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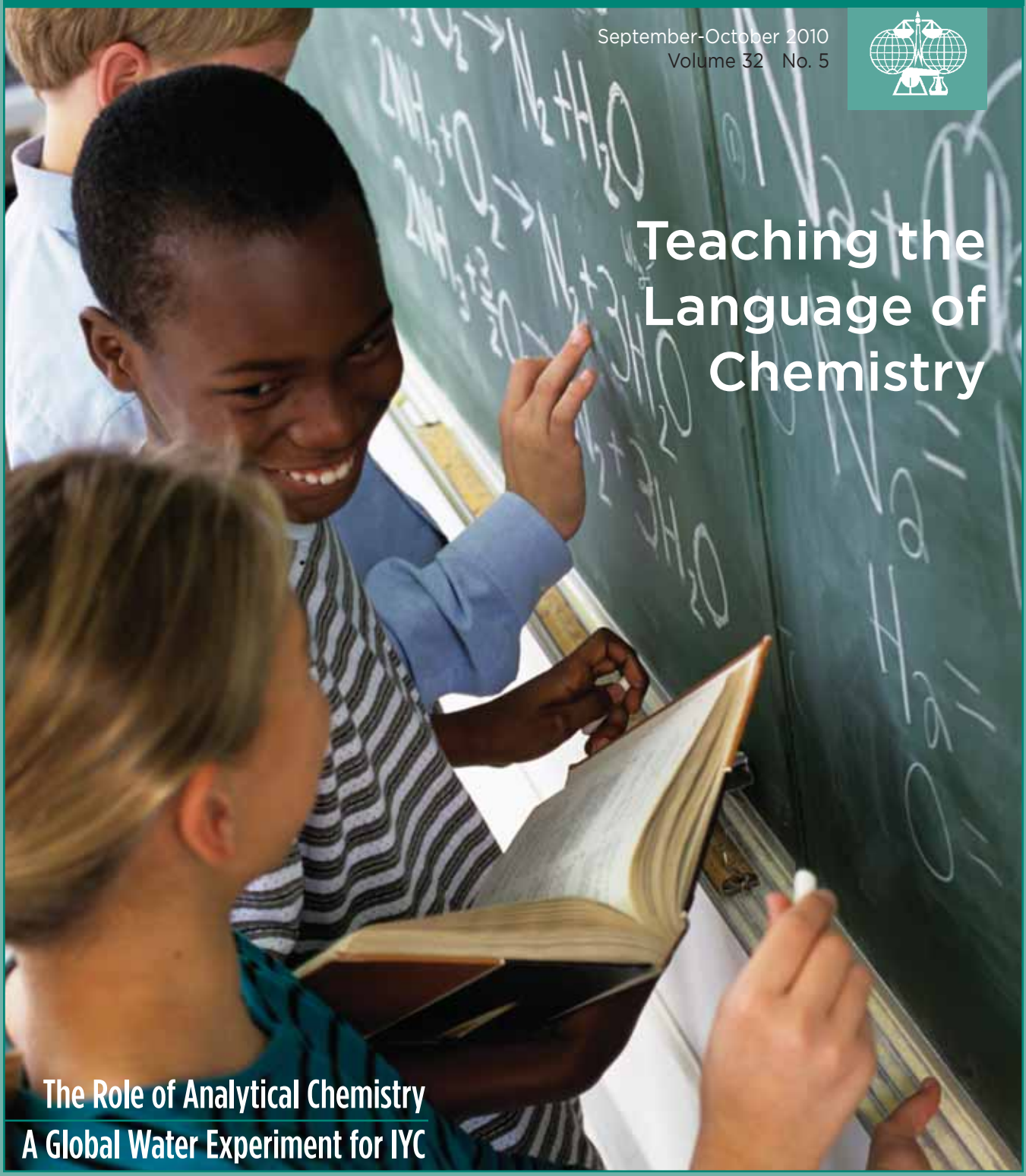

Teaching the Language of Chemistry

The Role of Analytical Chemistry

A Global Water Experiment for IYC

CHEMISTRY International

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

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From the Editor

Challenges—if I had to pick one word to sum up the feature articles in this issue of *CI*, that would be it.

