is “tetraclorotopaladato(2-)” in Portuguese and “tetracloruropaladato(2-)” in Spanish. To use “clorido” in these languages as a ligand prefix is to completely misunderstand the intention of the IUPAC rules, which are intended to be as simple as possible and with as few exceptions as possible. In order to justify “clorido” as a prefix, one would have to introduce in the Portuguese and Spanish translations of the IUPAC rules a special exception (to modify “eto” to “ido”), which does not exist in the English original. Not only would it make the rules unnecessarily complicated, but it would introduce an obviously superfluous new term “clorido,” which had never been used before in these languages. Obviously, it is much simpler to tell a student that he or she has to use the unchanged name of the free ligand as the ligand prefix, than to have him or her memorize an extra rule.

As pointed out above for Italian, Spanish, and Portuguese, the fact that “y” is not part of the alphabet introduces potential ambiguity for those attempting to adapt the names “benzyl” and “benzil.” But the opposite can also be true: There are potential sources of ambiguity in English, which do not exist in many other languages. Such an example exists with the ending “ide”. It occurs in chemical nomenclature most often when designating an atom or group of atoms with a negative charge (i.e., an anion, like in “oxide”, “hydroxide”, “sulfide”, “sulfanide”, “methanide”, “azanide”, “phosphanide”, “nitride”, “fluoride”, “chloride”, and the other halides. In other cases, like in amides, imides, of acids, it does not signify a negative charge. The original meaning of the ending in Latin is “similar

to.” As an example, “hominide,” derived from the Latin “homine” for man, means “similar to man.” When the root of the word is Greek as in “anthropos” for man, the analogous term is “anthropoid.”

To prevent the misinterpretation of “actinide” as the monoanion of actinium, IUPAC decided recently to change the name of the group of elements “actinides” to “actinoids,” in spite of infringing on the classical rule in scientific terminology not to have a Greek ending with a Latin root. In this case, it was considered more important to remove the possible confusion between the group of elements and the anion. In other languages, such a change would not be necessary. I would not recommend changing the “actinídeos” in Portuguese to “actinóides,” because there is no risk of confusion with “actineto,” which would be the name of the monoanion derived from actinium. The same applies to Italian and Spanish, where the ending for the anion would be “uro”.

A problem relatively easy to solve is the inversion of the order of names in compositional nomenclature of inorganic compounds and functional class nomenclature of organic compounds (including the formerly so-called radico-functional nomenclature). Some simple examples are sufficient to illustrate the principle, which is common to at least four languages: French (*FR*), Italian (*IT*), Portuguese (*PT*), and Spanish (*ES*) in contrast with English (*EN*) and other languages:

NaCl: *EN* sodium chloride, *ES* cloruro de sodio, *FR* chlorure de sodium, *IT* cloruro di sodio, *PT* cloreto de sódio.

Feature Articles Wanted

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Lost in Nomenclature Translation

$\text{CH}_3\text{COOC}_2\text{H}_5$: *EN* ethyl acetate, *ES* acetato de etilo, *FR* acétate d'éthyle, *IT* acetato di etile, *PT* acetato de etilo (*bras.* acetato de etila).

As can be verified in these two examples, in functional class nomenclature the words are separated by spaces in all five languages. This is not the case for German and some other Germanic languages:

For $\text{CH}_2(\text{COOCH}_3)_2$, the translations of the English name dimethyl malonate are *ES* malonato de dimetilo, *FR* malonate de diméthyle, *IT* malonato di dimetile, and *PT* malonato dimetilico, but in German (*DE*) it is Dimethylmalonat.

A slightly more complicated example in German is $\text{C}(\text{CH}_3)_2(\text{COOCH}_3)_2$: *EN* dimethyl dimethylmalonate, *ES* dimetilmalonato de dimetilo, *FR* diméthylmalonate de diméthyle, *IT* dimetilmalonato di dimetile, *PT* dimetilmalonato dimetilico, but the correct German translation is neither Dimethyldimethylmalonat nor Tetramethylmalonat, as one might suppose, but *DE* Dimethyl-2,2-dimethylmalonat.

As one may have noticed, there is an additional gender problem regarding the name of radicals or substituent groups between the Brazilian and European Portuguese versions. In European Portuguese, they are masculine, like “metilo”, “etilo”, “propilo”, etc. Once they cross the Atlantic and arrive in Brazil, they become feminine in “metila”, “etila”, “propila” etc. It has been impossible to reach an agreement. But should one really waste time on such a discussion? While Byzance was besieged by the Arabs, it is said that the church leaders were discussing the sex of angels. This might be a warning to overzealous multilingual nomenclaturists! The consequence of getting lost in such details might be that one forgets the most important aspect of translating nomenclature: First establish the rules in the target language before taking the second step, which is translating the names. 🙏

1. The author apologizes for not including examples of languages other than English, French, German, Italian, Portuguese, and Spanish, due to his lack of knowledge. For languages outside this group, there may be examples for translating problems of a different nature, which are not covered in this essay.

Bernardo Jerosch Herold, born in 1933 in Lisbon to German-speaking parents, became a professor of organic chemistry at the Instituto Superior Técnico (IST) in Lisbon in 1962. His research in physical organic chemistry focused on radicals and ion pairs. Later in his career, he also taught and did research on the history of chemistry. Because of his thorough knowledge of both German and Portuguese, he was asked to translate the German text-book



Organikum into Portuguese. This acquainted him with the problems of translating chemical nomenclature. In the 1980s, Herold coached for the Portuguese company Partex, as suppliers to the European Communities, a team of translators of 60 000 systematic names into the nine languages

of the European Communities (at the time). He then felt the need to be in touch with the authors of the IUPAC nomenclature recommendations. In 1991, he became a member and later the secretary of Commission III.1 on Organic Nomenclature. Herold served the ICTNS Interdivisional Committee on Terminology, Nomenclature and Symbols as secretary from 2002 to 2011 and the Advisory Subcommittee of Division VIII Nomenclature and Structure Representation from 2002 until now. Herold co-authored the Portuguese translations of the 1993 *Guide to IUPAC Nomenclature of Organic Compounds* and the *IUPAC and IUBMB Nomenclature of Carbohydrates*. Presently he is working as a member of a team on the Portuguese translation of the 2005 *Nomenclature of Inorganic Chemistry*.

Herold's language skills developed from being bilingual and from being also taught French by his mother and in secondary school, as well as English.

His French was improved by attending organic chemistry lectures at IST in the 1950s given in French by the French professor Pierre Laurent, as well as through industrial vacation training in France, dating a French-speaking girl, and attending a course on 19th Century French literature at the Alliance Française. His English was improved by attending a three-month English-language course in summer 1956 in London. Herold's German was updated by getting his doctoral degree 1961 in Heidelberg with Georg Wittig and marrying a German student. Later, his English was improved working in the English drama group Lisbon Players and by representing Portugal in various international organizations. As for his passive language knowledge, Herold picked up Spanish by reading Spanish books and traveling in Spain, and he once had some Italian lessons before traveling in Italy and can read Italian with the help of a dictionary.

Stamps International

Latin American Heroes of Chemistry

The eloquent prose and vivid poetry of many representatives of the so-called Latin American Boom of the 1960s and 1970s brought well-deserved recognition to the subcontinent's literature. As a matter of fact, Gabriel García Márquez and Mario Vargas Llosa, two of my favorite writers, are among the six Latin American novelists or poets who have been honored with the Nobel Prize in Literature since the end of World War II. In contrast, only two Latin American scientists have ever been awarded the Nobel Prize in Chemistry: Luis Leloir (1970) and Mario Molina (1995). Their careers and scientific accomplishments, a source of pride and inspiration for many fellow Latin Americans, are highlighted in this note.



Luis F. Leloir was born in Paris in 1906 but lived in Argentina since the age of two. He studied medicine at the University of Buenos Aires and started his scientific career in 1932 at the Institute of Physiology, where future Nobel Laureate Bernardo Houssay (Physiology or Medicine '47) introduced him to biochemical research and became a lifelong mentor, collaborator, and friend. In 1947, he was appointed founding director of the Instituto de Investigaciones Bioquímicas (IIB), a new biochemical research laboratory privately funded by the Fundación Campomar. Significantly, all the work that Leloir and his coworkers carried out that led to his Nobel Prize in Chemistry (1970)—for the discovery of sugar nucleotides and their role in carbohydrate biosynthesis—was performed at the IIB, often

with limited resources. He continued doing research on a daily basis until his death in 1987. The renamed Fundación Instituto Leloir remains today a preeminent center for the study of the biochemistry of neurodegenerative diseases.



In turn, Mario J. Molina was born in Mexico City in 1943 and graduated with a degree in chemical engineering from the National Autonomous University of Mexico in 1965. He moved to the United States for graduate studies in 1968 and obtained a Ph.D. in physical chemistry from the University of California, Berkeley, in 1972. In October of the following year, as a new postdoctoral fellow in the research group of F. Sherwood Rowland at the University of California, Irvine, he started investigating the environmental fate of chlorofluorocarbons (CFCs), a family of compounds widely used as propellants and refrigerants at the time. Within months, they developed a model that explained the progressive destruction of ozone by CFCs present in the atmosphere, pioneering work that eventually led to the 1995 Nobel Prize in Chemistry they shared with Paul J. Crutzen. Since 2004, Molina splits his time between atmospheric chemistry research at the University of California, San Diego, and the promotion of collaborative research and public policy changes in air quality and sustainability at the Center for Energy and the Environment, a think tank he established in Mexico City in 2005.

For a short autobiography of Leloir, see: Leloir, L.F. *Ann. Rev. Biochem.* 1983, 52, 1-15. In turn, a biographical sketch of Molina has recently been published in: Tollefson, J. *Nature* 2010, 467, 902-905.

