

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

# CHEMISTRY

## International

November-December 2010  
Volume 32 No. 6



### The International System of Units Turns 50

Playing with Salt

The First International  
Gathering of Chemists

Bonus: pull-out copy of the  
*Concise Summary of the SI*



# From the Editor

## CHEMISTRY International

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

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Remember why we meet! This is one lesson of the Karlsruhe meeting, the first international gathering of chemists. Held 150 years ago, the “first professional congress of a scientific discipline” set the stage for the entire scientific community. Be it a conference, a symposium, a workshop, a committee meeting, or a seminar, for the event to succeed it is important that the goals be clearly set.

Mönnich’s article (p. 10) describes how, in 1860 in Karlsruhe, the goals of the meeting were evident, as were the organizers plans to achieve



them. Although the congress ultimately did not resolve confusions regarding the concepts “atom,” “molecule,” and “equivalence,” the debates which took place, generated the necessary momentum for the community of chemists to pursue a common nomenclature.

In IUPAC, we certainly know the value of meetings, and there are several programs and

activities that recognize this. For instance, each year IUPAC sponsors about 30 independently organized events that cover a wide range of topics in chemistry. The program guidelines stipulate that “sponsorship by IUPAC attests to the quality of the scientific program and indicates the host country’s assurance that scientists from all countries may participate.” The other program that acknowledges the value of the meeting is the project-driven system. In place now for about 10 years, it is the core modus operandi of what IUPAC achieves, as it allows task groups—mostly international teams—to focus on specific issues, most of which relate to improving communication among the chemists or the world or expanding the role of chemistry. In most cases, the majority of project budgets is devoted to travel and per diem expenses. A final example of IUPAC’s dedication to the meeting, is the General Assembly held every 2 years, which is coordinated in parallel with the biennial IUPAC Congress. This unique gathering allows all IUPAC committees to meet at a place and time where individual scientists can also mingle with attendees at the larger gathering of the Congress. The IUPAC Council also meets on that occasion.

In addition to all these traditional modes of meeting, the scientific community now has more tools than ever to communicate and reach consensus. Like never before, Web-based technologies empower individuals to reach out in new ways. How these tools will be best used to promote and advance scientific communication is yet to be fully appreciated, but it is certain that just as the Karlsruhe meeting was a historical event in 1860, we are today part of a new chapter in history. Perhaps a Wiki-like community that holds virtual meetings will develop that will eclipse many of our current gatherings as we know them, pushing social scientific networking into uncharted territory.

Fabienne Meyers

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# Contents

CHEMISTRY International November-December 2010 Volume 32 No. 6



Stamps International, 23

A complimentary map/2011 calendar is enclosed with this issue.



**Vice President's Column** by Kazuyuki Tatsumi 2

## Features

**50th Anniversary of the SI**  
The International System of Units by Ian M. Mills 3

**A Philatelic Tribute to the SI**  
by Daniel Rabinovich 4

**A Place in the Salt!**  
Learning and Playing with Salt in Aveiro, Portugal  
by Maria Clara F. Magalhães, Cristina Sampaio, and Paulo Trincão 6

**Thriving for Unity in Chemistry**  
The First International Gathering of Chemists  
by Michael W. Mönnich 10

## IUPAC Wire

**Organization Launched to Solve the Name Ambiguity Problem In Scholarly Research** 16

**2011 IUPAC Prize for Young Chemists Announced** 16

**IUPAC Pilot Call for Proposals in Polymer Chemistry** 17

**Two Franzosini Awards in 2010** 18

**Inviting Young Chemists to the 43rd IUPAC Congress in Puerto Rico** 19

## The Project Place

**Radioanalytical Chemistry—Revision of the Orange Book Chapter** 20

**Developing Toolkits for National Chemistry Weeks During IYC** 20

**Enhancing the Capacity to Provide Quality Chemistry Education at Secondary and Tertiary Levels in Ethiopia** 21

## Internet Connection

**UV/Vis+ Spectra Database**  
by Andreas Noelle, Gerd K. Hartmann, and F. Javier Martin-Torres 22

## Conference Call

**Solubility Phenomena** by Heinz Gamsjäger 24

**Research and Education in the Middle East** by Stanley Langer 25

**Another Organic Synthesis Boost** by Leiv K. Sydnes 28

**Where 2B & Y** 30

**Mark Your Calendar** 32

**Index for 2010** 35



Pull-out copy of the Concise Summary of the SI, page 18.

## Building a Promising Future for IUPAC



by *Kazuyuki Tatsumi*

**A**s this is my first contribution to this column, I would like to outline my view of the future prospects for the roles and activities of IUPAC. As the only nongovernmental organization with a global membership of chemical societies, and as one of the world's foremost organizations for science,

**IUPAC bears significant responsibility for aiding the chemistry community in strengthening its expertise for the benefit of society worldwide.**


I look forward to building a promising future for IUPAC as it advances the worldwide role of chemistry through excellence in science and innovative technology. We have so much to offer, with the participation of talented chemists from all over the world, the possibilities are endless. Next year, we celebrate the International Year of Chemistry, and are looking forward to many events that will lift the visibility and reputation of IUPAC. For one thing, we expect to recruit fresh ideas and enthusiasm from the next generation into the field of chemistry. For another, the IYC2011 is expected to provide a wonderful opportunity to strengthen the link between IUPAC and chemical societies throughout the world.

The momentum, which the IYC2011 will create, must be carried over to the next step. We must plan to make the most of the platform that this auspicious year of celebration will give us for promoting the importance of chemistry for addressing the world's most pressing needs. I would like to point out here that IUPAC will soon be looking forward to celebrating its centennial in 2019. This is not the distant future. It is not too early to start planning for the 100th anniversary of IUPAC, and I plan to pave the way.

As an organization that draws a community of expert chemists together from all over the world, we have a responsibility to use our resources to address global needs. For instance, there is international demand for alternative ways to create reliable energy such as solar and wind power. Don't chemists have the knowledge and potential to develop long-term energy

solutions that are not only reliable but also sustainable? As governments and corporations look for efficient and sustainable ways to supply the energy needs of consumer societies, are we not in a unique position to help provide breakthroughs?

I am optimistic about the future of IUPAC, and yet a bright future is always a hard-earned one. We have witnessed the recent reforms of IUPAC structures, functions, and governance. This encouraging movement owes much to the dedication of successive presidents, officers, and active members, and I will continue to support innovative transformation of the Union. At the same time, the improvement of operational efficiency must be balanced with an increase in enthusiasm and devotion among members toward IUPAC activities. An important role of IUPAC is to facilitate discussion and networking between academia and industry. The activities of CHEMRAWN and COCI are good examples of IUPAC creating space for academia and industry to meet and discuss important issues and ideas. We need to continue to encourage and develop these and other initiatives that bring the academic world and the industrial world together.

Perhaps it is time for IUPAC to examine the key emerging issues in chemistry and modern society. We need to identify the priority areas for future commitments and new initiatives. Strategic planning is very important for an organization that wants to make the most of the opportunities that are available to it. Perhaps it is time for IUPAC to start thinking strategically about the future.\* What are our goals for the next 5 years, or the next 10 years? Where are we heading? Without a clear concept of how we have grown and how we want to grow in the future we will be simply blown by the winds of the moment rather than directing our organization on a desired path. Over the years, IUPAC has grown and adapted to the perceived needs of chemistry. Let us direct our path to continue to address the current needs of the world community through the development of chemistry. 

**Kazuyuki Tatsumi** <i45100a@nucc.cc.nagoya-u.ac.jp> has been vice president of IUPAC since January 2010. He served as vice president (2004–2007) and president (2008–2009) of the Inorganic Chemistry Division. Tatsumi is a professor at Nagoya University and has been a member of the Science Council of Japan (NAO for Japan) since 2008.

\*The IUPAC Strategic Plan was last revised in 2002–2003; see <http://media.iupac.org/news/archives/2002/strategic-plan.html>. The IUPAC biennial report is prepared following the long-range goals detailed in the plan.



# 50th Anniversary of the SI

## The International System of Units

by Ian M. Mills

The year 2010 is the 50th anniversary of the adoption of the name “International System of Units,” and the symbol “SI” (taken from the French words *Système international d’unités*), by the General Conference on Weights and Measures (CGPM, *Conférence Générale des Poids et Mesures*) at its meeting in 1960. This 11th meeting of the General Conference, held 11–20 October 1960, was the formal beginning of the SI. The success of the SI in providing internationally agreed standards for the worlds of science, engineering, and technology is an occasion to be celebrated.

The BIPM was originally established in 1875 by the Metre Convention to ensure world-wide unification of measurements. At its first meeting, in 1889, the General Conference decided definitions of the **metre** and the **kilogram** in terms of prototype artifacts. Definitions of the electrical units based on the **ampere** were added at the 9th meeting of the General Conference, in 1948, in agreement with the International Electrochemical Commission. At the same conference the **candela** was adopted as the name of the unit of luminous intensity in place of the older “new candle.” The definition of the **kelvin** was added at the 10th meeting of the General Conference, in 1954, and the formal definition of the **second** was added by the CIPM in 1956. Finally, at its 11th meeting, the General Conference in 1960 laid the foundation for the complete system of units, built upon the six base units used at that time and including multiple and sub-multiple prefixes, and adopted the name International System of Units by which the entire system is known today. The definition of the **mole** for the quantity amount of substance, the seventh base unit, was added at the 14th meeting of the General Conference, in 1971.

*... it is a living system, forever being revised and improved in a variety of ways ...*

There have been many developments to the system during the 50 years from 1960 to 2010. The definitions of many of the base units have been

revised to meet new developments in the experimental basis of metrology, and to ensure the coherence of the entire system. These changes have been faithfully recorded in successive editions of the *SI Brochure*, prepared by the Consultative Committee for Units (CCU) and published by the BIPM at irregular intervals.



The brochure has grown from the 36 pages of the original first edition to the 200 pages of the latest 8th edition published in 2006. The 8th edition is also accompanied for the first time by the four-page *Concise Summary of the SI*.<sup>\*</sup> These publications are available free on the BIPM website <[www.bipm.org/en/si](http://www.bipm.org/en/si)> and are now accepted around the world as the reference standard for all quantitative measurements.

The SI has now reached maturity as the ultimate international reference for all standards of measurement. But it is a living system, forever being revised and improved in a variety of ways to recognize our developing abilities in making measurements. At present, there are active plans to revise the definitions of four of the seven base units—the kilogram, ampere, kelvin, and the mole—as we strive to achieve a more uniform system in which the definitions of all units are referenced to the fundamental constants of nature.

Happy 50th birthday to the SI! May it continue to prosper in the hands of the metrologists of the world. 🎂

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<sup>\*</sup> To celebrate the 50th anniversary of the SI, *CI* offers its readers a pull-out copy of the *Concise Summary of the SI*—reprinted with permission from the BIPM, which retains full internationally protected copyright.

Reprinted with permission from the *BIPM Key Comparison Database (KCDB) Newsletter*, No. 13, June 2010 <[http://kcdb.bipm.org/NL/13/NL\\_13\\_June10.html#text11](http://kcdb.bipm.org/NL/13/NL_13_June10.html#text11)>.

# A Philatelic Tribute to the SI

by Daniel Rabinovich

Postage stamps constitute a simple yet effective way of commemorating events and educating the general public on a variety of subjects, including art, geography, history, and literature. Perhaps more surprising is that various topics in astronomy, biology, chemistry, and physics have also been showcased on stamps, even if in a somewhat more limited fashion. In this regard, a number of stamps depicting the periodic table, famous chemists, molecular formulas, and minerals have been regularly featured in the *Stamps International* column of this newsmagazine during the past four years. Since the International System of Units (SI) is now celebrating its 50th anniversary, this article pays tribute to the metric system and presents an assortment of postage stamps to highlight key aspects of its development and modern applications.



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The SI has a long and fascinating history that goes back to the turbulent years of the French Revolution (1789–1799). The first prototypes of the metre and the kilogram, made of pure platinum, were deposited with the Archives of the Republic in June of 1799, just a few months before Napoleon Bonaparte’s coup d’état and ascent to power as First Consul in November of that year. The metric system slowly spread to other countries in Europe and South America in the ensuing decades even though alternative units of measurement were still prevalent in many other regions of the world. Brazil was one of the first countries to adopt the metric system (1862) and a stamp [1] was issued 100 years later to remember the milestone. In a similar vein, the metric system was introduced in Romania in 1864 and a stamp [2] showing the original definition of the

metre (i.e., one ten-millionth of the quadrant of the Earth, measured from the North Pole to the Equator) was released in 1966.

The quest for a more broadly recognized system of measurements led in 1875 to the Convention du Mètre, where the International Bureau of Weights and Measures (BIPM) was created to oversee the implementation of universal metric standards. Under the terms of the Convention, new prototypes for the metre and the kilogram made of an improved platinum-iridium alloy (90:10) were prepared and distributed to the members of the Bureau by the time the first General Conference of Weights and



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Measures (CGPM) met in 1889. Several countries issued stamps in 1975 to observe the centennial of the Meter Convention, including the Netherlands [3], Romania [4], Surinam [5], and Sweden [6]. Remarkably, stamps issued by Bulgaria [7] and Indonesia [8] also displayed a small cylinder to represent the International Prototype Kilogram (IPK) and an X shaped bar for the International Prototype Meter.

The 10th CGPM (1954) introduced the ampere, the kelvin, and the candela as the base units of electric current, temperature, and luminous intensity, respectively. The name SI was finally adopted in 1960 at the 11th CGPM, which also approved a new definition of the metre as 1 650 763.73 wavelengths of the radiation corresponding to the transition between the  $2p^{10}$  and  $5d^5$  energy levels in an atom of krypton-86. This definition, abstruse perhaps, but quite precise, was a consequence of the development of the interferometer by Albert A. Michelson, the first American to receive the Nobel Prize in Physics (1907), and other technological advances that occurred during the first half of the 20th century. Interestingly, a French stamp issued in 1975 for the centennial of the Meter Convention [9], four years after the mole was added to the SI as the base unit for the amount of substance during the 14th CGPM, shows the symbols of the seven base units surrounding an atom of krypton-86. The names of the seven base units appear in a stamp from Cuba that specifically recognizes the SI [10]. It is also worth mentioning that the metre was redefined yet again during the 17th CGPM (1983) based on the speed of light in a vacuum (299 792 458 metres per second).

What is going to happen with the SI in the next 50 years? The kilogram is the only SI

unit that is still defined by an artifact but, surprisingly, it has been found that the mass of the IPK changes slightly over time (just a few micrograms per decade, but a measurable variation nevertheless). Thus, the International Committee for Weights and Measures (CIPM) has recommended that the kilogram be redefined in terms of Planck's constant, and this issue will be addressed at the upcoming 24th CGPM in 2011. The

metric system is also likely to continue spreading in Liberia, Myanmar, and the United States, the only three countries where the use of the SI is recommended but still not *officially* mandated. Although the use of the metric system is already the norm in chemical education and research, will such practice extend to other aspects of daily life? Will food products be sold everywhere in kilograms and road signs in highways displayed in kilometres? Several countries have issued stamps to promote the use of the SI, including Japan [11],

15



Bangladesh [12], Kenya, Uganda, and Tanzania [13], Pakistan [14], and Singapore [15]. So, on the golden jubilee of the SI, let's hope the trend continues . . . 🇸🇰

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# A Place in the Salt!

## Learning and Playing with Salt in Aveiro, Portugal

by Maria Clara F. Magalhães, Cristina Sampaio, and Paulo Trincão

For hundreds, perhaps thousands, of years, salt production was a key economic activity in the region around Aveiro, Portugal. In 2009, the interactive CD *A Place in the Salt!—Learn to Play with Salt from Aveiro* was released to highlight the scientific, cultural, and economic aspects of this ubiquitous substance. Produced by a multidisciplinary team, the CD contains activities and experiments that explore salt, salt water, brine, and some local plants and wildlife found in and around the salt pans at Aveiro.

The CD was conceived to appeal to the general public, which may have little scientific knowledge or laboratory skills, and also to primary and secondary school teachers. The majority of the activities can be carried out in a kitchen or a school classroom and do not require any specific equipment—only the supervision of an adult. There are also experiments that can be carried out by very young children.

The concept for this CD began some years ago when the Museu da Cidade de Aveiro (Museum of the

City of Aveiro) suggested the creation of a booklet with some experiments related to the exploration of salt in Aveiro. The city council, which owns one of the existing salt pans (saltwater evaporation ponds), wanted to explore the economic and pedagogic aspects of salt production (Ecomuseu da Marinha da Troncalhada). The original idea was to publish a book, but this transformed into an interactive CD.

### Historical/Regional Context

Salt extraction/production from seawater has existed in the Aveiro region for centuries if not millenia, even before the existence of the lagoon. The first written reference to the Aveiro (Allavarium) salt pans dates back to the 10th century, two centuries before the founding of the Portuguese Monarchy. The geological instability of the region, the continuous silting up and reopening of the lagoon to the sea, has been occurring throughout history, and, as such, has resulted in a continuous fluctuation in salt exploration in the area. The lagoon was only permanently opened to the sea at the beginning of the 19th century.

Salt exploration has been one of the most important economic activities in the Aveiro region, with more than 500 salt pans operating at its peak. Over 300 were still active at the beginning of the 20th century. From a historical and economic point of view, salt has always been a very important commercial product for Aveiro, with trading links to Brazil and other countries. Nowadays, only a few salt pans survive; one belongs to the city council, another to the University of Aveiro, and the rest are in the hands of local families that still manage to continue this ancient tradition. The loss of these salt pans means a progressive loss of the cultural and environmental richness linked to salt production. The use and even the names of the tools associated with salt production, along with the know-how, accumulated for centuries and transmitted from generation to generation, is being lost. The local wildlife and flora, well adapted to the salt pans extreme conditions, are also dying out.



One of the few remaining salt pans in Aveiro.