The challenge of learning a language—the language of chemistry, to be exact—is explored by Keith Kelly (see page 4) in his review of Content and Language Integrated Learning. The idea is to engage students for whom English is not their primary language, in learning English and a specific subject, simultaneously. This presents a challenge for teachers, who not only need to plan for the subject but also for the language and the specific language issues the students will be facing in approaching a new subject. The reward, as I see it, is the ease with which students will be able to communicate about a technical matter without ever have to translate from their mother tongue.

Another challenge explored in this issue relates to the assessment and refocusing of the role of analytical chemistry, particularly in regions where the need for such expertise might have been underestimated in recent times. In these areas, the question is how to restore a base of expertise where it is most needed. With that in mind, Nelson Torto, Heidi Assumption, and Zenixole Tshentu summarize the outcome of a recent workshop coordinated by the Analytical Section of the South African Chemical Institute (see page 8).

The third challenge concerns the planning of a global experiment that will take place as part of the International Year of Chemistry celebration in 2011 (see page 14). The global experiment, which focuses on water, will provide kids with a chance to learn about the role of chemistry and share their experiences and findings online. "Water–A Chemical Solution" will also provide ample teaching opportunities.

As these articles attest, there is no shortage of challenges for chemistry. However, as Winston Churchill once said, "A pessimist sees the difficulty in every opportunity; an optimist sees the opportunity in every difficulty."

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A complimentary copy of the IUPAC Biennial Report 2008–2009 is enclosed with this issue of *Chemistry International*. The report lists IUPAC's six long-range goals and provides illustrations of actions taken during the last two years toward meeting those goals. A full-text pdf is available online at <iupac.org>; printed copies are available per request at the IUPAC Secretariat at <secretariat@iupac.org>.

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"Pressure" Testing and Sponsorship

by John Corish

The various news media have provided me with some food for thought recently through their frequent reports and comments on the need for the regulatory fiscal authorities to undertake periodic "pressure" or "stress" testing of banks and other financial institutions. This, when first encountered, might appear to be a further ingress of technical and scientific principles into the commercial world. Indeed, I initially mused as to whether someone might have produced an autoclave that was sufficiently large to enclose a team of accountants and auditors or whether the application of a simpler vice-like apparatus might not be more efficient in these cases. As is often true, the reality is much less interesting. I am told that it involves no more than the application of mathematical and computational predictive techniques to test whether the institutions in question can be expected to withstand the financial stresses from a variety of imagined scenarios in the new and harsher commercial reality.

This changed and difficult financial environment seems to have permeated almost every part of the world and it is impossible to remain isolated from it. And so, the question naturally arises as to how IUPAC is doing? As I reported in my last column and to Council at the General Assembly at Glasgow last year, the Union's finances have been performing quite well despite the testing times. Our income streams from national subscriptions, publications, and our investment portfolio have held up well and expenditures have been controlled to ensure that we have stayed within the budget determined by the Finance Committee and approved by Council. The overall value of our portfolio, which is a good indicator as to how we are faring at any time, has continued to recover though the rate of increase remains on a modest scale.

At present, it is not possible to make predictions regarding IUPAC's financial outlook with any real confidence given the complexity of the factors affecting the international financial parameters within which we must operate. In particular, at the time of writing, the rapid rates of change of these parameters in response to variations in the fortunes of a number of national economies further aggravate the situation and make even the task of analysis difficult. What is very clear is that the diversity and prudence of the model chosen by the Finance Committee remains crucial to our continued ability to pass the financial tests thrown in our path. The value of the portfolio this year has benefited from the increase in the value of U.S. securities and has decreased because of the fall in the value of the Euro. Thankfully, the latter is not that important to us as that portfolio is mainly reinvested, although we do suffer some loss of income as the interest on our bonds is converted from Euros to U.S. Dollars.