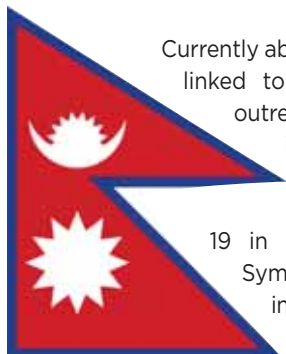
Written by Daniel Rabinovich <drabinov@uncc.edu>.

Nepal Joins IUPAC

In February 2013, Nepal Polymer Institute joined IUPAC and became the Union's 61st National Adhering Organization. The Nepal Polymer Institute is a national, nonprofit, professional organization registered under the Kathmandu District Administration Office of the Nepal Government. The institute was founded in 2010 by a team of enthusiastic chemists working at different academic institutes and government bodies under the leadership of Dr. Rameshwar Adhikari, associate professor at the department of chemistry, Tribhuvan University, Kathmandu.

The Nepal Polymer Institute is striving to accomplish the following objectives:

- serve the nation as a nonprofit organization working for the overall welfare of society
- establish and enhance education and research activities in chemistry, chemical technologies, and interdisciplinary areas of science and technology
- foster research in cutting-edge areas of materials science and engineering, with a particular focus on polymers, the environment, plastics based on renewable resources, and nanotechnology
- catalyze cooperation and coordination among different sectors (academia, industry, and the private sector) in Nepal to promote research and education in polymer science and technology
- encourage young scientists and students in related research fields by organizing workshops, congresses, and symposia; establishing funds for research laboratories, and for scholarships for researchers
- disseminate the scientific information among members through publication of newsletters, bulletins, and journals



Currently about 30 scientists are directly linked to the institute, with broad outreach to the national chemistry community. The Nepal Polymer Institute's activities, including POLYCHAR 19 in 2011¹ and the Kathmandu Symposia on Advanced Materials in 2012² have energized and benefited the chemistry community. Through its IUPAC membership, the

institute hopes to establish closer contact with the global chemistry community and to participate in

IUPAC projects. "Being a member of IUPAC", said Rameshwar Adhikari, "will support our chemistry education and research in Nepal. We, the chemistry community of Nepal, are aware of the very important role of chemistry in our country's development."

Nepal's provisional NAO status shall be ratified by the IUPAC Council in August 2013, along with that of Mozambique and Argentina who joined IUPAC in July and September 2012, respectively.

1. www.iupac.org/publications/ci/2011/3305/cc1_200311.html

2. www.iupac.org/publications/ci/2013/3502/cc5_090512.html

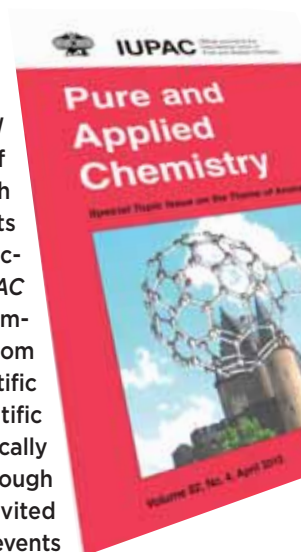
Scientific Editor for *Pure and Applied Chemistry*—Call for Nominations

James R. Bull, is stepping down as scientific editor of *Pure and Applied Chemistry* at the end of 2013 after serving faithfully and with distinction since 2002. IUPAC requests nominations and/or applications to succeed Professor Bull in this position. *PAC* is published monthly and includes recommendations, reports, and lectures from conferences. The mandate for the scientific editor will be to maintain the scientific standards of the journal and specifically focus on the international profile through the publication of collections of invited papers emerging from international events sponsored by IUPAC.

Nominations will be accepted from NAOs as well as from individual scientists. In either case, a CV, a brief statement of interest, and an outline of thoughts on the journal should be submitted to the secretary general at <rdeplanque@iupac.org>. If an NAO is making the nomination, a letter of nomination from the NAO should also be included. The deadline for nominations is 31 May 2013.

PAC is available online at <www.iupac.org/publications/pac>.

 www.iupac.org/news/news-detail/article/scientific-editor-for-pure-and-applied-chemistry-call-for-nominations.html



Call for Nominations for IUPAC International Award in Crop Protection Chemistry

This award recognizes individuals in government, inter-governmental organizations, industry, and academia who have exercised personal leadership for outstanding contributions to international harmonization for the regulation of crop protection chemistry.

The award is administered by the IUPAC Advisory Committee on Crop Protection Chemistry, and is presented on a biennial basis during even-numbered years in conjunction with an IUPAC-sponsored conference or special symposium. Awardees receive a USD 3000 honorarium plus travel and per diem reimbursement to attend the award presentation ceremony. Corporate sponsorship for the award has been arranged with Dow AgroSciences.



Nominations for the 2014 award are due 1 December 2013, and should be sent to Dr. John Unsworth <unsworthj@aol.com>, chair of the IUPAC Advisory Committee on Crop Protection Chemistry. Nominations must consist of the following:

- A nomination letter including the nominee's birthplace, date of birth, citizenship, business address, and a description (200–1000 words) of the reasons why the nominee should receive this award, stressing the individual's major accomplishments toward international harmonization for the regulation of crop protection chemistry.
- A curriculum vitae of the candidate that includes places and names of employment, professional affiliations, committee and working group assignments, and listing of relevant regulatory guidance documents, reports, and/or publications.
- One or more letters of support.

Past Awardees

2012—Lois A. Rossi, Office of Pesticide Programs, Environmental Protection Agency, Washington, D.C., USA www.iupac.org/publications/ci/2012/3404/iw3_rossi.html

2010—Denis J. Hamilton, Animal and Plant Service, Queensland Department of Primary Industries, Brisbane, Australia www.iupac.org/publications/ci/2010/3204/iw3_hamilton.html

Advancing Graduate Education in the Chemical Sciences

The American Chemical Society has released the report *Advancing Graduate Education in the Chemical Sciences*, the outcome of the ACS Presidential Commission appointed early in 2012 by ACS President Bassam Z. Shakhshiri.

This report is the 21st century's first major analysis of the education of chemical scientists in the USA, whose work impacts medicine, drug discovery, energy, materials science, and virtually every other field of science. The report's recommendations, if implemented, will serve to ensure that technological leaders have the skills necessary to ensure future innovation, job creation, and competitiveness.

"No one organization or government agency can, by itself, implement the thoughtful commission recommendations," concluded Bassam Z. Shakhshiri. "Success will require that government, the academic community, private sector and scientific societies work collaboratively in a coordinated fashion."

Copies of the 60-page full report and the 20-page summary are available at www.acs.org/gradcommission.

Your Formula—Fresh Ideas for a Sustainable Future

Yourformula.eu is an on-line platform dedicated to generating a dialogue among civil society, academia, authorities, and industry about the keys to building a sustainable future. The platform was created by the European Chemical Industry Council (CEFIC) to give young people a place to share ideas.



It is maintained by a dedicated group of young scientists and communicators who are passionate about sustainability.

“No single entity can build the future alone and everyone should play a role. No one has all the answers” says Nuno Bacharel <nuno@yourformula.eu>, chief editor at yourformula.eu. Through this communication platform, the focus is on young scientists and to find out what their expectations are. In addition to fun and inspiring articles, the site collects videos, news, and events, sharing innovations taking place in Europe and hinting at a more sustainable future.

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In Memoriam: Anders J. Thor

Anders J. Thor was born on 4 December 1935 and obtained a Master's of Science degree in electrical engineering at the Royal Institute of Technology (KTH) in Stockholm in 1959 and the degree of Tekn. L. in mechanics and mathematics, also at KTH, in 1964. He was lecturer in mechanics at KTH from 1962 to 1965 and became a senior lecturer (professor) in 1965. He also worked part time at the Swedish General Standards Institution, where he took responsibility for two projects: (1) Quantities and Units as secretary of the Swedish National Committee and the ISO/TC 12 in 1982 and (2) Technical Energy Systems at the Swedish National Secretariat. A nice summary of his attitude towards his work can be found in an interview from 1996.¹ Even after retirement he remained very active in his field.

From 1994 to 2001, Thor was an associate member of the Commission on Physicochemical Symbols, Nomenclature and Units (Commission I.1). From 2006 on, he was a national representative to the commission, representing the International Organization on Standardization (ISO, Technical Commission 12). He had joined the Green Book working group and contributed substantially to the discussions about the third edition when the group met in 1999 in Engelberg, Switzerland. This difficult and extensive project was finalized in 2006 and the picture below shows those authors of the IUPAC Green Book present at the dinner in Zürich after final corrections were implemented. He was also engaged in the Green Book abridged version, which is currently in preparation.

Anders often had strong opinions, and almost as often expressed them quite forcefully. But at the same time, we remember him as a member of our group who was always willing to discuss every question, every detail in a friendly way. In the following quote from his 1996 interview,¹ he discusses the stability of conventions, a subject dear to his heart: “These should have strict rules, but there should be one rule and it should be stable for some years before they change it. . . . Metrication, of which the SI is only the top, has gone on for 200 years and is still going forwards.



Green Book authors in 2006 (right, from front to back): Anders J Thor, Martin Quack, Jürgen Stohner, Franco Pavese and (left, from front to back) Roberto Marquardt, Ian Mills, Tom Cvitas, and Jeremy Frey.

Therefore, it doesn't really matter if it is this year or next year, but only that you go in the right direction. Then, if we have patience, after another 100 years the metrication process will be complete. Of course, I would have hoped that it could come while I'm still alive . . .” Regrettably, Anders left us much too early to see the metrication process come to an end. He died on 7 April 2012.

IUPAC and ISO/TC12 have lost a knowledgeable man and an expert in standardization. The members of the Green Book working group have also lost a good colleague and a true stable friend.

The members of Commission on Physicochemical Symbols, Nomenclature, and Units (I.1): Kozo Kuchitsu; Roberto Marquardt, vice president Division I; Martin Quack; Jürgen Stohner, chair Commission I.1 and secretary ICTNS.