## The Educational Project

The main aim of the interactive CD was to use salt, salt water, brine, and the flora of the Aveiro region to help children:

- observe the environment
- create new materials and objects
- learn some properties of materials, such as density, solubility, plasticity, etc.
- interpret the empirical knowledge, obtained from working on the salt pans, using modern scientific models
- learn the composition of particular systems such as salt or salt water
- learn which environmental factors contribute to salt crystallization in the salt pans (e.g., the tides, wind, and sunlight)

The CD is also intended to highlight some cultural and economic aspects of salt, salt water, brine, and flora. The Aveiro City Council wanted to create a method for younger generations to learn about the traditional methods of salt production, as well as the role of wildlife and plants in this particular ecosystem. The interactive science museum Fábrica Centro Ciência Viva wanted the CD to encourage children to play with science.

## How is the CD Organized?

The CD/interactive book has five main sections:

1. Twenty experimental activities focus on salt water, brine, salt, and the salt pans.
2. A set of safety rules that must be followed each time the experiments are carried out: at home, at school, in the interactive science museum.
3. A section called Around the Salt, with information on 1. salt production; 2. Ria de Aveiro —the lagoon; 3. oh salty sea!; 4. biodiversity in the Ria de Aveiro salt pans; 5. tides; 6. solar radiation; 7. the sun, the wind, and the Earth; 8. the scent of salt; 9. the salt we use; and 10. handmade salt: new products, new uses. These short texts give information about the geographic and geologic characteristics of the region where the salt pans exist (Ria de Aveiro); the influence of the wind, the tide, and solar radiation on salt production; the chemical composition of sea water and of adsorbed substances in salt that impart different smells according to the region; the biodiversity in the lagoon; cultural aspects of salt production; the specific vocabulary linked to salt exploration; the economic aspects of new salt exploration; and the commercialization of new products.
4. A glossary that can be accessed directly or through keywords.
5. A technical page.



*A screen shot of Oh Salty Sea! . . . , which talks about the chemical composition of sea water. There are also links to the five main sections of the CD: safety rules (red button), small texts (yellow button), glossary (green button), the technical page (brown button), and to the activities (“índice de actividades”). The links to the 10 small texts are also present (the small white buttons numbered from 1 to 10). The red highlighted words open a small window containing a description from the glossary. At the bottom there are links to the “salt pan map,” a pdf of the text for printing, and also to the start and exit of the CD.*

## A Place in the Salt



This screen provides links to the 20 experimental activities developed for the CD:

1. Salt crystals
2. Salt volcano
3. Salt toys
4. Bath salts
5. Dissolving salt
6. Do we need to stir?
7. Fine or coarse salt . . . which dissolves faster?
8. Can you dissolve all the salt you want in a glass of water?
9. Which solvent dissolves most salt?
10. How much salt does seawater contain?
11. Clay in river and seawater
12. Clay in the salt pans ... why?
13. *Salicornia ramosissima* and *Juncus L.*—different but similar
14. Measuring density?
15. To Float or not to float, that is the question!
16. How does sunlight effect water evaporation?
17. Sulfates in water! Yes or no?
18. How much sulfate does this water contain?
19. How much total carbonate does salt water contain?
20. What is the chloride concentration of salt water?

The experiments are presented in increasing order of complexity, ranging from those that can be done at home (from experiments 1 to 15) to those that must be carried out in a school laboratory (experiments 17 to 20) under supervision. Scientific concepts such as mass, volume, pressure, solubility, density, Archimedes principle, concentration, and chemical reactions are presented in the experiments intended for older students. Processes such as dissolution, crystallization, and vaporization can be introduced to very young children with one or more of the activities, depending on the knowledge and imagination of the supervisor.

Each experimental activity has a homepage with links to four other pages:

- **what you need**—where all the materials, equipment, and reagents needed to carry out the activity are outlined. This page is built in an interactive way where children can begin to learn, in an amusing way, about laboratory glassware and other materials, equipment, and reagents and how to handle them. When clicking on an object, the object or the reagent container moves and a sound is played.
- **what you do**—a description of the experimental procedure.


## Learning and Playing with Salt in Aveiro, Portugal

- **how to explore**—a pdf document can be printed with some questions related to the activity to help children to observe and record the experiment as well as to arrive at some conclusions. These pages were created to help children increase their scientific knowledge.
- **for parents and educators**—information for adults to help in the preparation and safe execution of the activity. In some cases, some scientific information is presented.

The experimental activities are explored in a playful way. They can be carried out just for fun or to introduce some scientific concepts. For example, in activity 3. Salt toys, children can make a recipe of flour, salt, and water to make toys, create small objects, or make beautiful pictures. School teachers can use pedagogical tools to create, for example, a solar system where the notions of relative size and distance can be learned, but they also can be explored more deeply to study specific properties of solid materials.

This CD was created by a multidisciplinary team that conceived and tested the experiments and wrote the texts. Team members included secondary school and university specialists in chemistry, physics, mineralogy, biology, planning, and history; a designer who conceived and created all of the illustrations and animations; a programmer who created all the move-

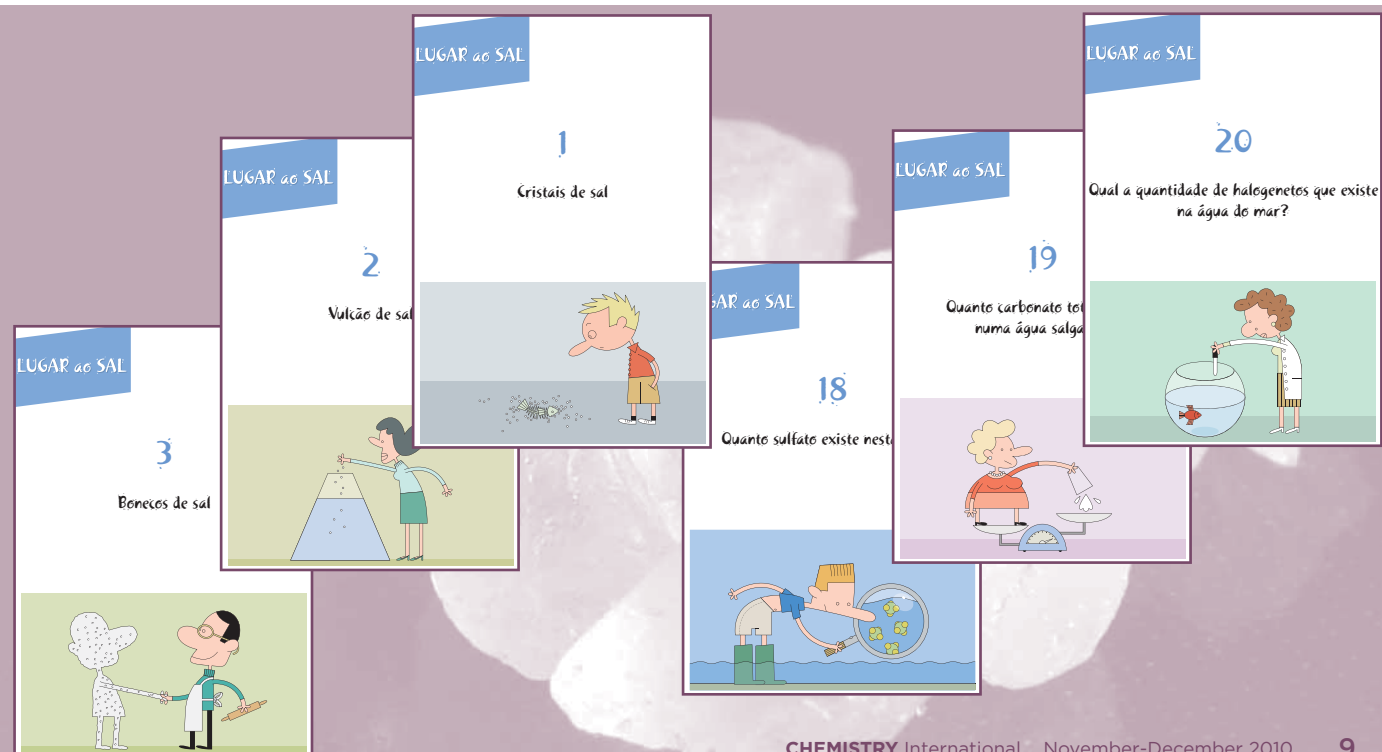
ments and links; and musicians who created all the music and sounds. This project was made possible by the financial support of a number of organizations: The Fundação João Jacinto Magalhães, the Fábrica Ciencia Viva of the University of Aveiro, and the Aveiro à volta do Património project.

Sodium chloride, once an important local product in Aveiro, is the star at the center of this CD's solar system. But this is just the start, we can envisage similar projects for many other subjects. A second CD will no doubt contain the electrolysis of brine, chlorine production, health related aspects of sodium chloride, and more. 

### Acknowledgements

The authors would like to express their deep appreciation to each member of the team who contributed to the CD. Special thanks go to Brian J. Goodfellow for his comments on and revision of this text and also to José Alberto Costa for help with the figures.

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# Thriving for Unity in Chemistry

## The First International Gathering of Chemists\*

by Michael W. Mönnich

Congresses are still a necessary and popular means of communication within a scientific discipline even in the age of the Internet and e-mail. Chemistry can look back at a 150-year old tradition: the first international congress of chemists took place on 3-5 September 1860 in Karlsruhe.

In the middle of the 19th century, the science of chemistry had come to a dead end. The work of Lavoisier had laid the foundations of modern chemistry; the following decades saw the introduction of many kinds of nomenclature, so that it became increasingly difficult to communicate about chemical compounds. That atoms were the smallest building blocks of chemical compounds, as proposed by Dalton, became widely accepted; however, little was known of how the atoms were arranged. Different scientific schools supported different views—even on fundamental theoretical questions such as the basis for a scale of atomic weights.

For example, the research of Jean Baptiste Dumas (1800-1884) and his students led to questions regarding the theory of Jöns Jakob Berzelius (1779-1848). Berzelius was the most renowned chemist of his time and his concept of electrochemical dualism in the construction of organic compounds was then widely accepted. The contemporary chemist Lothar Meyer (1830-1895) described the situation as follows: "We now easily recognize that the argument was mainly about three things: electrochemical dualism, Avogadro's Hypothesis, and the relative atomic weights of the elements. However, at the time, this was not so obvious; the most common arguments were about the formulas used to represent how chemical compounds were formed. . . . As a result, there was much confusion, every substance, even the simplest, had a series of formulas, e.g., water: H<sub>2</sub>O or HO or

H<sub>2</sub>O<sub>2</sub>, mine gas (methane): CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub> . . . . Even a simple compound such as vinegar could have enough proposed formulas to fill an entire printed page."<sup>1</sup>

$C_4H_4O_4$	. . . . .	empirische Formel.
$C_4H_3O_3 + HO$	. . . . .	dualistische Formel.
$C_4H_3O_4 \cdot H$	. . . . .	Wasserstoffsäure-Theorie.
$C_4H_4 + O_4$	. . . . .	Kertheorie.
$C_4H_2O_2 + HO_2$	. . . . .	Longchamp's Ansicht.
$C_4H + H_2O_4$	. . . . .	Graham's Ansicht.
$C_4H_3O_2 \cdot O + HO$	. . . . .	Radicaltheorie
$C_4H_3 \cdot O_3 + HO$	. . . . .	Radicaltheorie.
$C_4H_3O_2 \left. \begin{array}{l} H \\ H \end{array} \right\} O_2$	. . . . .	Gerhardt. Typentheorie.
$C_4H_3 \left. \begin{array}{l} H \\ H \end{array} \right\} O_4$	. . . . .	Typentheorie(Schischkoff)etc.
$C_2O_3 + C_2H_3 + HO$	. . . . .	Berzelius' Paarlingstheorie.
$H O \cdot (C_2H_3)C_2, O_3$	. . . . .	Kolbe's Ansicht.
$H O \cdot (C_2H_3)C_2, O \cdot O_2$	. . . . .	ditto
$C_2(C_2H_3)O_2 \left. \begin{array}{l} H \\ H \end{array} \right\} O_2$	. . . . .	Wurtz.
$C_2H_3(C_2O_2) \left. \begin{array}{l} H \\ H \end{array} \right\} O_2$	. . . . .	Mendius.
$C_2H_2 \cdot \left. \begin{array}{l} HO \\ HO \end{array} \right\} C_2O_2$	. . . . .	Geuther.
$C_2 \left\{ \begin{array}{l} C_2H_3 \\ O \\ O \end{array} \right\} O + HO$	. . . . .	Rochleder.
$(C_2 \frac{H_3}{CO} + CO_2) + HO$	. . . . .	Persoz.
$C_2 \left\{ \begin{array}{l} C_2 \\ H \\ H \end{array} \right\} \left. \begin{array}{l} O_2 \\ H \\ H \end{array} \right\} O_2$	. . . . .	Buff.

Thus, by the middle of the 19th century it was generally felt that the scientific situation in chemistry was unsatisfactory. Three young professors of chemistry took the initiative to organize a congress at which the subjects in dispute could be resolved: Friedrich August Kekulé, Carl Weltzien, and Charles Adolphe Wurtz.

### The Three Organizers

Friedrich August Kekulé von Stradonitz (1829-1896) originally studied architecture at the University of Giessen. Inspired by the lectures of Justus von Liebig (1803-1873) he changed to chemistry. After receiving his degree and after stays in Paris, Switzerland, and England, Kekulé became a professor of chemistry at the University of Ghent in Belgium. It was there that he clarified the structure of the aromatic carbon compounds. In 1867, he was named professor of chemistry at the University of Bonn. Today, his name is especially associated with the concept of the six-membered carbon ring of benzene as the prototypical aromatic compound which he proposed in 1865.<sup>2</sup>

This manuscript was originally published in German under the title "Für unsere schöne Wissenschaft eine Einigung anzubahnen" in *Nachrichten aus der Chemie*, Volume 58, May 2010, pp. 539-543; the English translation was prepared by John Jost and reviewed by the author.

Carl Weltzien (1813–1870) was a student of Friedrich Wöhler (1800–1882) and Eilhard Mitscherlich (1794–1863) in Berlin. He came to the Polytechnic in Karlsruhe in 1841 and nine years later became head of the Chemistry Department.<sup>3</sup>

Charles Adolphe Wurtz (Karl Adolph Würtz, 1817–1884) was born in Wolfisheim, Alsace, France, received a medical degree in Strasbourg, Germany, and then studied chemistry in Giessen with Liebig. He was an assistant with Dumas in Paris starting in 1845 and succeeded him in 1853 as holder of the chair in chemistry at the Faculty of Medicine. Kekulé knew Wurtz from his time in London in 1852.<sup>4</sup>

The driving force for the organization of an international conference of chemists undoubtedly came from Kekulé who was at this time a professor of chemistry at Ghent.

In the summer of 1859 Kekulé visited Weltzien in Karlsruhe and proposed that an international congress of chemists be organized in the city of Baden to settle the confusion regarding the concepts “atom,” “molecule,” and “equivalence.” Karlsruhe was seen as a suitable venue for the proposed conference not only because Weltzien was head of the chemistry department at the Polytechnic but also because support could be hoped for from Grand Duke Frederick I (1826–1907) of Baden who was known as a patron of science.

The current Karlsruhe Institute of Technology was founded in 1825 as the Grand ducal Polytechnic School of Baden; modeled on the École Polytechnique in Paris, it was the first Technical University in Germany and had an excellent reputation. In 1851, Weltzien had built a chemistry laboratory modeled on Liebig’s in Giessen—the laboratory cost 25 000 Gulden, almost half the annual budget of the Polytechnic.<sup>5</sup> This and the appointment of three prominent scientists to chairs of chemistry had moved Karlsruhe into the first rank among schools of chemistry at German universities. Karlsruhe’s convenient location led the organizers to expect that many French colleagues would participate in the proposed conference as well as the already well-known Heidelberg chemist Robert Bunsen (1811–1899).

## Preparations

After the meeting with Kekulé in Karlsruhe, Weltzien, during the winter semester 1859–1860, sketched the plans for a conference in letters to Wurtz in Paris and August Wilhelm Hofmann (1818–1892) in London.

At the end of March 1860, Kekulé and Weltzien travelled to Paris to visit Wurtz and took the first steps to implement their plans. A circular letter was planned to obtain the support of the most important chemists of the time. In a letter dated 14 March 1860, Kekulé wrote that the most important goal of the conference was to come to an agreement on the basic questions in theoretical chemistry.

The appeal was quickly initiated, with the three settling on Karlsruhe as the location for the meeting in the first week of September. Wurtz sent invitations to their French colleagues while Kekulé invited the British and Weltzien the German. The invitation letter from

Weltzien on 10 July stated the necessity and goals of an international congress: “More precise definition of what is meant by the expressions: atom, molecule, equivalence, atomicity, basicity, and designated expressions; investigation as to the true equivalent of bodies and their formulas; introduction of a proportional description and a rational nomenclature.”<sup>6</sup>



*Friedrich August Kekulé von Stradonitz (1829–1896)*



*Ständerhaus Karlsruhe.*



## Thriving for Unity in Chemistry

In addition to the three organizers, 42 renowned chemists signed the letter, among them Bunsen, Dumas, Liebig, Mitscherlich, and Wöhler. Others among the list of signatories were Stanislaw Cannizzaro (1826–1910), Otto Erdmann (1804–1869), Herman von Fehling (1811–1886), A.W. Hofmann, Herman Kopp (1817–1892), Louis Pasteur (1822–1895), Henry Roscoe (1833–1915), and Adolph Strecker (1822–1871). Weltzien received 129 letters<sup>7</sup> and the responses were so positive that it was felt that the practical organization of the congress could begin.

### Organization and Goals

From the beginning, it was intended that the congress would not only allow an exchange of views but that the participants would also come to decisions. Kekulé expressed it as follows: “To me it seems clear that the majority of the congress cannot make resolutions that are binding on the minority (and even less on those not present). Nevertheless, votes on many items would be useful because of the moral weight thus obtained. Discussion of certain key subjects could lead to the clarification of errors and thus to a consensus.”<sup>8</sup> All university chemistry faculty would have the right to vote.