The upcoming International Year of Chemistry, IYC2011, which is a unique and wonderful opportunity to highlight our subject to the world and one that we intend to grasp enthusiastically, will of course also present a pressure test for our finances. Our rate of spending on preparations for this project, such as on the IYC website, <www.chemistry2011.org>, has been larger and more immediate than is our typical expenditure on projects. This effect is also reflected in our portfolio. A campaign to raise sponsorship for our participation in the IYC2011 has been under way now since last year and at least our principal cornerstone events will be very largely financed in this way. However, we do need to raise much more funding.

A brochure is available from the Secretariat outlining the opportunities that exist for a number of sponsorship categories ranging from becoming a Worldwide Partner to supporting the IYC in an individual capacity as an IYC2011Friend. Wonderful ideas abound as to how chemistry can be promoted and popularized and the more sponsorship we can obtain, the more of these programs and events we can launch and support around the world. If any of you can assist, either in a personal capacity or through your contacts, to increase our sponsorship funding for our participation in the IYC, then we should be delighted to hear from you. If you would like to become an IYC2011Friend, you can do so by contacting the IUPAC secretariat (see page 3).

John Corish <jcorish@tcd.ie> has been treasurer of IUPAC since January 2008. He has served IUPAC at many levels since 1979, including chair of the Subcommittee on Materials Chemistry, president of the Inorganic Chemistry Division, and member of the Finance Committee.

Chemie- ons lewe, ons toekoms
Hemija – naš život, naša budućnost
Химия – наш живот, наша будућност
Chemistry – our life, our future
Chemie- ons leven onze toekomst
Химия-наша жизнь, наше будущее
Kemi - vårt liv, vår framtid
Chemie - náš život, naše budoucnost
Química - nossa vida, nosso futuro
Chimica-la nostra vita e il nostro futuro
Chemie - unser Leben, unsere Zukunft
Quimica-nuestra vida nuestro futuro
La Chimie - notre vie, notre avenir
化学 - 私たちの生活、私たちの未来
A KÉMIA AZ ÉLETÜNK, A KÉMIA A JÖVŐNK

2011 C CHEMISTRY

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An Invitation to a Unique Opportunity

To maximize the public impact of IYC2011 as a worldwide celebration of the contributions of chemistry, **IUPAC invites you to become a partner, a sponsor, or a friend.**

IYC2011 Global Partners: For a contribution of USD $250,000, each Global Partner will receive the highest level of available benefits: a CEO speaking opportunity at cornerstone event, banner logos on chemistry2011.org official website and stationery, 25-year IUPAC Company Associate Membership, reduced fee for booths at exhibitions, and opportunities to participate in meetings.

IYC2011 Global Sponsors: For a contribution of USD $50,000 or more, each Global Sponsor will be entitled to rotating logos on the official website and logos on base of stationery, 5 years as IUPAC Company Associate, reduced fee for booths at exhibition, and opportunities to participate in meetings.

IYC2011 Sponsors: Contributors donating USD $15,000 or more, which can be spread over 2010, 2011, and 2012, will be associated with special events celebrating the IYC. The level will be exclusive to organizations, agencies or institutions related to the chemical sciences. IYC2011 Sponsors will be listed on all brochures, will have the opportunity to participate in roundtable and other discussions and will receive Company Associate Membership of IUPAC for 3 years.

IYC2011 Media Sponsors: This will entail an in-kind contribution: because of the diverse forms of in-kind contributions possible, these will be negotiated on a case by case basis. In principle, Media Sponsors will provide publicity and coverage for the IYC global and international projects through, for example, special feature articles, news stories, distribution of CDs, or website linkages. Benefits can also be negotiated individually.

IYC2011 Cornerstone Sponsors: There are a limited number of opportunities to sponsor Cornerstone events which can be done through a combination of funding and contributions in kind and must, in each case, cover a major part of the overall cost of the event. An event sponsored in this way will carry the name of its sponsor.

IYC2011 Friends: Private contributions with no minimum donation. Spontaneous and voluntary private or individual donations either to specific events or to funding the planning, implementation and evaluation of the year's activities.