1. A.J. Thor, “Keeping Up Standards. Pretty Darn Quick” in *Friendship Among Equals. Recollections from ISO's First Fifty Years*, p. 69–79, ISO Central Secretariat, ISBN 92-67-10260-5 (1997) <www.iso.org/iso/2012_friendship_among_equals.pdf>.

CCE Projects in Latin America

At the Congreso Latinoamericano de Quimica (CLAQ 2012) held in Cancun, Mexico, in October 2012, several IUPAC activities related to projects of the Committee on Chemistry Education (CCE) were organized. These included the Flying Chemists Program and the Young Ambassadors for Chemistry (YAC) project. Taking advantage of the geographical proximity, the activities were first showcased in Panama.

The general aim of the Flying Chemists Program is to provide emerging countries with the means to improve the teaching and learning of chemistry at primary, secondary, and tertiary levels. The project provides the visited country with the expertise needed to strengthen chemistry education and to assist in its development. YAC is a project that has trained teachers around the globe to help students communicate the benefits of chemistry. A typical YAC event encompasses two to three days of teacher workshops, followed by a one-day public event where students—the Young Ambassadors for Chemistry—share their enthusiasm and interest with the public at large.

Panama City

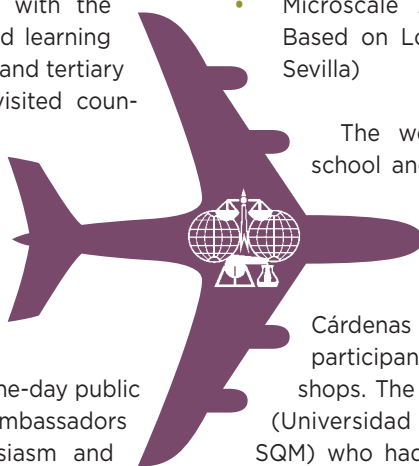
From 20–24 October 2012, the Ministry of Education of Panama and the Universidad de Panama hosted Mei Hung Chiu (Taiwan Normal University and CCE chair), Fortunato Sevilla (Universidad de Santo Tomas, Philippines, Flying Chemists task group member), and Lida Schoen (YAC task group chair). Chiu and Sevilla presented four workshops to high school and college teachers on “Pedagogical Insights for the Learning of Chemistry,” and “Microscale Analytical Chemistry.” Schoen organized a YAC workshop and a public event in front of the Ministry of Education offices that had over 100 participants. Local organizers included Marisa Talavera and Ilsa Austin of the Ministry of Education and Abdiel Aponte and his group from the Universidad de Panama.

Cancun, Mexico

The group then flew to Cancun, Mexico, in connection with CLAQ 2012, where the Sociedad Quimica

de Mexico and the Federacion Latinoamericana de Sociedades de Quimica hosted and facilitated the YAC and Flying Chemists workshops and an education symposium. Peter Mahaffy (Kings College, Canada), CCE past chair, joined the group in Cancun, where it offered the following workshops on 27 October 2012:

- Nonstandard Ways of Assessing and Developing Student Understanding in Chemistry (Mei Hung Chiu)
- Visualization of Chemistry and Climate Change Science—A Hands-On Workshop (Peter Mahaffy)
- Microscale Analytical Chemistry Experiments Based on Low-Cost Instrumentation (Fortunato Sevilla)



The workshops were attended by high school and college teachers from throughout Latin America (at an average of 20 participants in each). Kazuyuki Tatsumi (IUPAC president), Cecilia Anaya (SQM president), and Héctor Cárdenas (SQM general secretary) welcomed participants at the beginning of the workshops. The local organizer was Jorge G. Ibanez (Universidad Iberoamericana-Mexico City and SQM) who had much assistance from Carlos Rius Alonso (Universidad Nacional Autonoma de Mexico, UNAM/SQM), Juan Pérez (President, PROVITEC, a glass company), Norberto Farfán and Margarita Romero Ávila (UNAM/SQM), Alejandro Zepeda and Manolo Barceló (UADY), and José Manuel Méndez Estivalet (UNAM/SQM).

On 28 October 2012, the group participated in the Symposium on Chemistry Education, which about 100 persons attended. Organized by Jorge Ibanez, the symposium included the following presentations:

- Alternative Diagnostic Assessment in Chemistry Education, Mei-Hung Chiu
- Using the Rich Context of Climate Science to Teach Chemistry, Peter Mahaffy
- Communicating Chemistry, Lida Schoen
- Analytical Chemistry Experiments in Microscale, Fortunato Sevilla III
- Teaching Environmental Chemistry through Experiments, Jorge G. Ibanez

The same day, the group participated in the YAC event at which several hundred people took part in the outreach activities. The YAC event took place in front of the town hall Benito Juarez of Cancun, a spacious square.

On the days prior to the public event, the usual



YAC training workshop was held. Héctor Alejandro Cárdenas Lara (secretary general of SQM) kicked off the YAC training workshop, which, instead of training teachers, was focused on chemistry and medical students. No one knew how many students to expect nor from where they would come.

As unstructured groups of students descended upon the square, the volunteers did what they could to contain what appeared to be a chaotic situation, but which was simply a popular event with a lot of students and members of the public. Visitors to the event included Cecilia Anaya (president SQM), Nicole Moreau (past president IUPAC), Kazuyuki Tatsumi (president IUPAC), Javier García-Martínez (AM CCE, IUPAC Bureau), and Miranda Wu (president ACS). A local policeman estimated there had been 1000 visitors throughout the day on the square.

"It was both gratifying and inspiring for me," said Kazuyuki Tatsumi, "to observe many students and young chemists in Mexico and South America participating in these events with such enthusiasm."



From left: Lida Schoen, Kazuyuki Tatsumi, Peter Mahaffy, Jorge G. Ibanez, Fortunato Sevilla, and Mei Hung Chiu.

InChI Videos Launched

In April 2013, the InChI Trust launched a four-part video series to explain the International Chemical Identifier (InChI)—the widely used identifier for chemical substances that enables easier linking of diverse data compilations. Launched at the ACS Spring Meeting in New Orleans, the short, playful videos provide an easy-to-understand overview of InChI. The videos were created by Nick Currey from mfreeth.com and were produced by the InChI Trust. Following are screen shots from each of the four videos.

Video One: What on Earth is InChI?

Introduction of the InChI standard—the International Chemical Identifier—to represent chemical structures.

Video Two: The Birth of the InChI

Background to the development of the InChI standard.

Video Three: The Googable InChIKey

Describes how an InChIKey enables chemical structures to be uniquely identified on the web, using as a basis the InChI standard.

Video Four: InChI and the Islands

Describes how the InChI standard enables the linking of information on a chemical structure from a variety of sources like databases and journals.



Methods of Measurement and Evaluation of Natural Antioxidant Capacity/Activity (IUPAC Technical Report)

Reşat Apak, et al.

Pure and Applied Chemistry, ASAP article;
Published online 2013-02-26

The chemical diversity of natural antioxidants (AOXs) makes it difficult to separate, detect, and quantify individual antioxidants from a complex food/biological matrix. Moreover, the total antioxidant power is often more meaningful to evaluate beneficial health 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 hardly comparable because of the different mechanisms, redox potentials, and pH and solvent dependencies of various assays. This report will aid the identification and quantification of properties and mutual effects of antioxidants, bring a more rational basis to the classification of antioxidant assays with their constraints and challenges, and make the results more comparable and understandable.

 <http://dx.doi.org/10.1351/PAC-REP-12-07-15>

Impact of Scientific Developments on the Chemical Weapons Convention (IUPAC Technical Report)

Katie Smallwood, et al.

Pure and Applied Chemistry, ASAP article;
Published online 2013-02-16

This document represents the final report of discussions and conclusions arising from the workshop on Developments in Science and Technology Relevant to the Chemical Weapons Convention, held in Spiez, Switzerland, in February 2012. This is the third workshop of its kind: in 2002, IUPAC held the first workshop (Bergen, Norway) and in 2007, held a

second workshop (Zagreb, Croatia). For each previous workshop, the program committee also prepared a report with findings and recommendations to the States Parties of the CWC and the Organisation for the Prohibition of Chemical Weapons (OPCW). These reports provide an important independent contribution from the scientific community to the preparations for the Review Conferences by States Parties and the OPCW Technical Secretariat.

 <http://dx.doi.org/10.1351/PAC-REP-12-11-18>

See the next issue of *CI* for a detailed review and see also *Nature* 496, 25–26 (4 April 2013) for a recent commentary by Leiv K. Sydnes: <http://dx.doi.org/10.1038/496025a>

Electroanalytical Chemistry for the Analysis of Solids: Characterization and Classification (IUPAC Technical Report)

Antonio Doménech-Carbó, Jan Labuda, and Fritz Scholz

Pure and Applied Chemistry, 2013
Vol. 85, No. 3, pp. 609–631

Solid-state electroanalytical chemistry (SSEAC) deals with studies of the processes, materials, and methods specifically aimed at obtaining analytical information (quantitative elemental composition, phase composition, structure information, and reactivity) on solid materials by means of electrochemical methods. The electrochemical characterization of solids is not only crucial for electrochemical applications of materials (e.g., in batteries, fuel cells, corrosion protection, electrochemical machining, etc.) but it also is useful for providing analytical information on the structure and chemical and mineralogical composition of solid materials of all kinds such as metals and alloys, various films, conducting polymers, and materials used in nanotechnology. This report concerns the relationships between molecular electrochemistry (i.e., solution electrochemistry) and solid-state electrochemistry as applied to analysis. Special attention is focused on a critical evaluation of the different types of analytical information that are accessible by SSEAC.

 <http://dx.doi.org/10.1351/PAC-REP-11-11-13>

Fluorescence Anisotropy Measurements in Solution: Methods and Reference Materials (IUPAC Technical Report)

Marcel Ameloot, et al.