A further concern of the organizers was to arrange the congress so that there would be little opportunity for the display of personal sensitivity or vanity thereby enabling the participants to concentrate on the issues at hand. Kekulé therefore insisted that a permanent conference chair should not be elected. He feared that such an election would cause the defeated candidates to suffer from injured pride and he worried that a chair of the congress could lead it into a direction of his own preference. It was also decided not to have a large number of prepared lectures as these would contribute little to the goal of the congress: “The meeting will be without a result if everyone is given the opportunity to present himself and his personal views in a

well prepared lecture.<sup>9</sup> Kekulé placed great reliance on the “agenda leaders” (secretaries): “The Secretariat must be chosen from among the most energetic and active young people from each country, or better said, each language. The actual leadership of the work of the congress will be in the hands of the Secretariat.”<sup>10</sup> It was obvious that Kekulé sought to hold a meeting with the character of a modern workshop rather than a display congress where the famous members of the guild present their various opinions.

### Participants

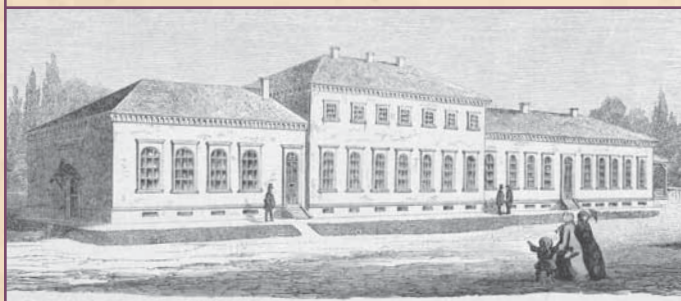
There were 127 chemists at the Congress in Karlsruhe; 57 from Germany, 21 from France, 18 from Great Britain, 7 each from Russia and Austria-Hungary, 6 from Switzerland, 3 each from Sweden and Belgium, 2 from Italy, and 3 from other countries.<sup>11</sup> Present were well-known chemists such as Bunsen, Adolf von Baeyer, Emil Erlenmeyer, von Fehling, Carl Fresenius, Kopp, Friedrich Beilstein, Jean-Baptiste Boussingault, Dumas, Arnould Paul Edmond Thénard, Cannizzaro, Dmitri Mendeleev, and Lothar Meyer. Most of the participants knew each other as the academic chemistry community at this time was still small. In addition, most of them had learned their chemistry in Paris, Giessen, or Heidelberg.

The participants were for the most part supporters of a conservative tendency to retain the system of Berzelius. Only a minority, to which the organizers themselves belonged, followed the molecular theory of the French chemists Auguste Laurent and Charles Gerhardt.

### The Event

The congress started on Monday, 3 September at 9:00 AM. The meeting was held in the assembly hall of the Baden Parliament on Ritter St.<sup>12</sup> Weltzien, as general secretary of the meeting, greeted the delegates with an address that emphasized the international and discipline-specific nature of the meeting: “For the first time the representatives of a single scientific discipline have met, and it is the youngest science . . . We represent different countries and speak different languages, but we are related by our craft . . . We are gathered for the specific purpose of attempting, in good conscience, to prepare the way for unity on points of significance for our beautiful science.”<sup>13</sup>

An opening address by Kekulé followed, the text of which has not survived.<sup>14</sup> Notes were made of all



*Chemical Laboratory in Karlsruhe, built in 1851.*



## The First International Gathering of Chemists

the meetings and proceedings prepared by Wurtz for eventual publication in French, German, and English.<sup>15</sup> Wurtz sent his French version to Kekulé in the fall, who noted the receipt of the text in a letter to Weltzien dated 19 November 1860 in which he asked for time to complete the editing and translation into German.<sup>16</sup> The publication of the proceedings was delayed a number of times and in the end never took place. However, a German translation of Wurtz' proceedings is available as they were edited by the Karlsruhe chemist Karl Engler as part of a *Festschrift* published by the Technical University Karlsruhe on the occasion of the 40th anniversary of the rule of Grand Duke Frederick of Baden in 1892.<sup>17</sup> Engler's edition of the proceedings is one of the most important sources of information about the meeting, supplemented by notes made by Meyer and Mendeleev as well as news items in the local Karlsruhe newspapers.<sup>18</sup>

The congress was organized as follows; Weltzien led the first meeting on 3 September at which Kekulé, Lev Nikolaevitch Schischkov, Strecker, Wurtz, Roscoe, and William Odling were named as secretaries of the congress. A nine-member committee, chaired by Kopp, then met in private to propose a detailed theme for the congress. They decided on the disputed meanings of the terms "atom," "molecule," and "equivalence." In the evening, a congress dinner for 120 people was held "in the large hall of the museum"—probably the current Karlsruhe art museum.

On the next day, the assembly discussed the question proposed by the committee, although no conclusions could be reached. The disputed subjects were therefore referred back to the committee, which met twice on the same day and decided to present the assembly with three specific nomenclature proposals.

On the third day the congress met, with Dumas as chair, to discuss the questions posed by the commission regarding nomenclature and the use of chemical symbols. During the discussion, Cannizzaro, at that time a little-known Genovese professor of chemistry, warned against trying to return the state of knowledge back to that of Berzelius' time, as chemistry had steadily developed since then.<sup>19</sup> After a heated dis-

ussion, the congress resolved that the sum formulas introduced by Berzelius could still be used.

### Results

The retention of the Berzelius style formulas as the only substantive result of the congress would seem at first glance to be very disappointing, a result very much different from the high expectations of the organizers. Still, the Karlsruhe Chemists Congress was undoubtedly the most significant event in the history of chemistry in the mid-19th century.

The concrete results originally planned by the organizers were not achieved; however, the gathering of so many chemists, from within Germany and from outside, had a catalytic effect on the development of theoretical chemistry. The development of the periodic system and the general acceptance of the Avogadro-Ampère theory in particular were undoubtedly promoted by the congress. Meyer, the codeveloper of the periodic system and a congress participant, testified to this later: "While formally it was without result, in fact it was very

useful, the many exchanges of views prepared for the later general agreement. At the end of the meeting friend Angelo Pavesi distributed on behalf of the publisher of an obscure journal a paper reprinted for the occasion, 'Sunto' by Cannizzaro, which had appeared a number of years earlier but had not received much attention. . . . I was astonished at its clarity, the little manuscript covered all the important points in dispute. It was as if scales fell from my eyes, doubts vanished, and a feeling of calm certainty came over me."<sup>20</sup> The congress undoubtedly helped to a large extent in the development of the periodic system of the elements.<sup>21</sup>


The Karlsruhe Congress was the first professional congress of a scientific discipline; it was followed in the following 20 years by 6 more: 1867 in Paris, 1872 in Moscow, 1873 in Vienna, 1876 in Philadelphia, 1878 in Paris, and 1880 in Düsseldorf.

The innovative nature of the Karlsruhe Chemists Congress should not be underestimated. Of course there had been natural science societies whose members met regularly for discussion and to hear lectures,



Carl Weltzien (1813-1870)

## Thriving for Unity in Chemistry

as early as 1746 in Europe (Switzerland) and 1822 in Germany, but these were mostly regional in nature and covered all disciplines (e.g., the “Meeting of the Society of German Natural Scientists and Physicians”). In contrast, the Karlsruhe meeting was viewed from the outset as an international and a discipline-specific meeting with a definitive theme. 

### References

1. L. Meyer in S. Cannizzaro. *Abriss eines Lehrganges der theoretischen Chemie*. Transl. by A. Miolati and ed. by L. Meyer. pp. 52–58, Engelmann, Leipzig (1891).
2. For Kekulé see R. Anschütz. *August Kekulé, Vol. 1*. Berlin, Verl. Chemie (1929) and W. Göbel. *Friedrich August Kekulé*. Teubner, Leipzig (1984).
3. For Weltzien see K. Birnbaum. *Ber. der deutschen chem. Ges.* **8**, 1698–1702 (1875); C. de Millt. *Chymia—Ann. Stud. in the Hist. of Chem.* **1**, 153–169 (1948).
4. For Wurtz see C. v. Voit. *Sitzungsber. der Bayer. Akademie d. Wiss. zu München/Mathemat.-Physikal. Kl.*, **15**, 153–160 (1885) and A. J. Rocke. *Nationalizing Science—Adolphe Wurtz and the Battle for French Chemistry*. MIT Press, Cambridge, [Mass.] (2001).
5. K.-P. Hoepke. *Geschichte der Fridericiana*. p. 52–58. Univ.-Press, Karlsruhe (2007).
6. See reference 2, p. 193 and pp. 671–680.
7. Some of them reprinted in A. Stock. *Der internationale Chemiker-Kongreß, Karlsruhe 3–5. September 1860 vor und hinter den Kulissen*. Verl. Chemie, Berlin (1933).
8. See reference 2, p. 185.
9. See reference 2, p. 191.
10. See reference 2, p. 191.
11. See reference 7, pp. 16–17.
12. U. Theobald (ed.). *Das badische Ständehaus in Karlsruhe*. Info-Verl., Karlsruhe (1988) and Stadt Karlsruhe (ed.), *Das neue Ständehaus*. Badenia-Verl., Karlsruhe (1993).
13. K. Engler. In *Festgabe zum Jubiläum der vierzigjährigen Regierung seiner Königlichen Hoheit des Grossherzogs Friedrich von Baden*, p. 348–349. Karlsruhe (1892).
14. Kekulé's notes in Anschütz I, pp. 689–691.
15. See reference 7, p. 18.
16. See reference 2, pp. 208–209.
17. See reference 13, p. 332–374
18. *Karlsruher Zeitung* **209–211** (4.9.–6.9. 1860). See also C. de Millt. *J. Chem. Educ.* **28**, 421–425 (1951) and *The Chemical News* **2**, 226 (1860).
19. See reference 2, p. 683.
20. See reference 1, p. 58–59.
21. About the importance of the congress, see E. von Meyer. *J. Prakt. Chem.* **83**, 182–189 (1911); A.J. Ihde. *J. Chem. Educ.* **38**, 83–86 (1961); H. Hartley. *Notes and Records of the Royal Society London* **21**, 56–63 (1966); J.H.S. Green. *Proc. Chem. Soc.*, 329–332 (1960) and M.J. Nye. *The Question of the Atom*. Tomash Publ., Los Angeles, 2. ed. (1984) (History of Modern Physics, Vol. 4).

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## The new SI: units of measurement based on fundamental constants

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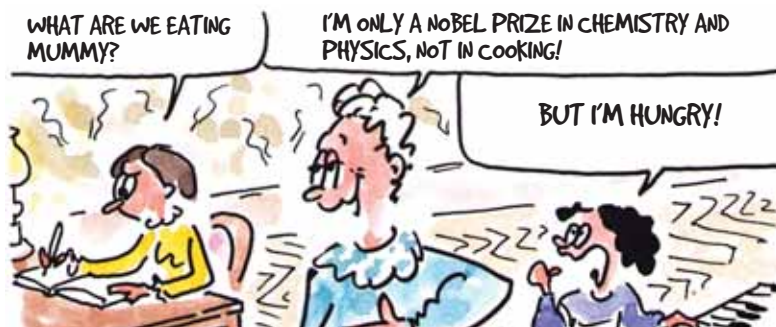
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## Organization Launched To Solve The Name Ambiguity Problem In Scholarly Research

**O**n 7 September 2010, the Open Researcher and Contributor ID (ORCID) initiative was officially launched as a nonprofit organization. ORCID, Inc. is dedicated to solving the name ambiguity problem in the scholarly research community and will manage a registry of unique contributor identifiers. Enabling the clear identification of researchers and their research will enhance the scientific discovery process and improve the efficiency of research funding and collaboration around the world.

ORCID is managed by a Board of Directors, comprised of 14 members of the global scholarly research community. To date, the organization has attracted support from more than 115 academic, corporate, and government organizations; associations; and publishing companies around the world.

"Difficulty in relating author identities has negative impacts on scientific discovery, research productivity, collaboration, project funding, publishing output, and even career advancement," notes Martin Fenner, Hannover Medical School and ORCID board member. "The ultimate success of ORCID will be through extensive participation and collaboration from all members of the scientific and scholarly community."

ORCID, Inc's activities are expected to show benefits for the publishing process. "Author ambiguity presents challenges for publishers in serving our authors, readers, and institutional customers," says Bernard Rous, Association of Computing Machinery and ORCID board member. "The ORCID registry of unique contributor identifiers, used collaboratively by scholarly societies, publishers, and all organizations involved in the scholarly enterprise, will enable us to build richer, more precise, and comprehensive services for the varied communities we serve."

"The problems associated with researcher identity ambiguity have become unwieldy as the volume of authors and published works continues to expand globally, and as more research output requires attribution," added MacKenzie Smith, MIT Libraries and ORCID board member. "We hope to work openly and collaboratively with the entire community to facilitate the solution."

 [www.orcid.org](http://www.orcid.org)

## 2011 IUPAC Prize for Young Chemists Announced

**T**he IUPAC Prize for Young Chemists encourages outstanding young research scientists at the beginning of their careers. Five prizes will be given for the most outstanding Ph.D. theses in the general area of the chemical sciences, as described in a 1000-word essay. Each prize consists of USD 1000 cash and travel expenses to the IUPAC 2011 Congress in Puerto Rico. Each awardee will be invited to present a poster on his/her research and to participate in a plenary award session. Awardees also are expected to submit a review article for possible publication in *Pure and Applied Chemistry*.

### Procedures for the 2011 Prize:

- a. Entrants must have received their Ph.D. (or equivalent) degree, or completed all Ph.D. requirements including successful defense of their doctoral thesis, during calendar year 2010 in any of the countries that are Members or Associate Members of IUPAC. Entrants need not be citizens or residents of one of these countries at the time the application is submitted.
- b. The research described in the entrant's thesis must be in the field of the chemical sciences, defined as "chemistry and those disciplines and technologies that make significant use of chemistry."
- c. The IUPAC Prize recognizes only work that was performed while the entrant was a graduate student.
- d. Application requires submission of a completed entry form, together with the material listed in items e. and f. The entry form and supporting material should be submitted by e-mail whenever feasible. Additional material may be sent as needed by fax or mail.
- e. An essay must be submitted by the entrant that describes his or her thesis work and places it in perspective relative to current research in the chemical sciences. The essay must be written in English by the entrant and may not exceed 1000 words.
- f. Two supporting letters are required from the thesis adviser and/or chair of the thesis committee and one additional faculty member. These letters should comment on the qualifications and accomplishments of the applicant and the significance of the thesis work.

g. Complete applications must be received at the IUPAC Secretariat by 1 February 2011. (If submitted through an NAO or Associate NAO, the deadline established by the NAO must be met.) Early submission is strongly encouraged so any questions may be resolved before the deadline date.

 [www.iupac.org/web/nt/2010-05-19\\_young\\_chemist](http://www.iupac.org/web/nt/2010-05-19_young_chemist)

## IUPAC Pilot Call for Proposals in Polymer Chemistry

**T**he research world is changing and international collaboration in chemistry is becoming increasingly important in achieving scientific success.

What is clear is the increased need and desire for multinational research, but what is not clear is where the funding for these programs will come from. Traditionally, national organizations are reluctant to provide funds to nondomestic researchers, and, in practice, funding truly international research projects can be quite problematic for a variety of technical and bureaucratic reasons.

In an effort to change this, the IUPAC Committee on Chemistry Research Funding—backed by several leading funding organizations and embodying the spirit of the upcoming International Year of Chemistry in 2011—was established in December 2007 to promote increased international collaboration and networking in the global chemistry community. From the committee meetings grew the idea for the first Transnational Call for Proposals in Polymer Chemistry, which was conducted from October 2009 through September 2010. The goal of this pilot call was to establish an efficient transnational funding program in chemistry, to transcend national/continental boundaries, to allow for minimal bureaucracy for the applicants, and to establish best practices for future calls of this type. Supporting this call were the IUPAC Polymer Division and the

seven national funding organizations that agreed to participate:

- Centre National de la Recherche Scientifique, France
- Deutsche Forschungsgemeinschaft e.V., Germany
- Fundação de Amparo à Pesquisa do Estado de São Paulo, Brazil
- Fundação para a Ciência e a Tecnologia, Portugal
- Irish Research Council for Science, Engineering and Technology, Ireland
- Ministerio de Ciencia e Innovación, Spain
- National Science Foundation, USA

The pilot call was configured to allow a team of three or more principal investigators from three different nations to submit a single research proposal that underwent a single common scientific review and



received a single funding decision. For each successful proposal, the individual applicants received funding from their respective national participating agency. The program was intended to fund one graduate student or postdoctoral fellow in each laboratory for a three-year period. Funding also included travel expenses, consumables, and minor equipment.

Applications were reviewed by an international panel of leading chemistry experts who made the ultimate decisions on funding priorities. Because of the diversity among topics in polymer chemistry, research themes for these proposals were limited

to the following high-priority basic science subjects:

- novel polymer syntheses
- new supramolecular polymer assemblies
- light-harvesting and light-emitting polymers

The enthusiasm for the pilot call was pronounced and the resulting proposals involved unique research teams from all seven countries, most of which would have been impossible to fund otherwise. The majority of the applications were from teams utilizing diverse country combinations that were used in no other applications; in fact, of the 35 possible national combinations, 18 were ultimately used. Only 14 percent of

the received applications were comprised solely of investigators from the five European nations, where international collaboration has historically been more accessible, while 72 percent were bicontinental and 14 percent were tricontinental. Overall, a 25 percent funding success rate was achieved, which is in line with the generalized success rates for the individual agencies.

The investigators and titles of the successful applications will be made available at <[www.iupac.org/polyedu/DivIVCall](http://www.iupac.org/polyedu/DivIVCall)> and on the agency websites of the seven affiliates. Laureates are also scheduled to report on their progress at the 44th IUPAC World Polymer Congress in Blacksburg, Virginia, USA, from 24–29 June 2012 ([www.macro2012.org](http://www.macro2012.org)).

For more information about this pilot program, contact Steven Meyers <[proposal@iupac.org](mailto:proposal@iupac.org)>, secretariat for the transnational funding opportunity for proposals in polymer chemistry, or Markus Behnke <[Markus.Behnke@dfg.de](mailto:Markus.Behnke@dfg.de)>, program officer for the Division of Chemistry and Process Engineering at the Deutsche Forschungsgemeinschaft.