Additional Information

You may address requests for additional information to the IYC Secretariat at the address below. If you would like to suggest or sponsor a particular event, please contact IUPAC Treasurer, Professor John Corish:

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United Nations Educational, Scientific and Cultural Organization
International Union of Pure and Applied Chemistry

A New Challenge for Chemistry Education

by Keith Kelly

In 1997, the British Council commissioned an investigation into the global trends of English language usage. *The Future of English?* (Graddol: 1997) describes a world where native English speakers are becoming a minority to speakers of English as a second or foreign language. In 2006, Graddol wrote *English Next*, which explores how students worldwide are learning subjects through the medium of English as a foreign language, how English language teachers are becoming redundant, and how English is becoming more of a key life skill rather than a subject to learn for the sake of learning. Out of this global movement has emerged the umbrella term Content and Language Integrated Learning (CLIL), which means teaching a subject, such as chemistry, through the medium of a language other than that normally used.*[*]

This article looks at the implications of these trends for teaching and learning chemistry through the medium of English as a foreign language. First, the article investigates the language of chemistry based on chemistry curriculum materials and lesson transcripts. Then it describes approaches to teaching chemistry as a language. Next, the article provides suggestions for designing chemistry-related tasks that both support and develop this language in the chemistry classroom. The article concludes with a discussion of the implications of the CLIL approach as it relates to the education of chemistry teachers and the development of chemistry curriculum materials worldwide.

The Language of Chemistry

Carrasquillo and Rodriguez (132: 2002) spell out the challenge to chemistry teachers who work with learners through English:

> *Science is, in itself, a language and each different science (biology, physics, chemistry) is a separate language.*

If chemistry is a language as well as a body of content, then it needs to be taught as a language as well as a body of content. So, what is the language of chemistry?

Kelly (forthcoming) describes three areas of language for any classroom context: subject-specific language, general academic language, and peripheral language. He states that an awareness of these "languages," as well as a pedagogy for dealing with the language, is important for the science teacher working with learners in an additional language. Subject-specific language in chemistry can best be described as the information carrying words, which are usually noun phrases such as *sulphuric acid* or *the process of acidification*. General academic language is cross-curricular language and, as such, is not exclusive to any one subject. A good example is the language of sequencing, including phrases such as *first*, *second*, *next*, and *finally*. Such language is used in chemistry for introducing steps in a process, but it could also be used in a history lesson for describing reasons contributing to an event which happened in the past. Peripheral language is the language of the classroom: the language used by the teacher to manage the class and the informal language between students.

Clearly, subject-specific language is important for learning any subject. This paper suggests that when learning chemistry in an additional language, learners may need increased exposure to the general academic language in chemistry and classroom time invested in practicing that language. Teachers may need to rethink how they provide opportunities for learners to process the input and practice the output of the chemistry lan-

*There are many examples where this is happening. The EU identifies CLIL as a priority educational strategy. The Spanish Bilingual Education Programme recently graduated its first cohort of learners which started learning through the medium of English in 1996. These are children who went into year one to be taught science (among others) through English. Another national example is in Qatar where the Supreme Education Council has recently passed legislation to the effect that all children will eventually receive their science education through the medium of English. This move is not restricted to primary and secondary chemistry education. The number of British student applications for chemistry degrees at UK universities fell by around 30 percent between 1996 and 2008 while the number of non-UK English-learning student applications increased by roughly the same percentage according to Royal Society of Chemistry statistics.

guage. Learners may also need more opportunities to think about concepts in the foreign language as well as time to internalize the formal language, express it in their own words, and translate their own words back into the formal language of chemistry.

Focus on a Chemistry Lesson

The data and impetus for this discussion come from a 45-minute secondary-school chemistry lesson in a German Grammar School delivered through the medium of English. The students, who are 14 and 15, are just starting to study chemistry through English and their chemistry teacher is also the English teacher. The lesson has students observe a laboratory experiment in which sulfur is burned and made to react with water to produce sulfuric acid. Students then write up a protocol based on their observations.