Pure and Applied Chemistry, 2013
Vol. 85, No. 3, pp. 589–608

The measurement of stationary and time-resolved linearly (or plane) polarized fluorescence in solution is an important method of investigating the physical and chemical molecular properties of the electronic structure and solvent-solute interactions of small molecules, the conformation and dynamics of natural and synthetic macromolecules, and more. In addition, a growing number of very sensitive and specific analytical methods are based on the determination of changes in fluorescence polarization. The theoretical aspects underlying the emission of polarized fluorescence are presented with great detail in a number of general and specific textbooks and journal publications. Conversely, the practical aspects of the corresponding experimental techniques, including the description of the most frequent sources of systematic errors that corrupt the measurement of polarized fluorescence intensity, are quite dispersed in the literature. As a consequence, the authors of this paper present a comprehensive discussion of spectroscopic methods used currently in the measurement of fluorescence polarization, both steady-state and time-resolved, focusing on those practices that provide accurate and reproducible values of fluorescence polarization from liquid solutions. Methods that are specific for fluorescence microscopy and multiphoton applications will only be touched on briefly, as far as they have consequences for the availability and applicability of polarization standards.

 <http://dx.doi.org/10.1351/PAC-REP-11-11-12>

Terminology for Aggregation and Self-Assembly in Polymer Science (IUPAC Recommendations 2013)

Richard G. Jones, et al.

Pure and Applied Chemistry, 2013
Vol. 85, No. 2, pp. 463–492

In the past, aggregation and self-assembly have been associated principally with micellar and colloidal systems of molecules; however, with the advent of supramolecular chemistry, molecular self-assembly has been opened to a much wider understanding that has facilitated access to a variety of different shapes and sizes, along with the construction of new and fascinating molecular topologies. This document aims at defining more than 150 terms related to aggregation and self-assembly in the particular case of macromolecules. The list is restricted to the most commonly encountered terms.

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

Rules for Abbreviation of Protecting Groups (IUPAC Technical Report)

Margaret A. Brimble, et al.

Pure and Applied Chemistry, 2013
Vol. 85, No. 1, pp. 307–313

Twenty years ago, the number of abbreviations and acronyms in the chemical literature was reasonable. However, in recent years the number has increased so rapidly that their introduction in text and schemes does not necessarily simplify the reading and increase the understanding of scientific papers. In order to remedy this situation, a project was initiated, with the goal of presenting information in the scientific literature clearly and unambiguously. A set of rules for the abbreviation of protecting groups has been developed which is based on principles designed to be as descriptive and systematic as possible, but also sufficiently pragmatic and flexible so as to accommodate the most important current abbreviations.

 <http://dx.doi.org/10.1351/PAC-REP-12-07-12>

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.

Glossary of Terms Used in Computational Drug Design, Part II

Computational drug design is a rapidly changing field that plays an increasingly important role in medicinal chemistry. Since the publication of the first glossary in 1997 (*Pure Appl. Chem.*, 1997, Vol. 69, No. 5, pp. 1137–1152. <http://dx.doi.org/10.1351/pac199769051137>), substantial changes have occurred in both medicinal chemistry and computational drug design. This has resulted in the use of many new terms and the consequent necessity to update the previous glossary. For this purpose a Working Party of eight experts was assembled. They produced explanatory definitions of more than 200 new and revised terms.

Comments by 31 May 2013

Yvonne Martin

E-mail: yvonnecmartin@comcast.net

 www.iupac.org/project/2010-057-3-700

Abbreviations of Polymer Names and Guidelines for Abbreviating Polymer Names

This document provides some basic rules and guidelines regarding the use and creation of abbreviations for the names of polymers. An extended list of currently used abbreviations for polymers and polymeric materials is appended.

Comments by 31 May 2013

Jiasong He

E-mail: hejs@iccas.ac.cn

 www.iupac.org/project/2006-004-1-400

Definitions of Terms Relating to Individual Macromolecules, Macromolecular Assemblies, Polymer Solutions, and Amorphous Bulk Polymers

This document defines terms relating to the properties of individual macromolecules, macromolecular assemblies, polymer solutions, and amorphous bulk polymers. In the section on polymer solutions and amorphous bulk polymers, general and thermodynamic terms, dilute solutions, phase behavior, transport properties, scattering methods, and separation methods are considered. The recommendations are a revision and expansion of the IUPAC terminology published in 1989 dealing with individual macromolecules, macromolecular assemblies, and dilute polymer solutions. New terms covering the principal theoretical and experimental developments that have occurred over the intervening years have been introduced. Polyelectrolytes are not included.

Comments by 30 June 2013

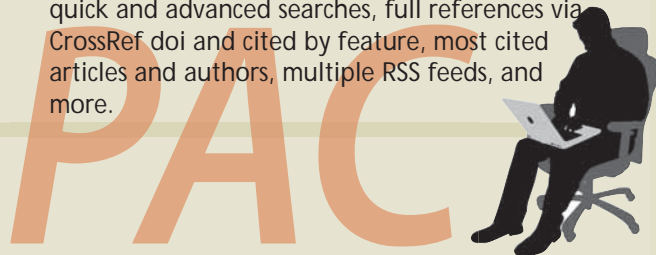
Robert Stepto

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 www.iupac.org/project/2005-005-2-400

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Fragments of Fullerenes and Carbon Nanotubes

edited by Marina A. Petrukhina and
Lawrence T. Scott

John Wiley & Sons, Inc., 2012
ISBN 978-0-470-56908-5

reviewed by Markus Etzkorn

In the context of fullerenes and carbon nanotubes, a recent monograph that discusses the *de novo* syntheses of defined non-planar polycyclic aromatic hydrocarbons and their physicochemical properties deserves attention. The editors, M.A. Petrukhina and L.T. Scott, both accomplished experts in this area of hydrocarbon research, have gathered 14 contributions by 35 authors to highlight a dynamic and rapidly evolving field to the broader scientific community.

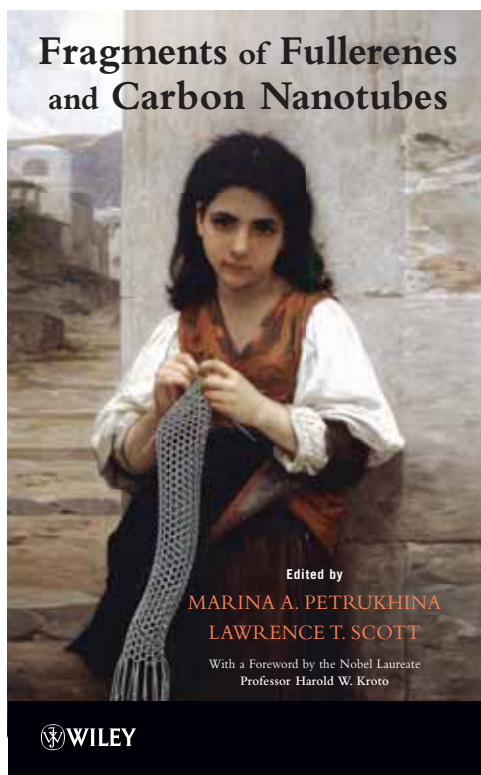
The book, with nine chapters on fullerene fragments and five chapters on carbon nanotube segments, provides a broad introduction to these non-planar aromatic hydrocarbons, while thoroughly discussing synthetic strategies toward the various (unusual) target compounds. Each book contribution highlights unique structural features, ingenious experimental approaches, individual reactivity patterns, as well as guiding theoretical investigation: The reader encounters the intriguing chemistry of molecular tweezers with corannulene pincers (i.e., the buckycatcher), before venturing into the versatile enyne-allene-driven preparation of bowl- and basket-shaped hydrocarbon fragments. The rich structural variety and chemical behavior of reactive buckybowl intermediates (radicals, radical anions, anions) is covered in several chap-

ters. A perspective on the organometallic chemistry of σ - and π -bonded metal complexes of corannulene, sumanene, and corresponding derivatives broadens the perspective even further. As the journey through this world of hydrocarbons continues, hemispherical geodesic polyarenes set the stage for a transition to carbon nanotube fragments. Thus, the last five book chapters conclude the excursion into this exciting world of non-planar polycyclic arenes with a thorough discussion of distinctly different routes to conjugated belt-shaped species (e.g., cycloparaphenylenes, aromatic cyclacene belts).

The chapters are well written, and often combine an individual, sometimes historic perspective with a detailed “story” of the conceptual and experimental evolution. Many schemes, tables and figures support the narrative, while a usually extensive list of references directs the reader to the primary literature. A minor drawback to this fascinating collection of accounts is—on occasion—the varying quality of schemes, figures, or images (e.g., a second, enlarged edition might choose a uniform format for molecule depictions in synthetic schemes, replace the grey-scale depiction of X-ray structures or electrostatic potential maps and improve the resolution of some images or spectra).

Despite the many exciting papers published since this book became available in 2012, this monograph will be a valuable addition to any library, an enjoyable page turner for aficionados of hydrocarbon

chemistry, and a treasure trove for advanced students of organic chemistry.



 www.wiley.com/WileyCDA/WileyTitle/productCd-0470569085.html

Lexicon of Chemical Terminology

French>English, English>French

Jean-Claude Richer, editor.

Lavoisier, Paris, 2012

ISBN 978-2-7430-1428-5

reviewed by Nicole Moreau

As nomenclature is the privileged domain of IUPAC, and as the official language of IUPAC is English, it may be surprising to find an analysis of a French-English lexicon in the IUPAC news magazine. However, it is not always easy to navigate IUPAC nomenclature and a translation into one's own language. It goes without saying that such a book will be extremely useful for many chemists.

It is important to stress that with 1235 pages and 160 000 translations, this book is not one you can place in your hand luggage along with your laptop, but one which should sit on your bookcase! Moreover, it may be debateable whether buying bilingual dictionaries is a good investment since it is so easy to look for a word on the Internet. However, the situation is totally different with this lexicon, since only a small percentage of the words can be found online.