 [www.iupac.org/polyedu/DivIVCall](http://www.iupac.org/polyedu/DivIVCall)

## Two Franzosini Awards in 2010

**J**itka Eysseltova and Stanislav Frančišković-Bilinski each received the Franzosini Award in recognition of their separate contributions to the IUPAC Solubility Data Project. They were honored at the 9th Annual Meeting of the IUPAC Subcommittee on Solubility and Equilibrium Data held 25–30 July 2010 in Montanuniversität Leoben, Austria.

Jitka Eysseltova, a retired professor at Charles University, Prague, Czech Republic, has been working on solubility projects for more than 30 years. Her first contact with the IUPAC solubility group, then named the Solubility Data Commission V.8, was in 1979. In 1981, she participated in its annual meeting, held in Louvain, Belgium, in spite of Czechoslovakian laws in force at that time prohibiting such involvement. Starting

in 1983, she participated in all annual meetings of Commission V.8, and since 2002 she has attended all meetings of the Subcommittee on Solubility and Equilibrium data. In 1988, she coauthored SDS volume 31 on “Alkali Metal Orthophosphates” (with the late T.P. Dirkse). Since 1988, she has contributed to all ISSPs, with oral and/or poster presentations and by chairing sessions. From 1991–1995 she served as titular member of Commission V.8, and from 1995–1997 she was a member of a V. 8 group working on a Copernicus Project. The head of this group was the late R. Cohen-Adad. In 1998, she coauthored SDS volume 66 on “Ammonium Phosphates” (also with T.P. Dirkse). From 2008–2009 she chaired the task group of the project “Solubility in Systems with Lithium and/or Sodium Nitrates,” and in 2010 she submitted for publication an SDS volume on lithium nitrate. At the 14th International Symposium on Solubility Phenomena and Related Equilibrium Processes in July 2010 she presented an excellent Franzosini communication on “Saturated Electrolyte Solutions: Thermodynamics and Reality.”

Stanislav Frančišković-Bilinski is a research associate at the Laboratory for Physical Chemistry of Traces, Division for Marine and Environmental Research, “Ruđer Bošković” Institute, Zagreb. He received his doctorate in geology at the University of Zagreb, Croatia in 2005. Frančišković-Bilinski has been, and still is, the principal investigator of geochemically oriented bilateral projects between Croatia and Austria as well as Croatia and Hungary. His scientific oeuvre mainly deals with the interaction of natural waters with sediments (e.g., “An Assessment of Multielemental Composition in Stream Sediments of Kupa River Drainage Basin, Croatia for Evaluating Sediment Quality Guidelines,” *Fresenius Environmental Bulletin* [2007], 16, 561–575). Thus, his expertise is a prerequisite for the success of solubility data projects of geochemical and environmental relevance which will be proposed by SSED in the near future. At the 14th ISSP he presented a comprehensive Franzosini communication titled “Toxic Elements in Stream Sediments as Indicators of Environmental Problems.”



*Franzosini Award winners  
Jitka Eysseltova (left) and  
Stanislav Frančišković-  
Bilinski.*

See the conference report on page 24 for more echoes from the 14th ISSP.



# A concise summary of the International System of Units, the **SI**

*Metrology is the science of measurement, embracing all measurements, made at a known level of uncertainty, in any field of human activity.*

The Bureau International des Poids et Mesures, the BIPM, was established by Article 1 of the Convention du Mètre, on 20 May 1875, and is charged with providing the basis for a single, coherent system of measurements to be used throughout the world. The decimal metric system, dating from the time of the French Revolution, was based on the metre and the kilogram. Under the terms of the 1875 Convention, new international prototypes of the metre and kilogram were made and formally adopted by the first Conférence Générale des Poids et Mesures (CGPM) in 1889. Over time this system developed, so that it now includes seven base units. In 1960 it was decided at the 11th CGPM that it should be called the *Système International d'Unités*, the SI (in English: the International System of Units). The SI is not static but evolves to match the world's increasingly demanding requirements for measurements at all levels of precision and in all areas of science, technology, and human endeavour. This document is a summary of the **SI Brochure**, a publication of the BIPM which is a statement of the current status of the SI.

The seven **base units** of the SI, listed in Table 1, provide the reference used to define all the measurement units of the International System. As science advances, and methods of measurement are refined, their definitions have to be revised. The more accurate the measurements, the greater the care required in the realization of the units of measurement.



*The international prototype of the kilogram,  $\mathcal{K}$ , the only remaining artefact used to define a base unit of the SI.*

Table 1 *The seven base units of the SI*

Quantity
Unit, symbol: definition of unit
<b>length</b>
<b>metre, m:</b> The metre is the length of the path travelled by light in vacuum during a time interval of $1/299\,792\,458$ of a second. <i>It follows that the speed of light in vacuum, <math>c_0</math>, is <math>299\,792\,458</math> m/s exactly.</i>
<b>mass</b>
<b>kilogram, kg:</b> The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram. <i>It follows that the mass of the international prototype of the kilogram, <math>m(\mathcal{K})</math>, is always 1 kg exactly.</i>
<b>time</b>
<b>second, s:</b> The second is the duration of $9\,192\,631\,770$ periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom. <i>It follows that the hyperfine splitting in the ground state of the caesium 133 atom, <math>\nu(\text{hfs Cs})</math>, is <math>9\,192\,631\,770</math> Hz exactly.</i>
<b>electric current</b>
<b>ampere, A:</b> The ampere is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed 1 metre apart in vacuum, would produce between these conductors a force equal to $2 \times 10^{-7}$ newton per metre of length. <i>It follows that the magnetic constant, <math>\mu_0</math>, also known as the permeability of free space is <math>4\pi \times 10^{-7}</math> H/m exactly.</i>
<b>thermodynamic temperature</b>
<b>kelvin, K:</b> The kelvin, unit of thermodynamic temperature, is the fraction $1/273.16$ of the thermodynamic temperature of the triple point of water. <i>It follows that the thermodynamic temperature of the triple point of water, <math>T_{\text{tpw}}</math>, is 273.16 K exactly.</i>
<b>amount of substance</b>
<b>mole, mol:</b> <ol style="list-style-type: none"> <li>The mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12.</li> <li>When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles.</li> </ol> <i>It follows that the molar mass of carbon 12, <math>M(^{12}\text{C})</math>, is 12 g/mol exactly.</i>
<b>luminous intensity</b>
<b>candela, cd:</b> The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency $540 \times 10^{12}$ hertz and that has a radiant intensity in that direction of $1/683$ watt per steradian. <i>It follows that the spectral luminous efficacy, <math>K</math>, for monochromatic radiation of frequency <math>540 \times 10^{12}</math> Hz is 683 lm/W exactly.</i>

The seven **base quantities** corresponding to the seven **base units** are length, mass, time, electric current, thermodynamic temperature, amount of substance, and luminous intensity. The **base quantities** and **base units** are listed, with their symbols, in Table 2.

Table 2 *Base quantities and base units used in the SI*

Base quantity	Symbol	Base unit	Symbol
length	$l, h, r, x$	metre	m
mass	$m$	kilogram	kg
time, duration	$t$	second	s
electric current	$I, i$	ampere	A
thermodynamic temperature	$T$	kelvin	K
amount of substance	$n$	mole	mol
luminous intensity	$I_v$	candela	cd

All other quantities are described as **derived quantities**, and are measured using **derived units**, which are defined as products of powers of the **base units**. Examples of **derived quantities** and **units** are listed in Table 3.

Table 3 *Examples of derived quantities and units*

Derived quantity	Symbol	Derived unit	Symbol
area	$A$	square metre	$m^2$
volume	$V$	cubic metre	$m^3$
speed, velocity	$v$	metre per second	m/s
acceleration	$a$	metre per second squared	$m/s^2$
wavenumber	$\sigma, \bar{\nu}$	reciprocal metre	$m^{-1}$
mass density	$\rho$	kilogram per cubic metre	$kg/m^3$
surface density	$\rho_A$	kilogram per square metre	$kg/m^2$
specific volume	$v$	cubic metre per kilogram	$m^3/kg$
current density	$j$	ampere per square metre	$A/m^2$
magnetic field strength	$H$	ampere per metre	A/m
concentration	$c$	mole per cubic metre	$mol/m^3$
mass concentration	$\rho, \gamma$	kilogram per cubic metre	$kg/m^3$
luminance	$L_v$	candela per square metre	$cd/m^2$
refractive index	$n$	one	1
relative permeability	$\mu_r$	one	1

Note that refractive index and relative permeability are examples of dimensionless quantities, for which the SI unit is the number one, 1, although this unit is not written.

Some **derived units** are given a **special name**, these being simply a compact form for the expression of combinations of **base units** that are used frequently. Thus, for example, the

joule, symbol J, is by definition equal to  $m^2 kg s^{-2}$ . There are 22 special names for units approved for use in the SI at present, and these are listed in Table 4.

Table 4 *Derived units with special names in the SI*

Derived quantity	Name of derived unit	Symbol for unit	Expression in terms of other units
plane angle	radian	rad	$m/m = 1$
solid angle	steradian	sr	$m^2/m^2 = 1$
frequency	hertz	Hz	$s^{-1}$
force	newton	N	$m kg s^{-2}$
pressure, stress	pascal	Pa	$N/m^2 = m^{-1} kg s^{-2}$
energy, work, amount of heat	joule	J	$N m = m^2 kg s^{-2}$
power, radiant flux	watt	W	$J/s = m^2 kg s^{-3}$
electric charge, amount of electricity	coulomb	C	s A
electric potential difference	volt	V	$W/A = m^2 kg s^{-3} A^{-1}$
capacitance	farad	F	$C/V = m^{-2} kg^{-1} s^4 A^2$
electric resistance	ohm	$\Omega$	$V/A = m^2 kg s^{-3} A^{-2}$
electric conductance	siemens	S	$A/V = m^{-2} kg^{-1} s^3 A^2$
magnetic flux	weber	Wb	$V s = m^2 kg s^{-2} A^{-1}$
magnetic flux density	tesla	T	$Wb/m^2 = kg s^{-2} A^{-1}$
inductance	henry	H	$Wb/A = m^2 kg s^{-2} A^{-2}$
Celsius temperature	degree Celsius	$^{\circ}C$	K
luminous flux	lumen	lm	$cd sr = cd$
illuminance	lux	lx	$lm/m^2 = m^{-2} cd$
activity referred to a radionuclide	becquerel	Bq	$s^{-1}$
absorbed dose, specific energy (imparted), kerma	gray	Gy	$J/kg = m^2 s^{-2}$
dose equivalent, ambient dose equivalent	sievert	Sv	$J/kg = m^2 s^{-2}$
catalytic activity	katal	kat	$s^{-1} mol$

Although the hertz and the becquerel are both equal to the reciprocal second, the hertz is only used for cyclic phenomena, and the becquerel for stochastic processes in radioactive decay.

The unit of Celsius temperature is the degree Celsius,  $^{\circ}C$ , which is equal in magnitude to the kelvin, K, the unit of thermodynamic temperature. The quantity Celsius temperature  $t$  is related to thermodynamic temperature  $T$  by the equation  $t/^{\circ}C = T/K - 273.15$ .

The sievert is also used for the quantities directional dose equivalent and personal dose equivalent.

The last four special names for units in Table 4 were adopted specifically to safeguard measurements related to human health.

For each quantity, there is only one SI unit (although it may often be expressed in different ways by using the special names). However the same SI unit may be used to express the values of several different quantities (for example, the SI unit J/K may be used to express the value of both heat capacity and entropy). It is therefore important not to use the unit alone to specify the quantity. This applies both to scientific texts and also to measuring instruments (i.e. an instrument read-out should indicate both the quantity concerned and the unit).

Dimensionless quantities, also called quantities of dimension one, are usually defined as the ratio of two quantities of the same kind (for example, refractive index is the ratio of two speeds, and relative permittivity is the ratio of the permittivity of a dielectric medium to that of free space). Thus the unit of a dimensionless quantity is the ratio of two identical SI units, and is therefore always equal to one. However in expressing the values of dimensionless quantities the unit one, 1, is not written.

### Decimal multiples and sub-multiples of SI units

A set of prefixes have been adopted for use with the SI units, in order to express the values of quantities that are either much larger than or much smaller than the SI unit used without any prefix. The SI prefixes are listed in Table 5. They may be used with any of the **base units** and with any of the **derived units** with special names.

Table 5 *The SI prefixes*

Factor	Name	Symbol	Factor	Name	Symbol
10 <sup>1</sup>	deca	da	10 <sup>-1</sup>	deci	d
10 <sup>2</sup>	hecto	h	10 <sup>-2</sup>	centi	c
10 <sup>3</sup>	kilo	k	10 <sup>-3</sup>	milli	m
10 <sup>6</sup>	mega	M	10 <sup>-6</sup>	micro	μ
10 <sup>9</sup>	giga	G	10 <sup>-9</sup>	nano	n
10 <sup>12</sup>	tera	T	10 <sup>-12</sup>	pico	p
10 <sup>15</sup>	peta	P	10 <sup>-15</sup>	femto	f
10 <sup>18</sup>	exa	E	10 <sup>-18</sup>	atto	a
10 <sup>21</sup>	zetta	Z	10 <sup>-21</sup>	zepto	z
10 <sup>24</sup>	yotta	Y	10 <sup>-24</sup>	yocto	y

When the prefixes are used, the prefix name and the unit name are combined to form a single word, and similarly the prefix symbol and the unit symbol are written without any space to form a single symbol, which may itself be raised to any power. For example, we may write: kilometre, km; microvolt, μV; femtosecond, fs; 50 V/cm = 50 V (10<sup>-2</sup> m)<sup>-1</sup> = 5000 V/m.

When the **base units** and **derived units** are used without any prefixes, the resulting set of units is described as being **coherent**.

The use of a coherent set of units has technical advantages (see the **SI Brochure**). However the use of the prefixes is convenient because it avoids the need to use factors of 10<sup>n</sup> to express the values of very large or very small quantities. For example, the length of a chemical bond is more conveniently given in nanometres, nm, than in metres, m, and the distance from London to Paris is more conveniently given in kilometres, km, than in metres, m.

The kilogram, kg, is an exception, because although it is a **base unit** the name already includes a prefix, for historical reasons. Multiples and sub-multiples of the kilogram are written by combining prefixes with the gram: thus we write milligram, mg, not microkilogram, μkg.

### Units outside the SI

The SI is the only system of units that is universally recognized, so that it has a distinct advantage in establishing an international dialogue. Other units, i.e. non-SI units, are generally defined in terms of SI units. The use of the SI also simplifies the teaching of science. For all these reasons the use of SI units is recommended in all fields of science and technology.

Nonetheless some non-SI units are still widely used. A few, such as the minute, hour and day as units of time, will always be used because they are so deeply embedded in our culture. Others are used for historical reasons, to meet the needs of special interest groups, or because there is no convenient SI alternative. It will always remain the prerogative of a scientist to use the units that are considered to be best suited to the purpose. However when non-SI units are used, the conversion factor to the SI should always be quoted. A few non-SI units are listed in Table 6 below with their conversion factors to the SI. For a more complete list, see the **SI Brochure**, or the BIPM website.

Table 6 *A few non-SI units*

Quantity	Unit	Symbol	Relation to SI
time	minute	min	1 min = 60 s
	hour	h	1 h = 3600 s
	day	d	1 d = 86 400 s
volume	litre	L or l	1 L = 1 dm <sup>3</sup>
mass	tonne	t	1 t = 1000 kg
energy	electronvolt	eV	1 eV ≈ 1.602 × 10 <sup>-19</sup> J
pressure	bar	bar	1 bar = 100 kPa
	millimetre of mercury	mmHg	1 mmHg ≈ 133.3 Pa
length	ångström	Å	1 Å = 10 <sup>-10</sup> m
	nautical mile	M	1 M = 1852 m
force	dyne	dyn	1 dyn = 10 <sup>-5</sup> N
energy	erg	erg	1 erg = 10 <sup>-7</sup> J

Symbols for units begin with a capital letter when they are named after an individual (for example, ampere, A; kelvin, K; hertz, Hz; coulomb, C). Otherwise they always begin with a lower case letter (for example, metre, m; second, s; mole, mol). The symbol for the litre is an exception: either a lower case



letter or a capital L may be used, the capital being allowed in this case to avoid confusion between the lower case letter l and the number one, 1.

The symbol for a nautical mile is given here as M; however there is no general agreement on any symbol for a nautical mile.

### The language of science: using the SI to express the values of quantities

The value of a quantity is written as the product of a number and a unit, and the number multiplying the unit is the numerical value of the quantity in that unit. One space is always left between the number and the unit. For dimensionless quantities, for which the unit is the number one, the unit is omitted. The numerical value depends on the choice of unit, so that the same value of a quantity may have different numerical values when expressed in different units, as in the examples below.

The speed of a bicycle is approximately  
 $v = 5.0 \text{ m/s} = 18 \text{ km/h}$ .

The wavelength of one of the yellow sodium lines is  
 $\lambda = 5.896 \times 10^{-7} \text{ m} = 589.6 \text{ nm}$ .

Quantity symbols are printed in an italic (slanting) type, and they are generally single letters of the Latin or Greek alphabet. Either capital or lower case letters may be used, and additional information on the quantity may be added as a subscript or as information in brackets.

There are recommended symbols for many quantities, given by authorities such as ISO (the International Organization for Standardization) and the various international scientific unions such as IUPAP and IUPAC. Examples are:

$T$	for temperature
$C_p$	for heat capacity at constant pressure
$x_i$	for the mole fraction (amount fraction) of species $i$
$\mu_r$	for relative permeability
$m(\mathcal{K})$	for the mass of the international prototype of the kilogram $\mathcal{K}$ .