There are 10 distinct didactic activities observed; each with specific chemistry language demands.

1. Students describe an illustration of the process through which acid rain is formed.
2. Students write the names of laboratory instruments on worksheets.
3. Students (and teacher) say the names of objects aloud.
4. The teacher describes the purpose of laboratory instruments.
5. Students (and teacher) describe substances.
6. Teacher describes steps in the experiment.
7. Teacher asks closed questions and students give answers.
8. Students write up their protocols of the experiment.
9. Two students draw instruments and label them at the board.
10. Students read aloud from their experiment protocol.

In summary, students are asked to reproduce the language of process description. They are expected to identify and name, in spoken and written form, objects used in a laboratory experiment, describe the purpose of the objects, and describe the appearance of chemical substances. Students are asked to listen to the teacher's monologue description of an experiment and they are also expected to describe themselves, in spoken and written English, the sequence of an experiment in the form of a protocol, including what happens at each stage.

As shown in figure 1, the general academic language of this chemistry lesson corresponds to specific science thinking. By identifying thinking areas and language functions in this way, we can begin to create a plan for the language of chemistry lessons (Smyth, 2003). It is this kind of lesson planning that is a new challenge to chemistry teachers working with learners for whom English is an additional language. Teachers who normally busy themselves with the content of their subject now need to plan for the language issues that may arise in their classes. Teachers themselves provide much of this language, though it may not be made explicit in the way that some learners need it to be.

Textbooks, curriculum guidelines, web-based materials, and electronic materials such as CD-ROMs all present sources for chemistry specialists to begin analyzing what terms their students need to study in English.

Figure 2 shows a curriculum document for a science course from Malaysia. This is a useful summary of the

Figure 1: The Language of Chemistry.

Identify objects and explain purpose

Questions
What is a...?
Give me explanation for a...
Who can explain what this is?
How would you explain...?
What do we call this?
What is the technical term for ...?

(A)	is a	thing device instrument tool object substance	where who which that	.....
			for	...-ing ...

Statements
... is called ...
The term/name for this is...
We call this...

Describe the sequences of a process or an experiment

Teacher questions:	Learner statements
What comes first/next? What happened/happens then? And then/after that...? When does/did...happen?	Firstly, secondly, thirdly, fourthly...finally/lastly First, The first thing to happen is, First of all, Then, after that, next The next step / stage Eventually, Finally, In the end, At last

thinking that goes on in any science context. What is missing in this curriculum is the language of chemistry.

University students and teachers already benefit from an extensive study conducted in 2010 called the Academic Word List, which words appear with the highest frequency in English-language academic texts. (Coxhead, 2010). What is desperately needed today to support the growing population of second language learners of chemistry is a similar study of the language of chemistry for English-language chemistry courses. Based on this study, publishers could adjust their curriculum materials for this target group. Fortunately, as of the writing of this article, this is just beginning to happen.

Teaching Chemistry as a Language

Ball (2008) lays out a practical approach to content learning that respects learner variables in terms of language, concepts, and procedures. Kelly (2009) describes three dimensions (linguistic, conceptual, procedural) to content learning in a diagrammatical framework that enables the teacher to ask questions of students to plan opportunities for them to learn.

Chemistry teachers who are not experienced in dealing with language issues in their classrooms need immediate access to compilations of techniques for developing language in the science classroom. One such freely available resource is Content and Language Integrated Learning (Kelly, 2006). Wellington and Osborne (45: 2001) offer a very useful list of suggestions for developing science reading skills, called DARTS (directed activities related to texts).

Some examples of language-supportive chemistry activities include the following: using diagrams to guide listening to teacher monologues and note taking; using charts while reading chemistry texts to transfer information from linear to diagram form; having students find missing chemistry information by talking to a partner; using scaffolds for chemistry writing such as writing frames, substitution tables, and word lists based on models; and learning chemistry vocabulary through unit word maps to show logical links.