The book has a classical structure for a lexicon: two parts, French>English for the 617 first pages and English>French for the other 613 ones. For the French part, the first expression is “à champ élevé” (upfield) and the last is “zymurgie” (zymurgy). For the English part, they are “A-value” and “zymurgy,” respectively.

What kinds of words or expressions can be found in the lexicon? The names of the chemical functions, such as acid, aldehyde, ester, and so on. One might think that would not be useful because every chemist knows these names in both languages. Well, this is not exactly the case. Just take “aldehyde,” which is a very tricky one, since it can lead one to make errors in both languages. As a French professor of chemistry, I do know that more than half of my students (and many grown chemists) think that the word is a feminine one: “une aldéhyde,” while it is in fact masculine: “un aldéhyde.” So, when a French chemist wants to translate “aldéhyde” into English, he may be tempted to write “aldehyd” since the deletion of the “e” is a general way of moving from French to English; “acide” becomes “acid,” “carbone” becomes “carbon,” etc.

The problem of the final “e” is a frequent one: why should we write penicillin, erythromycin, glycan, second, ion pair, but methane, sulfamide, adrenaline, hormone, theophylline, all of these 10 words harboring a final “e” in French? There are other traps such as sulfate, sulfite, in English as in French, and sulfur for “soufre” (and not “souffre,” dear French students!), but to sulphur, to sulphate, where French keeps the “f”.

The reader of this review can see that I have spent many nice hours reading this book. Of course, I must admit that I am a fan of correct spelling, and I am sure that this book will appear in every laboratory library, at least French ones. It will be of outmost use to those who need to write a paper in English. Of course, the reverse process is not as frequent, but when English or French chemists write in French, it is important that they know for instance which accent has to be used: propénamine or propènediamine.

I have some criticisms of this tome. For instance, why give the names of so many reactions that feature the name of the inventor, such as Birch reaction, Diels-Alder reaction, Grignard reaction? It seems safe to assume that in French they would simply be “réaction de Birch” and so on. The same holds for reagents, furnaces, rules, relations, etc. It would have been better to give one example, and eventually add those where the name is different, such as different ways of spelling foreign names. Also, I discovered that the French word “relation” can be translated either to “relation” or by “relationship”; I don't know why, but I trust the author on this one. Some useful words, although not purely chemical terms but which are very useful, could have been included, such as patent, pattern, molecular modeling (or modelling, USA).

But, what a delightful time I spent learning that “eau de menthe poivrée” is “peppermint water,” “eau de menthe verte” is “spearmint water,” “essence de cannelle-giroflée” is “clove bark oil,” “essence de cassis” is “oil of ribes nigrum” and so on. Such a book could only have been written by a Canadian person, who possesses equal command of both the English and French languages, and we have to thank and congratulate Jean-Claude Richer for this accomplishment.

 www.lavoisier.fr/livre/notice.asp?ouvrage=2638112

Nomenclature Notes

Organometallic Nomenclature

by Jeffery Leigh

The nomenclature of organometallic chemistry often poses a challenge to the chemist. For example, when constructing a systematic name for such a compound should one employ the methods of organic chemical nomenclature, or should one try to adapt the methods of inorganic nomenclature? The answer will depend upon the compound under consideration, with the addition that neither may be directly applicable because the compound presents a problem of assigning a structure with conventional electron-pair bonds. *Principles* goes some way to dealing with this poser.

Some organometallic compounds, primarily of main-group elements in Groups 13–16, are clearly formally so similar to their carbon analogs that they may be named in a rather like fashion, using an organic-type nomenclature. Hence, we can derive names such as methylalumane and trimethylsilanamine for the compounds AlH_2Me and SiMe_3NH_2 ($\text{Me} = \text{CH}_3$). The first name is derived from the name alumane, assigned to AlH_3 , and the second from silane, assigned to SiH_4 . More complex compounds, such as chain compounds may often be named by applying the methods of substitutive nomenclature to the names of the formal hydrocarbon parents. For example, skeletal replacement nomenclature can be used to develop a name for substances such as $\text{MeSiH}_2\text{OPHOCH}_2\text{Me}$. This may be considered to be derived from heptane, which, of course, contains a seven-carbon chain. Hence, the suggested name would be 3,5-dioxa-4-phospha-2-silaheptane. Although it actually contains only three carbon atoms in the chain, the name is unequivocal.

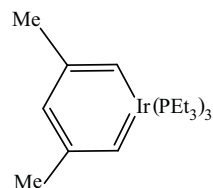
Although organometallic derivatives of Main Groups 1 and 2 may often also be conveniently named by using established additive nomenclature, originally developed to name transition-metal complexes such as $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$, hexaamminecobalt(III) trichloride, organometallic derivatives of transition elements may often not be dealt with so easily because they exhibit not only metal-carbon single bonds, but features such as metal-carbon multiple bonds, and also bonds between a metal ion and unsaturated molecules and groups. Nevertheless, additive nomenclature has been adapted to name them too, though additional strategies have had to be devised.

To define the names of non-organometallic complex compounds which exhibit formally different possibilities for the donor atoms, it has been found useful to employ the so-called κ (kappa) convention, whereby the actual donors are specifically indicated. An example is shown below, where two modes of designating the binding of a nitrite ion (NO_2^-) to a metal ion, M, are exemplified.

M- NO_2 designated nitrito- κV

M-ONO designated nitrito- κO

Compounds that contain a single metal-carbon bond present no new problems, but if such a bond is formally double or triple, the name of the carbon-donor must be altered by changing the termination -yl (as in methyl) to -ylidene or -ylidyne. However, the κ convention may also be applied to define which of more than one available carbon atom is a donor. Sometimes, two correct systematic names may be derived, as in the example below:



(2,4-dimethylpenta-2,4-diene-1,1,5-triido- $\kappa^2\text{C}^1, \text{C}^5$)
tris(triethylphosphane)iridium

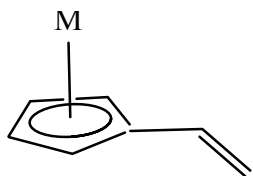
or

(2,4-dimethylpenta-1,3-dien-1-yl-5-ylidene)
tris(triethylphosphane)iridium

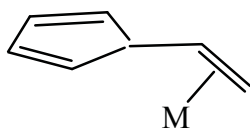
The carbon ligand is regarded as anionic in the first name and a radical in the second. Whether it is preferable to treat a specific carbon-donor ligand as an anion or as a radical is a matter still open for discussion, and *Principles* does not attempt to differentiate between the two approaches.

Sometimes contiguous atoms in a ligand act together as a donor group to a metal ion. This is particularly true of carbon-containing systems such as alkenes, alkynes, and various aromatic groups. To indicate which of the carbon atoms in a ligand is bonded to the metal ion, then the η (eta) or hapto system is applied, as in the examples on the next page.

Nomenclature Notes



ethenyl- η^5 -cyclopentadienido



5-(η^2 -ethenyl)cyclopenta-1,3-diene

However, some compounds, notoriously those of boron, are even more difficult to name. They are sometimes termed electron-deficient and do not always obey the more usual rules governing compounds with two-atom localized electron-pair bonds. Researchers have developed a unique approach to naming these compounds, based upon the names for simple borane polyhedra and boron hydride anions. Often the num-

bers of hydrido-ligands combined with the polyboron skeleton need to be stated. The practitioners in this area also employ several specialized terms. For example, they may differentiate between heteraboranes and metallaboranes, and they employ the word “subrogation” where others might prefer to use the phrase “skeletal replacement.” A whole new chapter in the new *Principles* is devoted to these compounds alone.

The methodologies outlined here are described in the new version of *Principles*, together with guidance upon where to apply them and to which type of compound, with examples of such applications and, for those who require them, references to the more detailed literature.

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

 www.iupac.org/publications/ci/indexes/nomenclature-notes.html

The next topic in this series will be polymer nomenclature.



1ST INTERNATIONAL SCIENTIFIC CONFERENCE REFERENCE MATERIALS IN MEASUREMENT AND TECHNOLOGY

10-14 September 2013,
Ekaterinburg, Russia
www.conference.gso.ru



Conference Call

Physical Organic Chemistry

by *Niklaas Buurma*

The IUPAC International Conference on Physical Organic Chemistry (ICPOC) series of biennial conferences has a long history as the leading international meeting on physical organic chemistry. From its first installment in Crans sur Sierre, Switzerland, in 1972, ICPOC has acted as a focus point for the physical organic community worldwide and the conference series enjoys high international reputation. With its focus on relating chemical behavior and properties to molecular structure through the development of, ideally quantitative, understanding of structure-property relationships, physical organic chemistry finds wide application in tackling current scientific challenges. Not surprisingly therefore, physical organic chemistry has been undergoing something of a resurgence in recent years.

The most recent conference in this series, ICPOC21, was held 9–13 September 2012 in Durham, UK, a spectacular city which boasts a Norman cathedral and an 11th century castle, and is a designated UNESCO World Heritage site. The scientific committee was chaired by Ian Williams (Bath) with other committee members Craig Butts (Bristol), Niklaas Buurma (Cardiff), Anna Croft (Bangor), David Hodgson (Durham) Patrick Fowler (Sheffield), Guy Lloyd-Jones (Bristol), Ann-Marie O'Donoghue (Durham) and Sijbren Otto (Groningen). The conference was organized by the Royal Society of Chemistry and sponsored by Syngenta, American Elements, Oxford University Press, and TCI. It also received generous support from the Engineering and Physical Sciences Research Council. Being an IUPAC-sponsored international conference, scientists from all over the world were present and the conference provided a forum for researchers based in academia or in industry, and at all career stages, to present their results to the physical organic chemistry community and to exchange ideas, meet old friends, and make new contacts. Overall, ICPOC21 was attended by 329 delegates, representing 38 countries and all continents (with the exception of Antarctica!).