Unit symbols are printed in a roman (upright) type, regardless of the type used in the surrounding text. They are mathematical entities and not abbreviations; they are never followed by a stop (except at the end of a sentence) nor by an s for the plural. The use of the correct form for unit symbols is mandatory, and is illustrated by the examples in the **SI Brochure**. Unit symbols may sometimes be more than a single letter. They are written in lower case letters, except that the first letter is a capital when the unit is named after an individual. However when the name of a unit is spelled out, it should begin with a lower case letter (except at the beginning of a sentence), to distinguish the unit from the man.

In writing the value of a quantity as the product of a numerical value and a unit, both the number and the unit may be treated by the ordinary rules of algebra. For example, the equation  $T = 293 \text{ K}$  may equally be written  $T/\text{K} = 293$ . This procedure is described as the use of quantity calculus, or the algebra of quantities. It is often useful to use the ratio of a quantity to its unit for heading the columns of tables, or labelling the axes of graphs, so that the entries in the table or the labels of the tick marks on the axes are all simply numbers. The example below

shows a table of vapour pressure as a function of temperature, and the logarithm of vapour pressure as a function of reciprocal temperature, with the columns labelled in this way.

$T/\text{K}$	$10^3 \text{ K}/T$	$p/\text{MPa}$	$\ln(p/\text{MPa})$
216.55	4.6179	0.5180	-0.6578
273.15	3.6610	3.4853	1.2486
304.19	3.2874	7.3815	1.9990

Algebraically equivalent forms may be used in place of  $10^3 \text{ K}/T$ , such as  $\text{kK}/T$ , or  $10^3 (T/\text{K})^{-1}$ .

In forming products or quotients of units the normal rules of algebra apply. In forming products of units, a space should be left between units (or alternatively a half high centred dot can be used as a multiplication symbol). Note the importance of the space, for example,  $\text{m s}$  denotes the product of a metre and a second, but  $\text{ms}$  denotes a millisecond. Also, when forming complicated products of units, use brackets or negative exponents to avoid ambiguities. For example, the molar gas constant  $R$  is given by:

$$pV_m/T = R = 8.314 \text{ Pa m}^3 \text{ mol}^{-1} \text{ K}^{-1} \\ = 8.314 \text{ Pa m}^3/(\text{mol K}).$$

When formatting numbers the decimal marker may be either a point (i.e. a stop) or a comma, as appropriate to the circumstances. For documents in the English language a point is usual, but for many continental European languages and in some other countries a comma is usual.

When a number has many digits, it is customary to group the digits into threes about the decimal point for easy reading. This is not essential, but it is often done, and is generally helpful. When this is done, the groups of three digits should be separated only by a (thin) space; neither a point nor a comma should be used. The uncertainty in the numerical value of a quantity may often be conveniently shown by giving the uncertainty in the least significant digits in brackets after the number.

Example: The value of the elementary charge is given in the 2002 CODATA listing of fundamental constants as  
 $e = 1.602\,176\,53(14) \times 10^{-19} \text{ C}$ ,  
where 14 is the standard uncertainty in the final digits quoted for the numerical value.

For further information see the BIPM website, or the **SI Brochure** 8th edition, which is available at

<http://www.bipm.org>



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### Inviting Young Chemists to the 43rd IUPAC Congress in Puerto Rico

The 2011 IUPAC Congress will take place 30 July–7 August in San Juan, Puerto Rico's new, state-of-the-art Convention Center. The theme of the Congress is "Chemistry Bridging Innovation Among the Americas and the World." The event will be a major cornerstone of the 2011 International Year of Chemistry and a unique opportunity to celebrate the achievements of chemistry and its contributions to the well-being of humankind.

To encourage young chemists to participate in the 43rd IUPAC Congress, the organizers have established two different Young Chemists Award programs, both offering travel assistance to Puerto Rico.

The two award programs are as follows:

- **Program A** is especially targeted at young scientists from developing and economically disadvantaged countries.
- **Program B** is open to chemists from any country.

#### Young Observers at the IUPAC General Assembly

Concurrent with the Young Chemists initiative, IUPAC and individual National Adhering Organizations (NAOs) are again offering a Young Observer program to provide young scientists with the opportunity to participate in sessions of the IUPAC General Assembly. Sessions of the General Assembly are generally reserved to IUPAC members of specific divisions and committees, but Young Observers can participate in these meetings—a unique opportunity to learn about IUPAC activities, establish international collaborations, and gain knowledge of global research activities.

IUPAC Young Observers will be invited from the pool of Young Chemists awards granted by the IUPAC Congress. Other NAOs, such as the USA, may have their own selection process. Those who are interested should inquire with the NAO from their country: [www.iupac.org/nao](http://www.iupac.org/nao).

 [www.iupac.org/web/nt/2010-11-05\\_43\\_Congress](http://www.iupac.org/web/nt/2010-11-05_43_Congress)



*The Puerto Rico Convention Center, site of the 2011 IUPAC Congress.*

Awards of up to USD 1500 will be made available to qualified candidates as a contribution to the costs of their travel to attend the Congress and to meet Congress registration fees.

Applications are welcomed from candidates under age 40 who received their Ph.D. less than five years ago. Scientists from academia, government, or industry may submit applications directly to the address below. Successful applicants will be expected to submit an oral or poster presentation abstract to be presented at the Congress. Such abstracts will be subject to adjudication as will all other submissions for presentation at the meeting.

Applicants are asked to return the application form, and complete it with the following information:

- letter of application
- brief CV
- confirmation of their current status and affiliation;
- publication list (5–10 top)
- the title of their abstract submission to the IUPAC 2011 Congress
- letter of support from the appropriate department head, dean, or laboratory supervisor
- an estimate of the applicant's economy airfare to and from the Congress

Applicants are not required to be a member or affiliate of IUPAC to be eligible for a Young Chemists Award. The deadline for receipt of applications is 28 February 2011. Applications should be sent to [info@iupac2011.org](mailto:info@iupac2011.org) or [restoe@iupac2011.org](mailto:restoe@iupac2011.org) with IUPAC Young Chemists Award in the subject line. Visit the Congress website for more info.

 [www.iupac2011.org](http://www.iupac2011.org)

## Radioanalytical Chemistry—Revision of the Orange Book Chapter

Since the last edition of the Orange Book was published in 1998, analytical chemistry has moved into new fields of science, and the importance of some areas has changed. The revision of the Orange Book is a major endeavor of the IUPAC Analytical Division and is expected to take until 2013.

The available terms in the field of radioanalytical chemistry were compiled 10 years ago. With the development of modern science and technology, many of the terms are outdated, scientifically inaccurate, or even completely wrong. In the last decade, many new terms in the field of radioanalytical methods have come into use or are emerging. In particular, sophisticated nuclear facilities and detectors, such as advanced neutron nuclear reactors, dedicated particle accelerators, and various new types of radiation detectors, are changing the

outlook of radioanalytical methods. For example, synchronous radiation devices and spallation neutron sources are used in many advanced nuclear analytical laboratories in the world. As a result, new nuclear analysis methods have been established or are being developed. Neutron scattering, accelerator mass spectrometry, X-ray absorption, and fluorescence methods based on synchronous radiation, have become more and more popular analytical tools in scientific analysis.

Following are a few examples of outdated terms in the Orange Book:

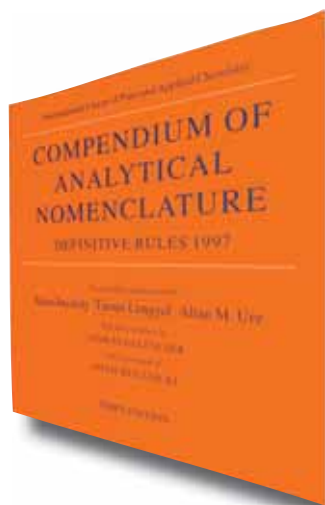
- **Nuclide:** “A species of atom, characterized by its mass number, atomic number, and nuclear energy state. Usually restricted to situations in which the mean life is long enough to be observable.” The second sentence of this term should be deleted because it is not completely correct. A nuclide can be stable or radioactive, and whether it has an observable mean life is inconsequential.

- **Half Life, Biological:** This term should be deleted since it belongs to the field of life sciences and is not used in nuclear science.
- **Tracer, Isotopic:** “A tracer which only differs in isotopic composition from the substance to be traced.” This is not a strict definition. It would make more sense to replace “isotopic composition” with “mass number.”

The objective of this new project is to prepare a revised vocabulary of concepts and terms in radioanalytical chemistry that is compatible with the glossary format used in the Gold Book.

For more information contact the Task Group Chair Zhifang Chai <[chaizf@ihep.ac.cn](mailto:chaizf@ihep.ac.cn)>.

 [www.iupac.org/web/ins/2010-030-1-500](http://www.iupac.org/web/ins/2010-030-1-500)



## Developing Toolkits for National Chemistry Weeks During IYC

Participants at the meeting of the Committee on Chemistry Education (CCE) in August 2009 in Glasgow, UK, discussed the idea of developing toolkits for the many national chemistry days or weeks that will be held around the world during the International Year of Chemistry. It was felt that this would be especially helpful for countries that do not have a strong tradition of arranging such events.

This project is designed to fulfill the following objectives:

- identify countries that already have established national chemistry days and weeks
- collect information about these countries' planned activities for IYC2011
- develop toolkits to facilitate the widespread celebration of national chemistry days or weeks around the world, particularly in countries that do not have a strong tradition of doing so

For more information contact the task group chair Mustafa Sözbilir <[sozibilir@atauni.edu.tr](mailto:sozibilir@atauni.edu.tr)>.

 [www.iupac.org/web/ins/2009-037-3-050](http://www.iupac.org/web/ins/2009-037-3-050)



## Enhancing the Capacity to Provide Quality Chemistry Education at Secondary and Tertiary Levels in Ethiopia

This project is the next leg of the Flying Chemists Program, a program coordinated by the IUPAC Committee on Chemistry Education. The goal of the project is to empower Ethiopian chemists and teachers to modernize chemistry education at secondary and tertiary levels. Specifically, the project aims at the following:

- introducing innovative and cost-effective laboratory instruction in chemistry education
- empowering chemistry instructors in designing and implementing contextualized and learner-centered chemistry education
- promoting innovative ways of training quality chemistry teachers

Ethiopia is one of the least developed countries located in the horn of Africa. It is also the only country in Africa that has not been colonized. Despite its economic constraints, it has a strong professional association—the Chemical Society of Ethiopia—that has been running various professional activities in the country for an uninterrupted 26 years. CSE also initiated the establishment of the Federation of African Societies of Chemistry (FASC), headquartered in Addis Ababa/Ethiopia.

Ethiopia has been revising its secondary school chemistry curricula and its implementation strategies. All these revisions have had an impact on tertiary chemistry education in one way or another. Currently, only a small percentage of secondary school students choose chemistry as their major subject. There is also a great deal of confusion about the ways in which chemistry teachers should be trained. Issues that need addressing include the balance between laboratory time and pedagogy, the best way of handling both areas, and the length of the training period.

In order to address these issues, this project proposes to do the following:

- survey the existing chemistry curriculum, methodology, assessment, and overall context (government, industry, academia) at secondary and tertiary levels
- organize a conference on “Chemistry Education in Ethiopia: Today and Tomorrow”
- introduce a new innovative teaching and learning program in chemistry education to secondary and tertiary teachers
- increase awareness among policy makers about the importance of improving teachers’ and students’ literacy in chemistry that is related to our daily lives
- establish follow-up mechanisms to ensure sustainability

The conference will take place in February 2011 in Addis Ababa, Ethiopia, in the two days prior to the 27th annual congress of CSE. The target audiences are Ethiopian chemistry professors, secondary school chemistry teachers, and chemists from FASC member countries. The conference will serve as a major event for celebrating the IYC2011 in Ethiopia.

The Flying Chemists Program will contribute to the project by providing the following speakers: Jorge Ibanez, Peter Mahaffy, Mei-Hung Chiu, Hans-Dieter Barke, Guenter Harsch, Temechegn Engida, and Sileshi Yitbarek. The FCP visit will be organized by CSE, with the full support and participation of FASC, PACN, Ministry of Education, Ministry of Science and Technology, and Ministry of Foreign Affairs of Ethiopia.

For more information contact the task group chair Temechegn Engida <[temechegn@gmail.com](mailto:temechegn@gmail.com)>.

 [www.iupac.org/web/ins/2010-025-1-050](http://www.iupac.org/web/ins/2010-025-1-050)



*Temechegn Engida, delegate from Ethiopia and president of FASC, discusses plans for IYC2011 in Africa at the 2009 IUPAC General Assembly.*



## UV/Vis<sup>+</sup> Spectra Database

by *Andreas Noelle, Gerd K. Hartmann, and F. Javier Martin-Torres*

The online UV/Vis<sup>+</sup> Spectra Data Base is a not-for-profit project established in August 2000 and operated in accordance with the "Open Access" definitions and regulations of the CSPP Assessment Panel on Scientific Data and Information.<sup>1</sup> The free database currently contains about 5 700 spectra (from low to very high resolution, at different temperatures and pressures) and data sheets (metadata) for about 900 substances. In addition, more than 250 links are provided to free, online, original publications. Since the database is interdisciplinary in its coverage, it is an excellent tool for scientists who research in different fields such as physics and chemistry of planetary atmospheres, astrophysics, agriculture, analytical chemistry, environmental chemistry, medicine, and remote sensing.

### Database Content

The online database comprises spectral data and information from the EUV-VUV-UV-VIS-NIR spectral region. The data-sheets contain meta data on publication, wavelength range, temperature, and pressure, as well as related photochemical information (quantum yields, photolysis studies). Additional spectra/data-sheets are continually added and new "Substance Groups" are added as new species are categorized. The database is subdivided into 27 substance groups. In addition, users can search within the CAS-list for spectral data and information.

All datasheets (metadata), as well as the spectral data (2 column tables), are in a plain ascii format, allowing for easy use without specific software. For some of the spectral data (e.g., for all dyes and several other substances), graphical representations (Fig. 1) are provided. Within several months, such graphs should be available for all of the spectral data in the database.

### Database Quality Assurance

The database contains spectral data and photochemical information from published papers. To ensure the

#### Substance Groups

Alkali Compounds	Aromatic Compounds	Carbon Oxides
Dyes	Halogenated Alkanes, Alkenes	Halogenated Aromatics
Halogenated Carbonyl Compounds	Halogenated Nitrogen Compounds	Halogens/Halogen Oxides
Hydrocarbons	Hydrogenhalides/Hypohalides	Nitrogen Acids
Nitrogen/Nitrogen Oxides	Noble Gases	Organic Acids/Esters
Organic Carbonyl Compounds	Organic Nitrogen Compounds	Organic Peroxy Compounds
Other Oxygenated Organics	Oxygen Hydrogen Compounds	PAHs
PBDEs	PCDDs	Pesticides/Herbicides
Radicals	Sulfur Compounds	Other Species (not yet categorized)

high quality of the fast-growing UV/Vis<sup>+</sup> Spectra Data Base, an international Scientific Advisory Group was established in 2004. The Scientific Advisory Group members are also editors of the UV/Vis<sup>+</sup> Spectra Data Base CD-ROM series.

### Database Access

The online UV/Vis<sup>+</sup> Spectra Data Base is subdivided into a Literature Service and a Spectra Service. Via the Literature Service, all datasheets (metadata), as well as many quantum yields and photochemical information, are available free of charge to all users. In addition, the Literature Service provides access to other related data such as the AutoChem software package (D. Lary, NASA-GSFC), Daily Solar Irradiances (J. Lean, NRL), MAS remote sensing data (G.K. Hartmann, MPAe), and Solar Ultraviolet Measurements of Emitted Radiation data (W. Curdt, MPS). In addition, the Spectra Service provides full access to the digital spectra data. However, access to the Spectra Service requires users to pay a very small utilization fee, which goes toward maintaining the Spectra Service and allows the Literature Service to be free. This arrangement is in accordance with the Open Access definitions and regulations of ICSU/CODATA.<sup>1</sup>

Every one to two years, the group that publishes the online database publishes a "UV/Vis<sup>+</sup> Spectra Data Base" CD-ROM. Most recently released in March 2010, the 7th edition<sup>2</sup> is a "mirror" of the online version.

## Outlook

The database is not static; additional spectra/data-sheets and related photochemical information (quantum yields, photolysis studies) are continually added. Recently, a digitization project was begun to capture spectral data that was made available only as graphical representations within a publication (especially from older publications), with no tabulated data. The aim of this project is to obtain the spectral information in digital tabulated form.

Science-SoftCon would like to create a CODATA Task Group on UV/Vis+ as a successor to the CODATA Working Group UV/Vis+ (active from 2004-2008). This group would support the future development of the UV/Vis+ Spectra Data Base. If you are interested in joining this initiative or if you have any questions/suggestions please contact us <Helpdesk@science-softcon.de>.

The support of the scientific community is crucial for this data compilation project. So we would like to encourage all members of the chemistry community to support this database.

### References

1. CSPR Assessment Panel on Scientific Data and Information (International Council for Science, 2004, *ICSU Report of the CSPR Assessment Panel on Data and Information*. ISBN 0-930357-60-4).
2. "UV/Vis+ Spectra Data Base," 7th edition, 2010, A. Noelle, G.K. Hartmann, A. Fahr, F.J. Martin-Torres, D. Lary, S. Le Calvé, P. Limao-Vieira, J.J. Orlando, F. Salama, A.-C. Vandaele, R.P. Wayne, C.Y.R. Wu and J. Orphal; ISBN 978-3-00-030970-0.



[www.uv-spectra.de](http://www.uv-spectra.de)

# Stamps International

See also [www.iupac.org/publications/ci/indexes/stamps.html](http://www.iupac.org/publications/ci/indexes/stamps.html)

## Gadolin and the Cradle of the Rare Earths

A seemingly ordinary mine in the small village of Ytterby on Resarö Island, off the coast of Sweden near Stockholm, played a remarkable role in the discovery of the rare earth elements and the development of the periodic table. It was there that Carl Axel Arrhenius, a Swedish artillery officer with a penchant for mineralogy, found in 1787 a strange black dense mineral while prospecting for feldspar. A sample of *ytterbite* eventually reached Johan Gadolin (1760-1852), a professor of chemistry at the University of Turku in Finland, who reported in 1794 the presence of a new "earth" in the unusual mineral from Ytterby. Although Gadolin had actually isolated yttrium oxide ( $Y_2O_3$ ), he is usually credited with the discovery of the element, which was subsequently obtained in fairly pure form by Friedrich Wöhler (1800-1882), better known of course for his synthesis of urea from ammonium cyanate. Three additional rare earth metals named after Ytterby (i.e., ytterbium, terbium,

and erbium) were isolated in the decades following Gadolin's seminal discovery, but it would be more than a century until the complete series of lanthanoid elements was uncovered.