Over the years, the interpretation of what constitutes physical organic chemistry has continued to develop. One interpretation (but not the only one) sees it as a widely applicable approach towards chemistry. In line with this developing interpretation of the field, scientific programs for ICPOC have followed suit. ICPOC21 was broadly divided into three streams, viz.

physical underpinnings, mechanism and catalysis, and supramolecular chemistry. Each stream was further divided into sessions covering a wide range of topics from systems chemistry to photochemistry, from concepts in aromaticity to enzyme catalysis, etc.



The conference logo was the minimal saddle trefoil, created by Carlo Séquin (U.C. Berkeley).

The scope of the meeting is illustrated nicely by the range of plenary and keynote talks. The nine plenary lectures covered metal-catalysis for amide synthesis (Jonathan Williams, Bath, UK, 2011 RSC Homogeneous Catalysis Award—replacing Robert Grubbs), radical chemistry (JoAnne Stubbe, MIT, USA), non-covalent synthesis (Bert Meijer, Eindhoven, the Netherlands), stereocontrol in organocatalysis (Donna Blackmond, Scripps, USA), control of chiral space in dynamic chemical systems (Ben Feringa, Groningen, the Netherlands, 2011 RSC Organic Stereochemistry Award), prebiotic chemistry (John Sutherland, Cambridge, UK, 2011 RSC Tilden Prize), dynamic combinatorial chemistry (Jeremy Sanders, Cambridge, UK), variational transition state theory for complex reactions (Don Truhlar, Minnesota, USA, 2012 RSC Chemical Dynamics Award), and selectivity control past the transition state (Barry Carpenter, Cardiff, UK). The plenary lectures were complemented by 15 keynote talks and a good mix of youth and experience. The program's 120 contributed talks, 24 flash poster presentations, and 138 poster presentations similarly represented a broad view of the conference subject matter.

Poster prizes were also awarded to up-and-coming young physical organic chemists. Because of the great number of high-quality poster presenters, seven poster awards were made. IUPAC Poster Prizes went to Eden

Conference Call

Tanner, New South Wales, Australia; Christopher Collett, St. Andrews, UK; Matthew Pringle, Sheffield, UK; Piotr Nowak, Groningen, the Netherlands. The RSC Books Poster Prize was awarded to Nandhini Ponnuswamy, Cambridge, UK. The RSC Chemical Science Poster Prize went to Tomohiro Higashino, Kyoto, Japan, and the RSC Organic and Biomolecular Chemistry award went to Michael Rawling, Strathclyde, UK.



The ICPOC21 banquet.

Overall, ICPOC21 probably counted at least as many memorable moments as there were participants. Many of these were happy occasions (see below), but ICPOC also included a special tribute in honor of Rory More O'Ferrall, who passed away on 15 June 2012. Rory was one of the most well-respected practitioners in the field. He was an active participant and frequent contributor at previous IUPAC conferences on physical organic chemistry. He was also a member of the International Scientific Advisory Board for ICPOC21, and the committee was very grateful for his advice and support during the organization. Rory will be fondly remembered by all who knew him and sadly missed by his family and many friends.

The many happy moments included award winners receiving their prizes, young chemists giving their first presentation at an international conference, and older chemists meeting friends or future collaborators. In addition to such pleasant events, highlights of ICPOC21 included the demonstration of the applicability of physical organic chemistry to a wide diversity of research, providing delegates with surprising new insights. In addition, the inclusion of a symposium honoring Jeremy Sanders, a series of sessions on new approaches to aromaticity, a series of sessions focused on systems chemistry, and several talks on reactions in non-traditional solvents as well as chemistry beyond the transition state provided the audience with a taste

of physical organic chemistry beyond the more traditional, though no less interesting, topics covered at ICPOC21. The flash poster presentations allowed representatives of the next generation of physical organic chemists to give their (first) presentations on an international stage. Overall, possibly the highlight of the conference was the realization that the international physical organic community is as vital and vibrant as it has ever been, promising exciting times ahead for physical organic chemistry.

While on the topic of exciting times ahead, the next ICPOC will be held in Ottawa, Canada, from 10–15 August 2014. Preparations for ICPOC22 are already being made by the Scientific Committee chaired by Heidi Muchall. Further information can be found at <http://events.science.uottawa.ca/icpoc22/welcome.html>.

Niklaas Buurma <Buurma@Cardiff.ac.uk> has been a lecturer in physical organic chemistry at Cardiff since 2006. He is a member of the Royal Society of Chemistry and of the RSC Physical Organic Chemistry Group committee. He was a member of the ICPOC21 scientific committee.

Human Errors and Out-of-Specification Test Results

by Ilya Kuselman and Ales Fajgelj

Out-of-specification (OOS) test results of chemical composition are results that fall outside the specifications of acceptance criteria established in the pharmaceutical industry, or do not comply with regulatory, legislative, or specification limits in other industries and fields, such as environmental and food analysis. Investigation of OOS test results is described in the U.S. FDA (Food and Drug Administration) Guidance 2006.¹ The guidance established an empirical organizational approach to investigation and decisions, which can be utilized at the different stages of investigation. When an OOS test result is identified, it is important to determine the root causes of the event and to avoid reoccurrence of such results. An investigation of the causes based on metrological concepts is proposed in the corresponding IUPAC/CITAC (Cooperation on International Traceability in Analytical Chemistry) Guide 2012.² This approach allows distinguishing between OOS test results, which indicate an actual change in chemical composition of an analyzed object, and OOS test results, which are metrologically related with a certain confidence probability (i.e., caused by measurement uncertainty and other metrological problems).

Conference Call

However, it is known that human activity is never free from errors: about 70 percent of incidents and accidents are caused by human errors. There is extensive literature on investigation and quantification of human error in aviation, engineering, medicine, accident analysis, and other fields. In analytical chemistry there are only some detached publications on the topic. Even those publications point to human error as the dominant cause of OOS test results.³ Reducing error probability starts with study and classification of the errors, education, and training. Therefore, IUPAC has recently approved a new project titled "Classification and Modeling Human Errors Contributing to Measurement Uncertainty of Chemical Analytical Test Results" (No. 2012-021-1-50). As part of this project, a workshop was organized in conjunction with the ISRANALYTICA 2013 Conference and Exhibition, on 29 January 2013 in Tel Aviv, Israel, <www.bioforumconf.com/workshop-on-human-errors>. The Israel Analytical Chemistry Society and CITAC took part in organizing the workshop. The event was sponsored by IUPAC, Israel Laboratory Accreditation Authority, and SIGMA-ALDRICH Corporation, and arranged by Bioforum Ltd.

Opening remarks were given by the chair of the Organizing Committee, Ilya Kuselman of the National Physical laboratory of Israel. Kuselman explained the missions of IUPAC and CITAC and delivered the first lecture "Introduction to Investigating OOS Test Results and Human Errors in Analytical Chemistry." Then, Zigmund Bluvband, ALD Group Ltd., Israel, winner of the prestigious Elmer Sperry Award 2012, gave a talk on "Human Errors in Aviation," which included a short

film on the topic. Karen Ginsbury, Pharmaceutical Consulting Israel Ltd., delivered a lecture on unmasking the causes of analyst errors, reducing mistakes in the laboratory, and investigating OOS test results. Producer's and consumer's risks of OOS test results were the subject of the lecture by Francesca Pennechi, National Institute of Metrological Research, Italy.

Yoel Donchin, Hadassah Hebrew University Medical Center, Israel, impressed the workshop participants with his lecture "Avoiding Medical Error in the Hospital: Mission Possible?" The lecture included short films on the topic and humor, as in the presentation by Zigmund Bluvband. Causes of errors in analytical chemistry, detected using a web-based survey of proficiency testing, were classified in the lecture by Stephen L.R. Ellison, Laboratory of Government Chemist Ltd., UK. A practitioner report by Ales Fajgelj, International Atomic Energy Agency, Austria, et al., on the use of corrective actions in management of human errors in analytical laboratories, and the report by Paulina Goldshlag, Laboratory for Pesticide Residue Analysis, Plant Protection and Inspection Services, Israel, on spurious errors in pesticide residue analysis practice, were also of great interest.

Finally, a round-table discussion moderated by Ales Fajgelj allowed everybody to receive answers to their questions, and to learn from the experiences accumulated in other laboratories, and even in other fields (e.g., aviation and medicine). It was a diverse, fruitful, and informative meeting, the first such one in analytical chemistry, but certainly not the last. Development of the methods for quantification and reduction of human errors in analytical laboratories, which will increase the reliability of chemical analytical test results, will certainly attract greater attention from the analytical, quality, and metrological communities in the near future.

References

1. U.S. FDA (2006) Guidance for Industry. Investigating Out-of-Specification Test Results for Pharmaceutical Production.
2. Kuselman I, Pennechi F, Burns C, Fajgelj A, de Zorzi P (2012) IUPAC/CITAC Guide: Investigating Out-of-Specification Test Results of Chemical Composition Based on Metrological Concepts (IUPAC technical report). *Pure Appl. Chem.* Vol 84, No 9, pp. 1939-1971.
3. Kuselman I, Pennechi F, Fajgelj A, Karpov Yu (2013) Human Errors and Reliability of Test Results in Analytical Chemistry. *Accred. Qual. Assur.* Vol 18, No 1, pp. 3-9.



Ilya Kuselman (left) and Ales Fajgelj at the ISRANALYTICA 2013 Conference and Exhibition.

Solubility Phenomena

by Dewen Zeng

The **15th International Symposium on Solubility Phenomena and Related Equilibrium Processes** was held 23–27 July 2012 at Qinghai Institute of Salt Lakes, Chinese Academy of Sciences, Xining, China. This IUPAC-sponsored symposium included a workshop entitled “Solubility and Other Equilibria in Salt Brines.”

The 11th Annual Meeting of the Subcommittee on Solubility & Equilibrium Data (SSED) of the IUPAC Analytical Chemistry Division met on 21 July, chaired by Clara Magalhães from Portugal.

Over 100 participants, including accompanying persons, from 21 countries attended the annual meeting of SSED and the symposium: Australia, Austria,

Canada, China, Czech Republic, Denmark, Finland, Germany, Hungary, India, Ireland, Italy, Japan, Nepal, Poland, Portugal, Russia, Slovakia, Ukraine, and USA.

The opening ceremony was chaired by Dewen Zeng from the Qinghai Institute of Salt Lakes, Chinese Academy of Sciences. Attendees were welcomed by Yunlong Gao, the vice governor of Qinghai Province, and Haizhou Ma, director of QISL. Heinz Gamsjäger, as IUPAC representative, gave a speech titled “IUPAC Advancing Progress in Chemistry.” Clara Magalhães, the chair of SSED, contributed a speech on “IUPAC Solubility Data Project (1972–2012).”

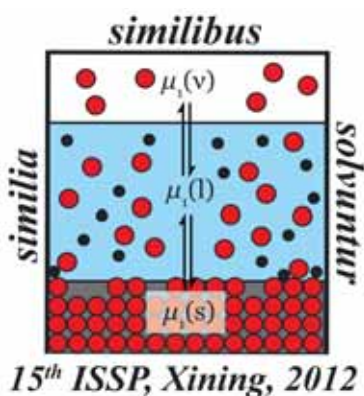
Seven plenary and four invited lectures focused on the six aspects related to solubility phenomena: 1) equilibria related to solid solutions; 2) computer-assisted equilibrium calculations; 3) solubility features in ionic liquids; 4) kinetics of phase transformations; 5) effects of solute-solvent interactions on solubility phenomena; and 6) solubility phenomena related to brine solution.

Heinz Gamsjäger (Austria) delivered the opening plenary address on “Solubility Phenomena in Science and Education—Experiments, Thermodynamic Analyses, and Theoretical Aspects,” which focused

mainly on experimental and theoretical aspects of sparingly soluble solids–aqueous solutions equilibria.

The other keynote lectures were as follows:

- Solid-Solute Phase Equilibria in Aqueous Solution—Fundamentals and Application (E. Königsberger, Australia)
- The Highs and Lows (and in-betweens) of Solubility Measurements of Electrolytes (G. Hefter, Australia)
- Solid Phase Equilibria in Ionic Liquids-Crystallization Phenomena (A. Koenig, Germany)
- Modeling of the Solubility of Inorganic Compounds in Multicomponent Process Solutions over Wide Temperature Ranges (V. Papangelakis, Canada)
- Phase Behavior and Intermolecular Interaction of Green Solvent Systems (B. Han, China)
- Solubility Phenomena Study Concerning Brines in China (P. Song, China)
- Solubility Phenomena Related to CO₂ Capture and Storage (A. De Visscher, Canada)
- Solid Solutions of Layered Oxides with Rare Earth Elements (I. Zvereva, Russia)
- Modeling Mixed Solvent Electrolyte Systems: Phase Behavior, Chemical Equilibria, and Transport Properties (P. Wang, USA)
- Investigation of Radionuclide Solubility and Speciation in Concentrated Salt Brine Solutions (M. Altmaier, Germany)



Heinz Gamsjäger receiving a Chinese present for his 80th birthday.

The authors of the keynote lectures have been invited to submit their papers to *Pure and Applied Chemistry*.

Conference Call

Julia Schmitt was honored with the 2012 Franzosini award. For more details, see article in the Wire section.



*Clara Magalhães (Portugal),
chair of the IUPAC
Subcommittee on Solubility
and Equilibrium Data.*

Thirty-three short communications and fifty-three posters were presented during afternoon and morning sessions.

IUPAC poster prizes were given to Christiane Bube (Karlsruhe Institute of Technology, Karlsruhe, Germany) on behalf of the team, for the poster “Thermodynamics of Magnesium Carbonate Phases in Dilute to Concentrated Magnesium Chloride Solutions at 25 °C”; Lijiang Guo (Institute of Salt Lakes, Chinese Academy of Sciences, Xining, China) on behalf of the team, for the poster “Thermodynamic

Understanding on the Liquid-Solid Equilibrium of the Ternary System $\text{CaCl}_2\text{-SrCl}_2\text{-H}_2\text{O}$ ”; and Qiaoling Chen (Institute of Salt Lakes, Chinese Academy of Sciences, Xining, China) on behalf of the team, for the poster “Species Distribution and Physicochemical Properties in Aqueous Magnesium Borate Solutions at 298.15 K.” The high quality of the work presented in the poster session made it very difficult to select only three posters. After analysis of all the posters under different criteria, the jury arrived at the conclusion that five posters qualified for the third poster prize. In addition to Qiaoling Chen’s these were the posters presented by Bin Hu, Hongxia Li, Wenlei Wang, and Hongyan Zhou. The names of the presenters were announced at the banquet and received enthusiastic cheers of the audience.

Sponsorship was provided by the Chinese Academy of Sciences, National Nature Science Foundation of China, Qinghai Foreign Experts Bureau, and the Qinghai Institute of Salt Lakes. The Local Organizing Committee provided financial support to 24 delegates to enable them to attend the meeting.

The symposium was chaired by Haizhou Ma and Dewen Zeng, with assistance from Haijun Han, conference secretary, and other relevant persons of the Local Organizing Committee.

Participants enjoyed a half-day excursion to Qinghai-Tibet Museum of Natural History and Tibetan Medicine and Culture Museum, and watched a dance drama “Skyfield Heaven” in the evening.



A Chinese style banquet was served to participants. During the banquet, a special program was organized to celebrate the 80th birthday of Heinz Gamsjäger. Clara Magalhães chaired the session. Glenn Hefter introduced the curriculum vitae of Gamsjäger and his achievements in solubility phenomena research and in chairing the SSED of IUPAC. The Local Organizing Committee presented Gamsjäger with a special Chinese birthday gift “Tang suit” and wished him good health and a long life.

The 16th ISSP will be held in July 2014 in Karlsruhe, Germany.

Dewen Zeng <dewen_zeng@hotmail.com> was co-chair of the symposium; he is a professor working with Qinghai Institute of Salt Lakes and College of Chemistry and Chemical Engineering, Central South University in China. He is a member of the SSED. Input to this report was also provided by Clara Magalhães and Heinz Gamsjäger.

Where 2B & Y

Network for Inter-Asian Chemistry Educators

25-27 July 2013, Pingtung, Taiwan

The **5th International Conference of Network for Inter-Asian Chemistry Educators** (5th NICE) will be held in Pingtung, Taiwan, on 25-27 July 2013. This symposium provides a platform for chemistry educators to exchange scientific opinions and experiences on chemistry education. The 5th NICE conference will definitely provide new insights for chemistry educators. The program consists of lectures given by distinguished chemistry scientists and educators from Japan, Korea,

Taiwan, USA, and other countries. Many prominent chemistry educators from the Asia Pacific area will report their latest innovative work and give prospects on chemistry education, including (i) vision of interdisciplinary chemistry; (ii) students' conceptions and conceptual change; (iii) analysis of classroom discourse and instructional strategies; (iv) representation of textbooks; (v) chemistry in daily life; and (vi) attitude toward chemistry. We will have about 20 oral contributions and up to 70 poster presentations.

 www.5thnice.org

Planetary Systems of our Sun and other Stars, and the Future of Space Astronomy

11-15 November 2013, Bangkok, Thailand

This symposium is the first of a new series of events initiated by COSPAR that will promote space research at a regional level in emerging countries and will be held every two years in a different area of the world. The symposium will include multidisciplinary and training sessions.

This first symposium will address the theme **Planetary Systems of our Sun and other Stars, and the**

Future of Space Astronomy. It is open to participants from all regions, but scientists, young professionals, and students in the Asian region are particularly encouraged to participate. The symposium will feature plenary lectures as well as parallel and poster sessions.

A capacity-building workshop entitled "Atmospheric Correction of Earth Observation Data for Environmental Monitoring: Theory and Best Practices" will also take place in Bangkok at GISTDA the week before the symposium from 4-8 November 2013 for which participants from the Asian region will be selected by application.

 www.cospar2013.gistda.or.th

Photobiology

8-12 September 2014, Córdoba, Argentina

The **16th International Congress on Photobiology**, organized by the International Union of Photobiology (IUPB) will be held at the National University of Córdoba (UNC), Argentina, on 8-12 September 2014. The program covers all aspects of photobiology such as microorganisms movement, antennas, photosynthesis, vision, plant development, phytochromes, phototropins, BLUF proteins, cryptochromes, UV8 receptor, bioluminescence, circadian rhythms, photomedicine, photoinmunology, photocarcinogenesis, UV damage,

repair and protection, optogenetics, use of fluorescent probes in biology, and so forth. The UNC is located in the beautiful City of Cordoba in the center of Argentina and is the oldest university in the country. Pre- and post-conference trips retracing some of Darwin's trips in Argentina may be offered to those interested.

 www.photobiology2014.com.ar



Chemical Reactions: Chemistry and Global History

10–12 April 2014, Philadelphia, Pennsylvania, USA

One of the most important developments in the history of science and technology in recent years has been the recognition that, far from being an essentially Western history, it can best be understood and analyzed in the broader context of global history. This is not a



call to investigate “influence” or to compare the “achievements” of “the West and the Rest,” but to consider how globally spread interactions and networks of commercial and cultural

exchange both depended on and fed scientific and technological investigation and development. Such an approach has proven extremely fruitful in the history of medicine, natural history (botany, etc.), astronomy, cartography, and geography. Surprisingly, the history of chemistry has yet to be analytically integrated with global history in a sustained and organized way. This conference and subsequent edited volume are a first step in that direction.

For the purposes of this international conference to be held at the Chemical Heritage Foundation, the term “chemistry” should not be considered in a scientifically narrow, discipline-bound way. Rather, we are interested to include examinations of knowledge-claims and practices, wherever they were situated or travelled, that somehow involved the de- and re-composition of material compounds, irrespective of whether they were labeled as “chemistry” by contemporaries.