The stamp illustrated herein was issued in Finland on 4 June 1960 to celebrate the bicentennial of Gadolin's birth and features his likeness based on a portrait made when he was 19 years old, around the time he left his native Turku to pursue advanced studies at the University of Uppsala. In addition to the discovery of yttrium, Gadolin authored several books, including the first chemistry textbook published in Scandinavia, and pioneered the direct involvement of students in experimental work as part of their education. Not surprisingly, he received many academic honors and is usually considered the founder of Finnish chemistry. The element gadolinium, compounds of which are the most popular magnetic resonance imaging (MRI) contrast agents used today, was named after him.



Written by Daniel Rabinovich <[drabinov@uncc.edu](mailto:drabinov@uncc.edu)>.



# Conference Call

## Solubility Phenomena

by Heinz Gamsjäger

The IUPAC-sponsored **14th International Symposium on Solubility Phenomena and Related Equilibrium Processes** was held 25–30 July 2010 at the Montanuniversität Leoben in Austria. The symposium included a workshop entitled “From Chemical Equilibrium to Process Modeling, Inclusion of Kinetics into Thermodynamic Reasoning.” The Subcommittee on Solubility & Equilibrium Data (SSED) of the IUPAC Analytical Chemistry Division met on 24 July, with Clara Magalhães of Portugal as the chair.

Ninety participants, including accompanying persons, from these 24 countries attended the annual meeting of SSED and the symposium: Algeria, Australia, Austria, Bulgaria, Canada, China, Croatia, Czech Republic, Finland, Germany, Great Britain, Iran, Ireland, Japan, Libya, Luxembourg, Nepal, Poland, Portugal, Russia, Serbia, Spain, Switzerland, and USA.

The opening ceremony was presided over by Wolfhard Wegscheider, the rector of Montanuniversität Leoben. Attendees were welcomed by IUPAC Representative Filomena Camões, vice president of the Analytical Chemistry Division, Heinz Gamsjäger, symposium co-chair, and Clara Magalhães.

Six plenary and four invited lectures highlighted the wide scientific spectrum covered by this conference, which successfully integrated the traditional theme of solubility in and between solids, liquids, and gases with process modelling and inclusion of kinetics into thermodynamic reasoning emphasized by the workshop. Filomena Camões (Portugal) delivered the opening plenary address on “Analytical Chemistry and Solubility Phenomena: Interdisciplinary Methods, Concepts, and Projects,” which described how progress in special topics of chemistry is dependant upon interdisciplinary approaches. Prominent examples she used were Svante Arrhenius’ ionic theory (1884) and Walther Nernst’s solubility study on silver acetate (1889) which led him to formulate a concept later named the “solubility product.”

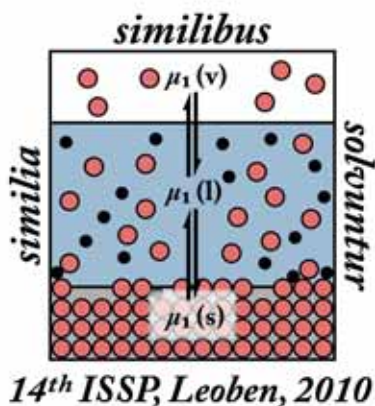
The first plenary lecture of the workshop was given by Klaus Hack, Germany, on “Computational Thermochemistry: A Tool for Daily Use in Industry and Academia,” which provided a comprehensive over-

view of the history, theory, and scientific, as well as industrial, applications of Gibbs energy minimization. Among the other keynote lectures were the following:

- recovery of pure magnesium oxide and other products by hydrometallurgical processing of ultramafic rock (M. Grill, Austria)
- applications of the constrained free energy minimization method (P. Koukkari, Finland), solubility phenomena of calcium sulphate and its hydrates in the hydrometallurgical process of heavy metals (D. Zeng, China)
- tidying up the environment: a journey from exponential curves to hydrodynamics in environmental dissolutions (V. W. Truesdale, Great Britain)

The authors of the keynote lectures and the authors of two excellent oral communications (“Stabilities of Sampleite and Lavendulan and the Formation of Sampleite in the Northparkes Copper-Gold Ore System” by M. Clissold, P. Leverett, and P.A. Williams, and “Melt Corrosion of Refractories in the Non-Ferrous Industry and the Electric Arc Furnace: A Thermochemical Approach” by V. Reiter and H. Harmuth) have been invited to submit their papers to *Pure and Applied Chemistry*.

Jitka Eysseltova and Stanislav Frančičkovič-Bilinski were each honored with the 2010 Franzosini awards, and each delivered a Franzosini lecture. For more details, see page 18 in



the Wire section.

Twenty eight short communications and thirty five posters were presented during afternoon and morning sessions. The oral and poster contributions ranged from solubility phenomena discussed on an interdisciplinary basis emphasizing industrial applications to thermodynamic peculiarities of liquid-liquid systems and solubility aspects of diseases and medical drugs. The delegates continued their scientific discussions over lunch in the university cafeteria, thus providing a scientifically stimulating and socially friendly atmosphere throughout the conference.

IUPAC poster prizes were given to Oleg I. Silyukov (Department of Chemistry, Saint Petersburg State University, Saint Petersburg, Russia) for his poster “Behavior of Solids with Layered Type of Structures in Aqueous Systems”; Alexey N. Manin (Institute of Solution Chemistry, Russian Academy of Sciences,

Ivanovo, Russia) for his poster “Solubility, Solvation Processes of Hydroxyl- and Carboxy- Acetanilides”; and Melanie Oestreich (Institute of Inorganic Chemistry, TU Bergakademie Freiberg, Germany) for her poster “Determination of Solubilities in the System  $\text{MgO-MgCl}_2\text{-H}_2\text{O}$  at 25°C, 40°C and 120°C.”

Sponsorship was provided by Das Land Steiermark, the Stadtgemeinde Leoben, the RH I AG, the Gesellschaft von Absolventen und Freunden der Montanuniversität, and the Austrian Chemical Society GÖCH. IUPAC generously granted financial support for six young scientists from Eastern European Countries to attend, and the Organizing Committee waived their registration fees. The participation of a delegate from Nepal was financially supported by the Lion's Club Leoben. The symposium was chaired by Helmut Antrekowitsch and Heinz Gamsjäger, with assistance from Karin Schober and Bettina Hörmann, conference secretaries, and Harald Harmuth and Johannes Schenk, members of the local Organizing Committee.

Participants enjoyed a half-day excursion to Vordernberg and its blast furnace and finery museums. Herbert Hiebler and Gerhard Sperl guided the English-speaking visitors and A. Lampl guided the German-speaking visitors. At the Gasthof “Schwarzer Adler” a typical Styrian “Brettljause” (afternoon tea on a wooden plate) was served. Accompanying persons enjoyed guided tours to the cities of Leoben and Graz, and a tour through the Enns Valley.

The 15th ISSP will be held in July 2012 in Xining, China.

Heinz Gamsjäger <gamsjaeg@mu-leoben.at> was co-chair of the symposium; he is a professor in the Department of Physical Chemistry at Montanuniversitaet Leoben in Austria. He is a long-time member of the SSED. Input to this report was also provided by Clara Magalhães.



*Participants of the 9th Annual Meeting of the IUPAC Subcommittee on Solubility and Equilibrium Data, which met the day before the 14th ISSP.*

## Research and Education in the Middle East

*by Stanley Langer*

Scientists from 14 Middle East countries attended the Malta-IV conference on “**Frontiers of Chemical Science: Research and Education in the Middle East**” in Amman, Jordan, from 14–19 November 2009. This was the fourth in the biennial series of meetings known as the Malta conferences, designed to forge stronger relationships with, and establish collaborations between, scientists in the region. As with previous conferences, the intention of the organizers was to draw the attention of national governments to the notion that improving scientific cooperation could act as a spur to sustainable growth and in promoting peace and political reconciliation in a volatile region.

This was the first time that the conference had been held in a Middle East country, the previous three having taken place in Malta (2003, 2005) and Turkey (2007). It was attended by almost 80 invited people, with many more women than at previous conferences. Delegates came from Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, the Palestinian Authority, Qatar, Saudi Arabia, Turkey, and the United Arab Emirates. The conference was cosponsored by UNESCO, IUPAC, the Royal Society of Chemistry, the American Chemical Society, and the Gesellschaft Deutscher Chemiker.

As chair of the Organizing Committee, Zafra Lerman opened the meeting by welcoming HRH Prince Hassan bin Talal of Jordan, well-known internationally as a voice for global sustainability, reconciliation, and inter-religious understanding. His opening remarks reflected his ongoing interest in economic and social governance, and water and energy issues in the region. He noted that science cannot be project driven and that science for knowledge should mean science for citizenship, leadership, education, and inclusion. Critical thinking skills are required to address improvements in the lives of the people in the region concerning climate change, food, health, and sustainable development. He stressed the need to address many unpopular truths and the importance of raising awareness of these issues, charging attendees to develop the consciousness of science referred to in Roger Schank's thesis on what it means to have an educated mind in the 21st century. His presentation was extremely well received and he stayed on to talk to students during the morning break. Prince Hassan also expressed an interest in working with the organizers in the future,

## Conference Call

especially on water issues. He was very interested in the exchanges that Stanley Langer, one of the organizers' vice chairs, has had with Tony Blair's office following the resolution on water in the Gaza strip that the Malta-III conference had approved in 2007.

The conference was structured on a series of thematic workshops, keynote talks from Nobel Laureates, visits, and some social activity, all designed to encourage collaboration between individual scientists from countries in the region. A pre-conference doctoral student workshop on "Communicating the Chemical Sciences" was generously supported by several German institutions.

In addition, an IUPAC Working Group on Regional Water Quality Assessment in Jordan, the Palestinian Authority, and Israel also met during the conference and reported its findings at a subsequent session (see below). The conference concluded with a visit to the SESAME synchrotron facility outside Amman, an international center for research and advanced technology under the auspices of UNESCO.

On this occasion, there were six thematic workshops that dealt with sustainable air and water quality in the Middle East, nanoscience and technology, alternative energy sources, medicinal chemistry and natural products, and two science education workshops covering innovation and chemistry safety and security. Each was co-chaired by Middle East and Western contributors.

The talks given by the Nobel Laureates have always been regarded as crucial to the success of these conferences, providing the cement that binds the delegates together and it is a reflection of the esteem in which these conferences are held that laureates are willing to take so much time out of their busy lives to stay for the entire period of the meeting. On this occasion, the laureates were Claude Cohen-Tannoudji (École Normale Supérieure, Paris), Richard Ernst (ETH, Zurich), Robert Grubbs (Caltech, Pasadena), Walter Kohn (University of California at Santa Barbara), and Yuan Tseh Lee (Academia Sinica, Taiwan).

In "Advances in Atomic Physics: An Overview," Claude Cohen-Tannoudji presented a high-powered erudition on an extremely complex and difficult subject that he made relatively easy to understand.

Richard Ernst's talk on "Academic Responsibility and Our Future" presented more philosophical arguments on ethics and altruism, and brought in concepts voiced by Nelson Mandela, Mahatma Gandhi, and Karl Popper. He professed an obligation on society for global responsibility based on altruism rather than personal profit and the need to be willing to give up a degree of freedom to collaborate towards a responsible market economy. Yuan Tseh Lee's superb talk on "Dynamics of

Molecular Dissociation by Molecular Beam Techniques" also made a complicated subject appear understandable due to the speaker's ability to promote his subject in a clear and authoritative manner.

Bob Grubbs' lecture on "Catalysis for Green Chemistry and the Synthesis of Nanomaterials" brought the focus back to more traditional science and was a direct contribution to the workshop on this topic. Walter Kohn's presentation on "A World Predominantly Powered by Solar and Wind Energy" indicated the enormous problems for the future of the planet if alternative energy sources are not embraced urgently. He drew upon the *Stern Report on Energy* and discussed oil

and natural gas as well as prospects for the nuclear industry.

The organization of the conference allowed considerable time for informal discussions amongst the participants. Most morning and afternoon sessions began with one of the Nobel Laureate presentations followed by discussion and then one or more workshops. These were scheduled so that each attendee had an opportunity, so far as was practicable, to participate in each session. As at previous conferences, each workshop developed a set of statements and recommendations for future action that were presented in a plenary session on the last day.

The workshop on Alternative Energy Sources featured two working sessions consisting of oral presentations and extensive discussions on relevant topics, some of which were updates of the work presented at the previous conference in Istanbul. Two major ideas were considered appropriate for continuing collaboration: a student school/workshop and an Internet communication channel. The workshop, the theme of which would be "Towards Solar Paint: Research to Making a



*A poster session at the Malta conference.*



## Conference Call

Dream into Reality” would probably be held in 2011. The idea behind an Internet communication channel is to allow contact between scientists and their students on issues relevant for alternative research and teaching. To this end, it was suggested that a closed website could be established that might, for example, provide quantitative, reviewed information on energy information needed by students for experiments and projects, details on suppliers, and open scientific literature that may not otherwise be available.

The workshop on Nanoscience and Technology dealt with basic concepts, sensors and bio-applications, and hybrid organic/inorganic structures. Organizers plan to promote greater student participation at future Malta conferences and a workshop for about 40 students was planned for Turkey in July 2011. It is anticipated that this workshop will deal with the topics discussed in Amman as well as with energy-related applications.

The workshop on Medicinal Chemistry and Natural Products identified a need for focused multidisciplinary programs (e.g., in pharmacology, toxicology, and clinical chemistry) and for further practical postgraduate training, especially for female students. There also needs to be an expansion of web-based resources such as a directory of laboratory equipment and expertise, together with web links of databases and software that are freely available.

The first of the Chemical Education workshops dealt with innovation, with participants asked to identify challenges facing chemical education in the Middle East during the next decade. Numerous issues were identified, including improving university and pre-university education in relation to the development of the region and beyond, reversing the negative response of students towards chemistry and the bad image of the subject presented by the media, and promoting environmental issues, alternative energy sources, and water for irrigation.

The initial presentations set the theme for a discussion on the role of entertainment in teaching science, with the latter talks initiating considerable discussion

regarding the contrast between the linear and systematic approaches to teaching organic chemistry. Several ideas for future action emerged from these discussions, the first being the establishment of a Malta conference science education website to share curricular materials developed by teachers in the region.

Workshop participants put forth a proposal, incorporating aspects of both the above suggestions, to hold a series of workshops for teachers in several Middle East countries on developing teaching materials on alternative energy concepts. It was anticipated that such workshops would serve as models for adoption in other countries. It was noted that there was no regular course or degree in the region that dealt with risk management. It was suggested that a task force be established to develop short courses and/or training sessions in this area and also to develop the criteria and requirements for a degree program in this important subject.

The second of the chemical education workshops dealt with chemistry safety and security, the main topics for discussion being safety, waste management, and risk assessment in the laboratory; issues surrounding the subject of chemical weapons; the disposal of laboratory waste; the promotion of a laboratory inspection tour during the next conference; and the development of a curriculum on chemical risk management. It was also suggested that the Malta conference could act as a pool for information on chemical safety and security.

The workshop on Sustainable Air and Water Quality identified two specific areas for possible future collaborative research projects. The first would deal with the environmental impact of desalination schemes. The forecast of increasingly intensive desalination activity to provide additional fresh water for the region may threaten the environmental quality of coastal land and marine ecosystems, as well

as degrading marine water quality, making desalination activities more difficult and expensive. The outcome of such a project could include guidelines for the sustainable operation of desalination technology. The second project would be participation in regional air-



*Conference Chair Zafra Lerman (left), Prince Hassan bin Talal of Jordan, and Stanley Langer, conference vice chair.*

## Conference Call

quality studies centered on the eastern Mediterranean. These studies would require extensive data production on both primary air pollution emissions from the cities, industries, and agricultural activities in the region as well as ambient air-quality data across the region. The aim of the project would be to help coordinate the collection of regional emissions and air-quality data for use in regional air-quality model inputs and evaluation studies.

Closely allied to the activities of the air and water-quality workshop was the working group on Regional Water Quality Assessment in Jordan, the Palestinian Authority, and Israel referred to earlier in this report (see IUPAC project 2008-003-3-600; [www.iupac.org/web/ins/2008-003-3-600](http://www.iupac.org/web/ins/2008-003-3-600)). Participants recommended that the initial study area be expanded to the north to include Lebanon and Syria, which share many of the same water sources. It was also agreed that the results of the initial study be widely disseminated and used to motivate further studies to include Egypt, Libya, and Sudan to the west, and Iraq, Kuwait, Saudi Arabia, and the Gulf States to the east. A full report on this project can be found in the March-April 2010 *CJ*, p. 22.

Conferees presented about 30 oral papers during the workshop sessions, as well as 20 contributions to well-attended and highly stimulating poster sessions that included contributions on water, energy, bioremediation, desert crops, air quality, virtual screening in drug discovery, and science education innovation. These provided participants with an overview of work in the region related to scientific and management strategies. Private discussions will undoubtedly lead to collaborations that would be extremely difficult, if not impossible, to establish under normal circumstances. It was evident that all those present made a contribution to promoting the chemical sciences for peace, diversity, and human rights by building friendship, trust, tolerance, and cooperation in a very turbulent part of the world.

It is well worth recording that the organization of Malta-IV required several additional obstacles to be overcome compared to previous conferences. These included, for example, problems obtaining visas for some participants, and only the strong relationships forged in those earlier meetings enabled such problems to be solved. Without these relationships, an already difficult conference organization would have made matters even more burdensome. The numerous positive comments from participants at the end of the meeting more than justified the efforts made to ensure that the conference took place.