Topics

In order to provide a manageable way into this huge and fascinating field, the conference will be limited to the 17th–20th centuries and will be organized around a small number of topic areas:

- Chemistry and Global Commodities—examples include porcelain, sugar, oil, rubber (natural and synthetic) and “recreational drugs.”
- Chemistry and Environment—modifying or sustaining the environment through chemistry, whether conscious or as an unintended by-product. Examples range from pest control to “cradle

to cradle” modes of production and include globally connected topics such as the Green Revolutions and Bhopal.

- Chemistry and Global Health—from the early-modern circulation of drugs and pharmaceutical knowledge to recent struggles over patent rights and distribution of medicines.
- Chemistry and Industry—from the early-modern world of porcelain manufacture, textile production and dyeing to recent issues relating to the mining and exploitation of minerals only available in war-torn areas of Africa, production of computers and cell phones.
- Chemistry and Governance—the role of governments, trading companies, (professional and amateur) scientific societies, and corporations in managing and directing the production and circulation of chemically-based productions, methods and knowledge
- Chemistry and Everyday Life—the introduction of new processes and materials such as glass, cement, synthetic fibers, ersatz foods, plastics, and nano-materials. Subject areas might include topics such as architecture, clothing and fashion, food and drink.

Running through the entire conference, we hope, will be attention to the material exchange of chemical techniques of all kinds across different cultures around the world, whether carried by commodities, books, concerns about public health, or profit-seeking entrepreneurs.

Submit a Proposal

One-page proposals for individual presentations or round-table discussions that fall under any of these rubrics or focus on relations between them are welcome. We hope to include not only historians of chemistry, but also historians who more generally investigate global commodities, the environment, global health, industry, governance, and material culture. The deadline for proposal submission is 1 June 2013. Travel support for participants, to defray the cost of transportation and lodging, will be available. The conference will be open (without cost) to all who are interested.

Proposals should be sent to Carin Berkowitz <cberkowitz@chemheritage.org>.

For further information, please contact Carin Berkowitz or Lissa Roberts <l.l.roberts@utwente.nl>.

2013 (after 1 July)

 IUPAC poster prizes to be awarded

7-10 July 2013 • Polymer Chemistry • Northern Territory, Australia

34th Australasian Polymer Symposium (34 APS)

Dr. Kevin Jack, University of Queensland, Centre for Microscopy & Microanalysis, Level 1, AIBN, Bldg. 75 St. Lucia, QLD 4072, Australia, Tel.: +61 7 3365 1143, Fax: +61 7 3346 3993, E-mail: k.jack@uq.edu.au

7-12 July 2013 • Solution Chemistry • Kyoto, Japan 

33rd International Conference on Solution Chemistry (ICSC 2013)

Prof. Toshio Yamaguchi Fukuoka University Department of Chemistry Nanakuma, Jonan, Fukuoka 814-0180, Japan, Tel.: +81 092 871 6631 ext. 6224, Fax: +81 092 865 6030, E-mail: yamaguchi@fukuoka-u.ac.jp

7-11 July 2013 • Polymer Spectroscopy • Prague, Czech Republic

19th European Symposium on Polymer Spectroscopy (ESOPS 19)

Prof. Jiri Spevacek Academy of Sciences of the Czech Republic Institute of Macromolecular Chemistry Heyrovsky Square, 2 CZ-162 06 Prague Czech Republic
Tel.: +420 2 9680 9380, Fax: +420 2 9680 9410, E-mail: spevacek@imc.cas.cz

7-11 July 2013 • Carbohydrate • Tel Aviv, Israel

17th European Carbohydrate Symposium

Prof. Timor Baasov, Technion Israel University of Technology, Faculty of Chemistry, Haifa, Israel
Tel.: +972 4 829 2590, Fax: +972 4 829 5703, E-mail: chtimor@techunix.technion.ac.il

8-12 July 2013 • Chemistry for Sustainable Growth • Pretoria, South Africa

12th International Chemistry Conference in Africa (ICCA-2013)

Prof. Mathew Muzi Nindi, Department of Chemistry, University of South Africa, P.O. Box 392, UNISA 0003 South Africa, Tel.: +27 12 429 8559, Fax: +27 12 429 8549, E-mail: nindimm@unisa.ac.za

14-17 July 2013 • Calixarenes • St. John's, Newfoundland, Canada

12th International Conference on Calixarenes (Calix 2013)

Prof. Paris Georghiou, Memorial University of Newfoundland, Department of Chemistry, St. Johns, NL A1B 3X7 Canada, Tel.: +1 709 864 8517, Fax: +1 709 864 4569, E-mail: parisg@mun.ca

25-27 July 2013 • Chemistry Literacy for Global Citizens • Pingtung City, Taiwan

5th International Conference Network for Inter-Asian Chemistry Educators (5th NICE)

Professor Shyan-Jer Lee, Department of Chemical Biology, National Pingtung University of Education, No.4-18 Minsheng Rd., Pingtung City, Pingtung County 90003, Taiwan (R.O.C.)
Tel.: +886-8-7226141 ext 33201, Fax: +886-8-7230305, E-mail: sjlee@mail.npue.edu.tw or 5thnicice@gmail.com

28 July-1 August 2013 • Organometallic Chemistry • Fort Collins, Colorado, USA 

17th International IUPAC Conference on Organometallic Chemistry Directed Towards Organic Synthesis

Prof. E. Peter Kündig, Université de Genève, Département de Chimie Organique, CH-1211 Genève 4, Switzerland
Tel.: +41 22 379 6093, Fax: +41 22 328 7396, E-mail: peter.kundig@unige.ch

28 July-2 August 2013 • Novel Aromatic Compounds • Taipei, Taiwan 

15th International Symposium on Novel Aromatic Compounds (ISNA-15)

Prof. Ken-Tsung Wong, Taiwan National University, Department of Chemistry No. 1, Sec. 4, Roosevelt Road, Taipei 10167 Taiwan, Tel.: +886 2 3366 1665, Fax: +886 2 3366 1667, E-mail: kenwong@ntu.edu.tw

4-9 August 2013 • Homogeneous and Heterogeneous Catalysis • Sapporo, Japan

16th International Symposium on Relations between Homogeneous and Heterogeneous Catalysis (ISHHC-16)

Prof. Atsushi Fukuoka, Hokkaido University, Kita 21-10, Sapporo 001-0021, Japan
Tel.: +81 11 706 9140, Fax: +81 11 706 9140, E-mail: fukuoka@cat.hokudai.ac.jp

11-16 August 2013 • IUPAC 44th Congress • Istanbul, Turkey 

44th IUPAC Congress—Clean Energy Through Chemistry

Prof. Mehmet Mahramanlioglu, Turkish Chemical Society, Istanbul University, Department of Chemistry, TR-34320 Avcilar, Istanbul, Turkey
Tel.: +90 212 591 1996, Fax: +90 212 591 1997, E-mail: mehmah@istanbul.edu.tr, www.iupac2013.org

13-16 August 2013 • MacroMolecular Complexes • Clemson, South Carolina, USA 🌐

15th International Symposium on MacroMolecular Complexes (MMC-15)

Prof. Anthony Guiseppi-Elie, Clemson University, Department of Chemical & Biomolecular Engineering, 132 Earle Hall, Clemson, SC 29634, USA, Tel.: +1 864 656 1712, Fax: +1 864 656 1713, E-mail: guiseppi@clemson.edu

18-23 August 2013 • Advanced Polymers via Macromolecular Engineering • Durham, UK

10th International Conference on Advanced Polymers via Macromolecular Engineering (APME-2013)

Prof. Neil R. Cameron, Department of Chemistry, Durham University, Durham, DH1 3LE, UK
Tel.: +44 191 334 2008, Fax: +44 191 384 4737, E-mail: n.r.cameron@durham.ac.uk

25-29 August 2013 • Analytical Chemistry • Warsaw, Poland

XVIIth European Conference on Analytical Chemistry (EuroAnalysis XVII)

Prof. Maciej Jarosz, Warsaw University of Technology, Department of Analytical Chemistry, Ul. Naokowskiego 3, PL-00 664 Warsaw, Poland, Tel.: +48 22 234 7408, Fax: +48 22 234 7408, E-mail: mj@ch.pw.edu.pl

23-28 September 2013 • Ionic Polymerization • Awaji Island, Japan

21st International Symposium on Ionic Polymerization (IP2013)

Prof. Tatsuki Kitayama, Osaka University, Department of Chemistry, Toyonaka, Osaka 560-8531, Japan
Tel.: +81 6 6850 6230, Fax: +81 6 6841 0104, E-mail: kitayama@chem.es.osaka-u.ac.jp

28-29 September 2013 • Biorefineries • Brasília, Brazil

2nd Brazilian Symposium on Biorefineries (II SNBr)

Dr. Sílvio Vaz, Jr., EMBRAPA Agroenergy Parque Estação Biológica, Av. W3 Norte, Asa Norte Brasília, DF 70770-901 Brazil, Tel.: +55 61 3448 2315, Fax: +55 61 3448 1589, E-mail: silvio.vaz@embrapa.br

17-22 October 2013 • Novel Materials • Shanghai, China 🌐

9th International Conference on Novel Materials and their Synthesis (NMS-IX)

Prof. Yuping Wu, Fudan University, Department of Chemistry, New Energy & Materials Laboratory Shanghai, 200433 China, Tel: +86 21 55 664 223, Fax: +86 21 55 664 223, E-mail: wuyup@fudan.edu.cn

8-13 December 2013 • Frontiers of Polymers • Auckland, New Zealand 🌐

12th International Conference on Frontiers of Polymers and Advanced Materials (ICFPAM 2013)

Prof. Paul Kilmartin, School of Chemical Sciences, University of Auckland, 23 Symonds Street, P.O. Box 92019, Auckland 1142 New Zealand
Tel.: +64 9 373 7599 x 88272, Fax: +64 9 373 7422, E-mail: p.kilmartin@auckland.ac.nz

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