UNESCO will host Malta-V in Paris as a contribution towards the International Year of Chemistry in 2011.

Stanley Langer <[stanley1910@yahoo.co.uk](mailto:stanley1910@yahoo.co.uk)> was vice chair of the organizing committee for Malta-IV.

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## Another Organic Synthesis Boost

by Leiv K. Sydnes

The **18th International Conference of Organic Synthesis** (ICOS-18) was held in Bergen, Norway, from 1-6 August 2010. The meeting was attended by almost 500 delegates from 48 countries, which is quite decent considering the fact that a large number of people who intended to participate, had registered and even paid, had to withdraw because their employer, in most cases university departments, cut the funding. The academic predominance was therefore considerably lower on this occasion than what has usually been the case at previous ICOS meetings, and it is quite noteworthy that more than 75 percent of participants from countries like Denmark, Sweden, and Switzerland came from chemical industry.

The main ingredients of the meeting, following the ICOS tradition, were lectures, including the Thieme-IUPAC Prize Lecture, poster sessions, exhibitions, and a Wednesday afternoon conference trip. Due to very valuable input from members of the International Advisory Board, plenary and invited lectures were delivered by chemists from 22 different countries from all around the world. The talks covered most aspects of modern organic synthesis, from new delicate methodologies based on mechanistic understanding, via greatly improved synthesis technologies and exciting total syntheses, to the application of organic synthesis to meet challenges in bioorganic chemistry and the life sci-



*Professor Phil S. Baran, the winner of the Thieme-IUPAC Prize in Synthetic Organic Chemistry, gave a wonderful lecture about the ideal synthesis. (Photo: Adnan Budnjo, University of Bergen).*

## Conference Call

ences. A synthesis of most of these aspects was presented by Phil S. Baran in his splendid Prize Lecture entitled "Aiming for the Ideal Synthesis," which in a powerful way illustrated his dedication "to the study of fundamental organic chemistry through the auspices of natural product total synthesis."

There were two new features at this meeting. One was a section of five parallel sessions with short talks given mainly by young chemists. Given the potential for difficulties with the timing of talks, the speakers' showed exemplary discipline, allowing the chairs to be lenient in a firm fashion. Collectively the short presentations showed that a wide range of new and brave ideas are being investigated by these young colleagues, indicating that organic synthesis is heading towards a bright future.

The second new feature was the awarding of Thieme-IUPAC Poster Prizes, five in total, to the best posters presented at the conference as judged by an international committee of outstanding synthetic chemists. There were a large number of excellent posters, so the committee had a difficult job, but a unanimous decision was reached and the prizes, a one-year subscription to *Synfact* (from Thieme) and Barry Trost's book on stereocontrolled organic synthesis (from IUPAC), were awarded to Marianne L. Rosenberg from Norway ("Highly *cis*-Selective Rh(I) Catalyzed Cyclopropanation Reactions"), Fabian Pfrengle from Germany ("Synthesis of C-Branched Amino Sugars via Lewis Acid Promoted Rearrangement of 1,2-Oxazines"), Tsz Ying Yuen from New Zealand ("Synthetic Studies towards the Marine Fungal Metabolite Paecilospirone"), Fumika Yakushiji from Japan ("First Total Syntheses of Thiomarinols A and B"), and Sonia Paz from Spain ("Synthesis of Tetrahydrobenzothiophene Derivatives from a Stable Ozonide as Inhibitors of an Essential Enzyme in *Helicobacter pylori* Survival"). These were certainly excellent picks as judged from the big applause the winners received from the audience.

A meeting like this would of course never have taken place without sponsors. Financial support from various sources, particularly the Research Council of Norway, is highly appreciated. But one sponsor has to be mentioned in particular, Georg Thieme Verlag. Thieme's dedication to the ICOS series of meetings has been consistent and outstanding ever since 1992.



*Thieme-IUPAC Poster Prize winners surrounded by officials (from left): Sonia Paz (Spain), Julia Stötzner (Germany, Thieme Verlag), a fellow student receiving the prize for Tsz Ying Yuen (New Zealand), Leiv K. Sydnes (Norway, ICOS-18 chair), Fabian Pfrengle (Germany), David StC. Black (Australia, IUPAC representative), and Marianne L. Rosenberg (Norway). Fumika Yakushiji (Japan) was not present during the ceremony. (Photo: Adnan Budnjo, University of Bergen).*

ICOS-18 certainly nourished organic synthetic chemists' professional development through lectures, poster presentations, and discussions dealing with the cutting-edge advances in organic synthesis. There are many that are looking forward to the next meal, to be served when ICOS-19 opens in Melbourne, Australia, on 1 July 2012, less than two years from now ([www.icos19.com](http://www.icos19.com)).

Leiv K. Sydnes <[leiv.sydnes@kj.uib.no](mailto:leiv.sydnes@kj.uib.no)> is a professor of organic chemistry at the University of Bergen, Norway, and is currently chair of the CHEMRAWN Committee in IUPAC. He was IUPAC President for 2004–2005.

## Erratum

The caption on page 33 of the July-August 2010 issue incorrectly identifies the individual in the middle of the photo who is accepting the Paul J. Flory Medal 2010. The photo is of Hans Wolfgang Spiess (left), co-recipient of the medal, and not Andrezej Galeski (right), who was also a co-recipient of the medal.





# Where 2B & Y

## Water Quality

IUPAC Congress, Puerto Rico  
30 July–7 August 2011

Without water, life on Earth would not be possible. Our earth is composed largely of water; however, only 0.06% is easily accessible. Here are some interesting facts highlighted by Dr. Sut Ahuja in the Global Water Sustainability Symposium at a recent American Chemical Society meeting in San Francisco.

- Over 40 countries in the world suffer from a water deficit.
- An estimated 1.2 billion people drink unclean water.
- The UN estimates that 2.7 billion people will face water shortages by 2025.
- Water-related diseases kill 5 million people, mostly children, annually.

For these reasons, one of the main themes of the International Year of Chemistry 2011 is “Chemistry

meets the global challenges of safe water.” In order to highlight chemistry’s role in water quality, a special symposium on the **Sustainability of Water Quality** is being organized at the IUPAC Congress in Puerto Rico, which will take place 30 July to 7 August 2011. The symposium will cover the following topics:

- global water-quality issues
- monitoring contaminants in water
- remediation of various contaminants

Notable speakers from various parts of the world are being invited to address these issues. Participation of younger researchers and students will be actively sought also. Financial support of USD 250 will be offered to each of eight younger scientists to encourage their participation. For further information, contact Sut Ahuja <Sutahuja@atmc.net>.

 [www.iupac.org/web/act/San\\_Juan\\_2011-07-30aa](http://www.iupac.org/web/act/San_Juan_2011-07-30aa)

## Frontiers of Polymers and Advanced Materials

22–27 May 2011  
Pretoria, South Africa

ICFPAM, the **International Conference on Frontiers of Polymers and Advanced Materials** series, has a unique scope involving a blend of science, technology, and business. The conferences are truly multidisciplinary and global, with scientists, engineers, industrialists, and top-level business and management representatives participating and discussing the status of advanced materials, new technologies, and industrial and business opportunities. The 11th ICFPAM conference will include plenary talks, invited lectures, contributed talks, tutorials, and poster sessions as well as an industrial exhibition.

In support of the International Year of Chemistry 2011, the 11th ICFPAM conference theme is “Celebrate the Contribution of Chemistry as an Enabling Science for Polymers and Advanced Materials.” The event also

will incorporate Biomaterials Africa 2011. Conference topics include the following:

- Tutorial lectures: New Materials and Advanced Manufacturing Technologies
- Advanced Nanoscale and Nanostructured Materials
- Environmentally Friendly Materials: Natural Fiber Composites and Polymer Recycling
- Advanced Materials and Nanostructures in Electrochemistry: Energy Storage and Conversion, Electro Catalysis, and Electro Analysis
- Synthesis and Chemistry of Polymer Nanocomposites
- Laser Processing & Photonics: Advanced materials and composites for photonics
- Fluorochemical Materials, Engineering, and Technologies
- Biomaterials
- Carbon-Based Materials: Graphene, Carbon Nanotubes, Diamonds, and Graphite

See **Mark Your Calendar** on page 32 for contact information.

 [www.icfpam.co.za](http://www.icfpam.co.za)

## Molecular Mobility and Order

6-10 June 2011

St. Petersburg, Russia

The **7th International Symposium on "Molecular Mobility and Order in Polymer Systems"** will be held in St. Petersburg, Russia, 6-10 of June 2011. The main aim of the symposium is to discuss the modern problems of physics and chemistry of complex stimuli-responsive polymer systems with nanostructure organization and "soft" order preserving a pronounced molecular mobility. Symposium topics include linear macromolecules; branched, star polymers and dendrimers in solutions; copolymers and polymer blends, polymer

brushes; polymer micelles and complexes of different topologies; polymer networks; and liquid crystalline polymer systems.

Both experimental data and results of theory and simulation will be presented. The symposium program will include about 20 plenary lectures, oral communications, and poster sections. The deadline for submitting abstracts is 21 March 2011.

See **Mark Your Calendar** on page 32 for contact information.

 [www.macro.ru/symp7](http://www.macro.ru/symp7)

## POLYCHAR

20-24 March 2011

Katmandu, Nepal

Polymers have invaded almost all areas of present-day technology and the basic sciences, ranging from drug-delivery systems, biocompatibility, protein design and synthesis, to high-tech applications such as the design of electronic devices, nanomaterials, conduction, and photosensitivity. Polymers are playing a leading role in the advancement of nanotechnology today.

In this context, the **POLYCHAR World Forum on Advanced Materials** will take place in Katmandu, Nepal, from 20-24 March 2011. The focus of the conference is on properties and characterization on the one hand, and synthesis, processing, and manufacturing on the other, with emphasis on the performance of all classes of polymers. All classes of materials, including thermoplastics, thermosets, alloys, heterogeneous

and molecular composites, biomaterials, hybrids, and nanohybrids are included.

The conference will bring together scientists and technologists to discuss the emerging areas of proteomics, nucleonics, tissue engineering, drug delivery, and light-emitting polymers. Specific topics to be covered include Predictive Methods; Synthesis; Nanomaterials and Smart Materials; Mechanical Properties and Performance; Dielectrical and Electrical Properties; Surfaces, Interfaces, and Tribology; Rheology, Solutions, and Processing; Biomaterials and Tissue Engineering; Natural and Biodegradable Materials and Recycling; and Characterization and Structure-Properties Relationships.

See **Mark Your Calendar** on page 32 for contact information.

 <http://polychar19-nepal.com>

## Asian Chemical Congress

5-8 September 2011

Bangkok, Thailand

The **14th Asian Chemical Congress (14ACC)** will take place 5-8 September 2011 in Bangkok, Thailand, under the auspices of the Federation of Asian Chemical Societies. Over the past 26 years, ACC has grown to be one of the major international conferences in chemistry. The 14ACC continues the tradition of high-quality, broad international participation in all areas of pure and applied chemistry.

The 14ACC will provide unprecedented opportunities for participants to expand their scientific horizons.



The theme of 14ACC, "Contemporary Chemistry for Sustainability and Economic Sufficiency," is particularly appropriate as chemistry and the chemical sciences are increasingly being utilized to address global environmental, health, and energy challenges. The scientific program will include all traditional areas of chemistry and also will offer outstanding content uniquely characterized by six leading universities in Thailand.

See **Mark Your Calendar** on page 33 for contact information.

 [www.14acc.org](http://www.14acc.org)

# Mark Your Calendar

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

2011

 IUPAC poster prizes to be awarded

**16–21 January 2011 • African Chemical Societies • Johannesburg, South Africa**

*40th South African Chemical Society Convention & 3rd Federation of African Chemical Societies Meeting*

Prof. James Darkwa, University of Johannesburg, Department of Chemistry, Auckland Park 2006, South Africa  
Tel.: +27 11 559 2838, Fax: +27 11 489 2819, E-mail: [jdarkwa@uj.ac.za](mailto:jdarkwa@uj.ac.za)

**13–16 February 2011 • Polymers • Coffs Harbour, Australia**

*32nd Australasian Polymer Symposium*

Prof. Martina Stenzel, University of New South Wales, Centre for Advanced Macromolecular Design, Sydney, NSW 2052, Australia, Tel.: +61 2 9385 6250, Fax: +61 2 9385 4344

**21–24 February 2011 • Chemistry Education in Ethiopia • Addis Ababa, Ethiopia** 

*Chemistry Education in Ethiopia: Today and Tomorrow*

Dr. Temechegn Engida, President, Federation of African Societies of Chemistry, UNESCO Institute for Capacity Building in Africa, P.O. Box 2305, Addis Ababa, Ethiopia  
Tel.: +251 91 124 4704, Fax: +251 91 124 4704, E-mail: [temechegne@faschem.org](mailto:temechegne@faschem.org)

**6–9 March 2011 • Heterocyclic and Synthetic Chemistry • Gainesville, Florida, USA**

*12th Florida Heterocyclic and Synthetic Conference*

Prof. Alan R. Katritzky, University of Florida, Department of Chemistry, Gainesville, Florida 32611-7200, Tel.: +1 352 392 0554, Fax: +1 352 392 9199, E-mail: [katritzky@chem.ufl.edu](mailto:katritzky@chem.ufl.edu)

**20–24 March 2011 • Polymer Characterization • Katmandu, Nepal** 

*19th International Conference on Polymer Characterization: World Forum on Advanced Materials*

Prof. Rameshwar Adhikari, Tribhuvan University, Department of Chemistry, P.O. Box 24411, Katmandu, Nepal  
Tel.: +977 1433 2034, Fax: +977 1433 390 927, E-mail: [nepalpolymer@yahoo.com](mailto:nepalpolymer@yahoo.com)

**26–28 March 2011 • Materials Education • Pune, India**

*International Symposium on Materials Education*

Prof. Ram Prakash Singh, Indian Institute of Science Education & Research, 900 NCL Innovation Park, Dr. Homi Bhabha Road, Pune 411 008, India  
Tel.: +91 20 259 08 181, Fax: +91 20 259 08 022, E-mail: [singh.prakash.ram@gmail.com](mailto:singh.prakash.ram@gmail.com)

**26–29 April 2011 • Functional Polymeric Materials and Composites • Stellenbosch, South Africa** 

*11th UNESCO/IUPAC Workshop and Conference on Functional Polymeric Materials and Composites*

Prof. Harald Pasch, University of Stellenbosch, Department of Chemical and Physical Science, Private Bag X1, Matieland 7602, South Africa  
Tel.: +27 21 12 808 3173, Fax: +27 21 12 808 4967, E-mail: [hpasch@sun.ac.za](mailto:hpasch@sun.ac.za)

**5–6 May 2011 • Clinical Laboratory and In Vitro Diagnostic Industry • Barcelona, Spain** 

*6th European Symposium on Clinical Laboratory and In Vitro Diagnostic Industry*

Dr. Xavier Fuentes-Arderiu, Hospital L'University de Bellvitge, L'Hospitlet de Llobregat, E-08907 Barcelona, Spain  
Tel.: +34 93 260 76 44, Fax: +34 93 260 75 46, E-mail: [xfa@csub.scs.es](mailto:xfa@csub.scs.es)

**22–26 May 2011 • Analytical Sciences • Kyoto, Japan**

*IUPAC International Congress on Analytical Sciences 2011 (ICAS-2011)*

Prof. Koji Otsuka, Department of Material Chemistry, Graduate School of Engineering, Kyoto University  
Katsura, Nishikyo-ku, Kyoto 615-8510, Japan  
Tel.: +81 75-383-2447, Fax: +81 75-383-2450, E-mail: [otsuka@anchem.mc.kyoto-u.ac.jp](mailto:otsuka@anchem.mc.kyoto-u.ac.jp)

**23–27 May 2011 • Advanced Materials • Pretoria, South Africa**

*11th International Conference on Frontiers of Polymers and Advanced Materials*

Prof. Walter W. Focke, University of Pretoria, Department of Chemical Engineering, Menlo Park, Pretoria 0102, South Africa, Tel.: +27 21 12 420 3728, Fax: +27 21 12 420 2516, E-mail: [walter.focke@up.ac.za](mailto:walter.focke@up.ac.za)

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

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

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

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

*4th International IUPAC Symposium on Trace Elements in Food*

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

**24 June 2011 • Applied Thermodynamics • St. Petersburg, Russia**

*25th European Symposium on Applied Thermodynamics*

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

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

*XIXth International Symposium on Photophysics and Photochemistry of Coordination Compounds*

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

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

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

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

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

*International Symposium on Ionic Polymerization*

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

**10-14 July 2011 • Macromolecules • Prague, Czech Republic** 

*75th Prague Meeting on Macromolecules: Conducting Polymers*

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

**24-29 July 2011 • Novel Aromatic Compounds • Eugene, Oregon, USA** 

*14th International Symposium on Novel Aromatic Compounds*

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

**24-28 July 2011 • Organic Synthesis • Shanghai, China** 

*16th International Conference on Organometallic Chemistry Directed Toward Organic Synthesis*

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

**30 July-7 August 2011 • 43rd IUPAC Congress • San Juan, Puerto Rico** 

*Chemistry Bridging Innovation Among the Americas and the World*

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



**30 July-3 August 2011 • Philosophy of Chemistry • San Juan, Puerto Rico**

*Symposium of the International Society for the Philosophy of Chemistry*

Prof. Klaus Ruthenberg, Coburg University of Applied Sciences, D-96406 Coburg, Germany, Tel.: +49 9561 317 349, Fax: +49 9561 317 349, E-mail: ruthenberg@hs-coburg.de

**30 July-5 August 2011 • Heterocyclic Chemistry • Glasgow, UK** 

*23rd International Conference on Heterocyclic Chemistry*

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

**28 August-2 September 2011 • Solution Chemistry • La Grande Motte, France** 

*32nd International Conference on Solution Chemistry*

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



## Conference Call

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

*Colloquium Spectroscopicum Internationale XXXVII*

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

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

*4th European Conference on Chemistry for Life Sciences*

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

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

*14th Asian Chemical Congress*

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

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

*XIVth International Meeting on Boron Chemistry*

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

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

*Euroanalysis XVI*

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

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

*3rd International Nuclear Chemistry Congress*

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

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

*XIXth Mendeleev Congress on General and Applied Chemistry*

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

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

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

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

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

*7th International Symposium on Novel Materials and their Synthesis*

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

I U P A C



Advancing Worldwide  
Chemistry



### IUPAC Prize for Young Chemists

*Supporting the future of chemistry*

The encouragement of young research scientists is critical to the future of chemistry. With a prize of USD 1000 and paid travel to the next IUPAC Congress, the IUPAC Prize for Young Chemists encourages young chemical scientists at the beginning of their careers. The prize is based on graduate work and is given for the most outstanding Ph.D. thesis in the general area of the chemical sciences, as described in a 1000-word essay.

**Call for Nominations:** Deadline is 1 February 2011.

For more information, visit [www.IUPAC.org/news/prize.html](http://www.IUPAC.org/news/prize.html) or contact the Secretariat by e-mail at [secretariat@iupac.org](mailto:secretariat@iupac.org) or by fax at +1 919 485 8706.

**Bookworm**

- An Ontology on Property for Physical, Chemical, and Biological Systems, 24(3)  
 Antarctic Climate Change and the Environment, 25(2)  
 Concepts in Toxicology, 25(1)  
 Japanese Versions of the IUPAC Red Book and Green Book Available, 28(4)  
 Nanotechnology for the Energy Challenge, reviewed by Alan Smith, 28(4)  
 Nomenclature of Inorganic Chemistry—Bulgarian edition, 24(3)  
 Polymer Colloids: From Design to Biomedical Industrial Applications, 26(1)  
 Science, Technology, and Innovation for Socioeconomic Development, 22(3)  
 The Future of the Chemical Industry, reviewed by Michael J. Droscher, 29(4)

**Conference Call**

- Advanced Polymeric Materials, Werner Mormann and Michael Hess, 33(4)  
 Another Organic Synthesis Boost, Leiv K. Sydnes, 28(6)  
 Crop Protection Chemistry in Latin America, Kenneth Racke, 26(5)  
 Electrochemistry, Vesna Miskovic-Stankovic, 31(5)  
 Environmental Best Practices, Maciej Góra, 32(4)  
 Frontiers in Polymer Science, Stanislaw Penczek, 27(3)  
 Heteroatom Chemistry, Enrique Aguilar, 26(3)  
 Heterocyclic Chemistry, Lisa McElwee-White, 35(4)  
 High Temperature Materials Chemistry, Alexandra Navrotsky, 27(2)  
 IUPAC-ACS Collaboration Summit, Katherine Bowman and Francisco Gomez, 30(4)  
 Mendeleev's 175 Anniversary, Oleg M. Nefedov, Natalia P. Tarasova, and Stepan N. Kalmykov, 29(1)  
 Novel Aromatic Compounds, Bruno Bernet, 28(1)  
 Novel Materials, Yuping Wu, 29(2)  
 Research and Education in the Middle East, Stanley Langer, 25(6)  
 Self-Healing Materials, Solar Olugebefola, 27(1)  
 Soil Science, Jianming Xu, 28(2)  
 Solubility Phenomena, Heinz Gamsjäger, 24(6)  
 think poly. Frank Wiesbrock and Franz Stelzer, 27(1)

**Features**

- 50th Anniversary of the SI—The International System of Units, Ian M. Mills, 3(6)  
 A Century of pH Measurement, Maria Filomena Camões, 3(2)  
 A Fixed Avogadro Constant or a Fixed Carbon-12 Molar Mass: Which One to Choose? Yves Jeannin, 8(1)

- A Philatelic Tribute to the SI, Daniel Rabinovich, 4(6)  
 A Place in the Salt!—Learning and Playing with Salt in Aveiro, Portugal, Maria Clara F. Magalhães, Cristina Sampaio and Paulo Trincão, 6(6)  
 Analogue-based Drug Discovery, Janos Fischer and C. Robin Ganellin, 12(4)  
 Chemistry 2.0: Creating Online Communities, Javier Garcia-Martinez, 4(4)  
 Chemistry in Tunisia: The Tunisian Chemical Society—A Necessity for a Developing Country, M. Jemal, 8(3)  
 Closing Comments from Ian M. Mills, 10(1)  
 Improving Analytical Chemistry in South Africa: Report from a Workshop, 8(4)  
 IUPAC as a Science NGO, Colin Humphries, 8(2)  
 IUPAC in Glasgow, Scotland: Division Roundups, Part II, 15(1)  
 IUPAC in Glasgow, Scotland: Division Roundups, Part III, 12(2)  
 Marvels & Ciphers: A New Exhibit at Chemical Heritage Foundation Links Alchemy and Quantum Chemistry, CHF Staff, 4(3)  
 Perspectives on Chemistry and Global Climate Change, Fulvio Zecchini and Pietro Tundo, 8(4)  
 Reassessing the Role of Analytical Chemistry, Nelson Torto, 8(4)  
 Teaching about the Role of Green Chemistry, Fulvio Zecchini et al., 8(4)  
 The Impact of Depleted  ${}^6\text{Li}$  on the Standard Atomic Weight of Lithium, Norman E. Holden, 12(1)  
 The Language of Chemistry: A New Challenge for Chemistry Education, Keith Kelly, 4(4)  
 The Myth of Insufficient Information, Terry Clayton, 4(1)  
 Thriving for Unity in Chemistry: The First International Gathering of Chemists, Michael W. Mönnich, 10(6)  
 Visualizing and Understanding the Science of Climate Change, Peter Mahaffy, 11(4)  
 Water—A Chemical Solution: A Global Experiment for the International Year of Chemistry, Tony Wright and Javier Garcia Martinez, 14(4)  
 What is a Mole? Old Concepts and New, Jack Lorimer, 6(1)  
 Xperimania—From Molecules to Materials: An Industry-Academic Partnership, Ann Whent, 10(3)

**From the Editor**

- C is for Communication (2)  
 Challenges . . . (1)  
 Make It Your C (4)  
 Remember Why We Meet! (6)

## Index for 2010

The Conference Season Beckons (3)  
The First-Ever Miniupac Awards (5)

### Internet Connection

ChemShow, 24(1)  
Element podcast, 24(1)  
UV/Vis+ Spectra Database, Andreas Noelle, Gerd K. Hartmann, and F. Javier Martin-Torres, 22(6)

### IUPAC Wire

2010 Thieme-IUPAC Prize Awarded to Phil S. Baran, 14(3)  
2011 IUPAC Prize for Young Chemists Announced, 16(6)  
A 60-Year-Old Journal Reborn, 20(5)  
Arun K. Ghosh is Awarded the 2010 IUPAC-Richter Prize, 14(3)  
Chemical Heritage Foundation Fellowships, 20(1)  
CrossRef Invites You to its Labs, 21(1)  
David Moore Named 2009 LANL Fellow, 17(2)  
Denis Hamilton to Receive the First International Award for Advances in Crop Protection Chemistry, 18(4)  
Han E.H. Meijer Garners 2010 DSM Performance Materials Award, 14(3)  
Happy Birthday Copernicus, 16(2)  
In Memoriam: Ari Horvath, 16(3)  
In Memoriam: Gerard Rieck, 22(5)  
In Memoriam: Pan Ming Huang (1934–2009), Antonio Violante, 22(1)  
In Memoriam: Itaru Mita, 19(2)  
InChI 1.03 Released, 18(5)  
International Year of Biodiversity, 19(2)  
Inviting Young Chemists to the 43rd IUPAC Congress in Puerto Rico, 19(6)  
IUPAC and InChI Trust Agree Upon Conditions for Collaboration, 16(4)  
IUPAC Announces Winners of the 2010 IUPAC Prizes for Young Chemists, 16(4)  
IUPAC Pilot Call for Proposals in Polymer Chemistry, 17(6)  
IUPAC Welcomes New Members, 19(1)  
IUPAC/ACS 2011 Challenge Grants, 20(5)  
L'Oréal-UNESCO Awards for Women in Science 2010 Announced, 15(3)  
Major Update to IYC Website Completed, 21(1)  
Materials Chemistry: a Stronger Role within IUPAC, 18(2)  
Molly Stevens Receives Polymer International-IUPAC Award 2009, 17(2)  
Naming Ceremony for Element 112 in Darmstadt, 18(5)  
New Leadership at IOCD, 20(1)

Nominations Requested for Members of IUPAC Divisions and Commissions, 19(4)  
Noureddine Yassaa Awarded the 2010 CHEMRAWN VII Prize, 19(5)  
Organization Launched To Solve The Name Ambiguity Problem In Scholarly Research, 16(6)  
Primary Data for Chemistry, 21(1)  
Terrence Renner Appointed IUPAC Executive Director, 16(2)  
The IUPAC-Jiang Novel Materials Youth Prize, 21(5)  
Two Franzosini Awards in 2010, 18(6)

### Making an impact

Electrochemical Nucleic Acid-Based Biosensors: Concepts, Terms, and Methodology, 27(4)  
IUPAC/CITAC Guide: Selection and Use of Proficiency Testing Schemes for a Limited Number of Participants—Chemical Analytical Laboratories, 26(4)  
The IUPAC-NIST Solubility Data Series: A Guide to Preparation and Use of Compilations and Evaluations, 26(4)

### Mark Your Calendar

Listing of IUPAC-Sponsored Conferences and Symposia, 36(1), 32(2), 34(3), 38(4), 35(5), 32(6)

### Officers' Columns

Building a Promising Future for IUPAC, Kazuyuki Tatsumi, 2(6)  
“. . . for the times they are a-changin,” Nicole J. Moreau, 2(5)  
Nature's Fury, David StC. Black, 2(3)  
“Pressure” Testing and Sponsorship, John Corish, 2(1)  
The IUPAC Presidency—A Happy Recollection, Jung-Il Jin, 2(2)  
IYC 2011 Update—Here We Go! John M. Malin, 2(4)

### The Project Place

Analytical Chemistry in Action, Brynn Hibbert, secretary of Division V, 22(4)  
Assessment of Stable Isotopic Reference and Inter-Comparison Materials, 23(5)  
Categorizing Halogen Bonding and Other Noncovalent Interactions Involving Halogen Atoms, 20(2)  
Coordination Polymers and Metal Organic Frameworks: Terminology and Nomenclature Guidelines, 23(1)  
Developing Toolkits for National Chemistry Weeks During IYC, 20(6)

## Index for 2010

Enhancing the Capacity to Provide Quality Chemistry Education at Secondary and Tertiary Levels in Ethiopia, 21(6)

Evaluated Kinetic Data for Atmospheric Chemistry, 18(3)

Guidance for Substance-Related Environmental Monitoring Strategies Regarding Soil and Surface Water, 18(3)

Guidelines for Measurement of Luminescence Spectra and Quantum Yields of Inorganic Compounds, Metal Complexes, and Materials, 21(4)

New Drugs for Neglected Diseases in Latin America, 24(2)

Postgraduate Course in Polymer Science, 24(5)

Radioanalytical Chemistry—Revision of the Orange Book Chapter, 20(6)

Regional Drinking Water Quality Assessment in the Middle East: An Overview and Perspective, 22(2)

Risk Assessment of Effects of Cadmium on Human Health, 21(2)

Structure, Processing, and Performance of Ultra-High Molecular Weight Polyethylene, 20(4)

Technical Guidelines for Isotope Abundances and Atomic Weight Measurements, 22(4)

Terminology and Definition of Quantities Related to the Isotope Distribution in Elements with More than Two Stable Isotopes, 23(5)

Terminology for Chain Polymerization, 24(4)

Toward Higher Quality of Chemistry Teacher In-Service Training in Croatia, 24(5)

Young Ambassadors for Chemistry in Cyprus, 21(4)

### Provisional Recommendations

Glossary of Terms Used in Photocatalysis and Radiocatalysis, 19(3), 25(4)

Name and Symbol of the Element with Atomic Number 112, 23(1)

Terminology of Polymers and Polymerization Processes in Dispersed Systems, 25(4), 25(5)

### Stamps International

Gadolin and the Cradle of the Rare Earths, 23(6)

Giant Sulfur Bacteria, 7(2)

Johann Heller: Pioneer of Clinical Chemistry, 24(3)

R is for Rutherford, 14(1)

The Stone that Came in from the Cold, 33(5)

The Wizard of Protein Crystallography, 3(4)

### Where 2B & Y

Asian Chemical Congress, 5–8 September 2011, Bangkok, Thailand, 31(6)

Bioluminescence and Chemiluminescence, 19–23 April 2010, Lyon, France, 32(1)

Biotechnology for the Sustainability of Human Society, 14–18 September 2010 Palacongressi, Rimini, Italy, 30(2)

Chemistry for Sustainable Development, 26–30 July 2010, Mauritius, 34(1)

Chemistry in Africa, 20–23 November 2010, Luxor, Egypt, 32(3)

Conducting Polymers, 10–14 July 2011, Prague, Czech Republic, 33(5)

Coordination Chemistry, 25–30 July 2010, Adelaide, Australia, 30(2)

Electrochemistry—South-East Europe, 6–10 June 2010, Belgrade, Serbia, 33(1)

Frontiers of Polymers and Advanced Materials, 22–27 May 2011, Pretoria, South Africa, 30(6)

Functional Polymeric Materials & Composites, 27–29 April 2011, Stellenbosch, South Africa, 32(5)

Inorganic Materials, 12–14 September 2010, Biarritz, France, 30(2)

International Symposia on Advancing the Chemical Sciences, 2010, 35(1)

Liquid Chromatography–Mass Spectrometry, 10–12 November 2010, Montreux, Switzerland, 36(4)

Molecular Mobility and Order, 6–10 June 2011, St. Petersburg, Russia, 31(6)

Organic Chemistry, 22–25 June 2010, Beijing, China, 35(1)

Organometallic Chemistry Directed Towards Organic Synthesis, 24–28 July 2011, Shanghai, China, 37(4)

Plant Lipids, 11–16 July 2010, Cairns, Australia, 32(1)

POLYCHAR, 20–24 March 2011, Katmandu, Nepal, 31(6)

Polymer Science and Technology, 24–29 October 2010, Hersonissos, Greece, 32(3)

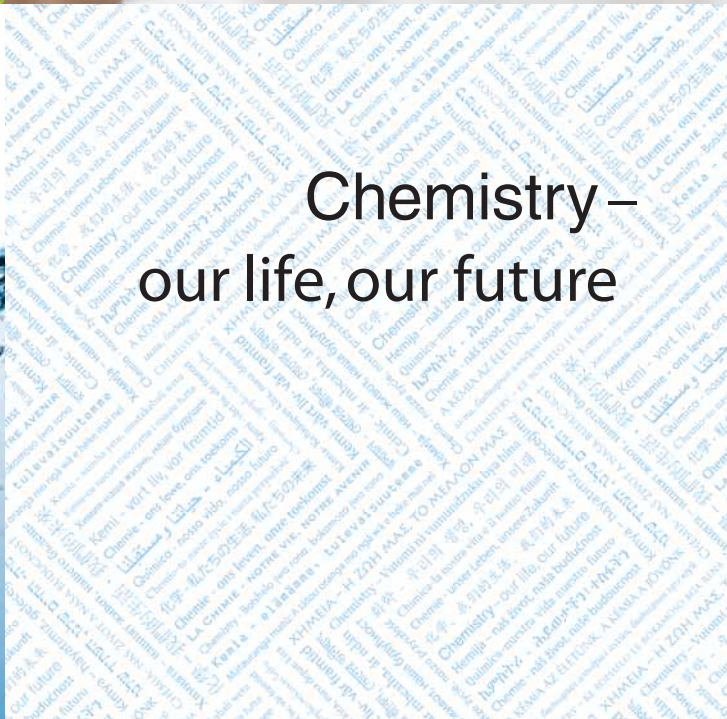
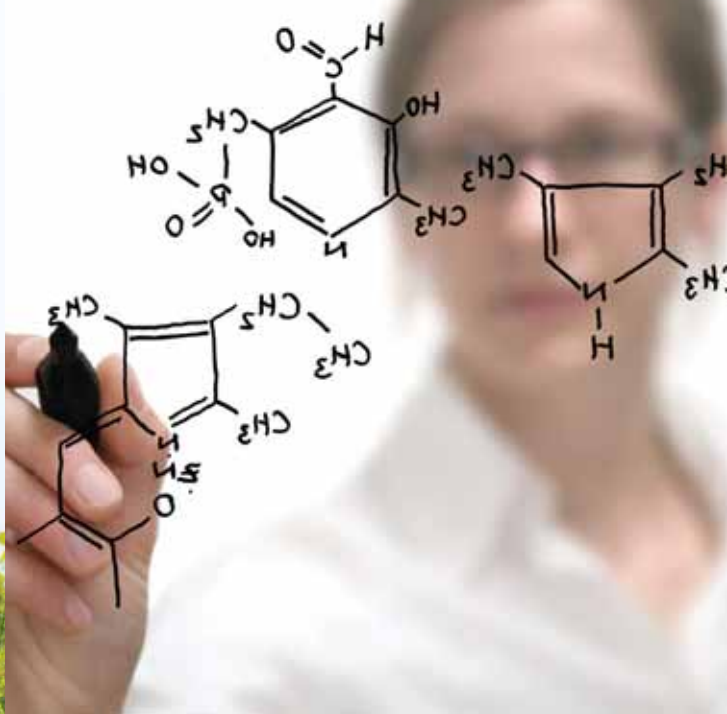
Reactive Intermediates and Unusual Molecules, 10–16 July 2010, Great Barrier Reef, Australia, 34(1)

Spectral Line Shapes, 6–11 June 2010, St. John's, Newfoundland, Canada, 33(1)

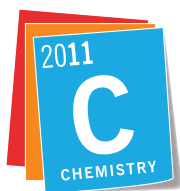
Vanadium, 6–9 October 2010, Toyama, Japan, 36(4)

Water Quality, IUPAC Congress, Puerto Rico, 30 July–7 August 2011, 30(6)





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