Implications for Chemistry Teacher Training and Curriculum Publications

Although it is still very hard to find books or other resources written specifically for students learning a science subject through an additional language, one noteworthy exception is Macmillan's *Vocabulary Practice Series Science* (Kelly 2008). The VPS Science publication is based entirely on language analysis carried out using secondary science curriculum textbooks and materials (Chung-Harris, 2005). Gibbons (2002) provides teachers with a rich collection of ideas for "scaffolding" the language and the learning of content curriculum material. Clegg (1999: 71) argues for materials that subject teachers have "produced, or even in rare cases published, with language demands in mind." Clegg also states the importance "for English teaching to be integrated as fully as possible into the teaching of the mainstream curriculum both in the early years" and further on in school (1999: 77). There are implications for textbook writers and publishers to pay attention to learner needs in chemistry as a foreign language. Clegg (1999: 120) lays out approaches to task design in the bilingual secondary classroom where there is a "need to balance the language and cognitive demands of the lesson, focusing on discourse functions and exploiting diagrammatical representation of content to the full." The suggestion is that textbooks

Figure 2: Science Curriculum Specifications for Malaysia.

Scientific Skills	Thinking skills (Critical and creative)
Observing	**Critical thinking skills:**
Classifying	Attributing
Measuring and using numbers	Comparing and contrasting
Inferring	Grouping and classifying
Predicting	Sequencing
Communicating	Prioritising
Using space-time relationships	Analysing
Interpreting data	Detecting bias
Defining operationally	Evaluating
Controlling variables	Making conclusions
Hypothesising	
Experimenting	**Creative thinking skills:**
Manipulative skills	Generating ideas
	Relating
Thinking strategies	Making inferences
Conceptualising	Predicting
Making decisions	Making generalisations
Problem solving	Visualising
	Making hypotheses
Reasoning	Making analogies
	Inventing

for this group of learners have language made explicit on the page and that the content be delivered to them in a largely diagrammatical form.

Hayes Jacobs (2006: 38) describes the need for an active literacy across the curriculum where subject teachers "talk about" language with their students. This is not to suggest by any means that chemistry teachers become language teachers in the traditional sense that we know. It may be, as Hayes Jacobs suggests, that chemistry teachers of the future will have moments in their lessons in which they make explicit to learners the different types of terminology in the lesson. These might include words that are "high frequency" in chemistry, terms that are "specialized," and phrases that students can use to "embellish" their chemistry language.

Conclusions

It seems clear that a radical change is required in the way teachers are prepared for teaching chemistry when they are expected to work with children and students who are learning through English as an additional language. It is a move from the subject to the learner and from the content to the language of the subject.

Perhaps it also time to rethink efforts aimed at *popularizing chemistry*. It is through language, communication, and real-life contextualization of chemistry that we will make chemistry meaningful to young people. In an environment where growing numbers of young people demand chemistry in English, we should embrace an approach to popularizing the subject that involves communicating to young people through their own life experiences. The International Year of Chemistry in 2011 is a perfect opportunity for the chemistry community to engage with young people through intercultural communicative learning moments based within chemistry contexts. The IUPAC Young Ambassadors for Chemistry project, which ran from 2004 to 2007, is a good example of chemistry activities that engage young people through their own life experiences using the medium of a common language.

It is through language, communication, and real-life contextualization of chemistry that we will make chemistry meaningful to young people.

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Reassessing the Role of Analytical Chemistry

by Nelson Torto

Over a century ago, the Nobel Prize–winning chemist Friedrich Wilhelm Ostwald wrote about the "supreme importance" of analytical chemistry, noting that it "takes a prominent position among the applications of science, since the questions which it enables us to answer arise wherever chemical processes are employed for scientific or technical purposes."*

This description is just as apt today, and perhaps more so. In a November 2009 keynote address, renowned analytical chemist Roger M. Smith of Loughborough University, UK, reiterated that analytical chemistry is a core discipline essential for research, industry, government, and society. He added that "all innovative research requires measurements, and that for such measurements to be of any value, they require analytical skills."

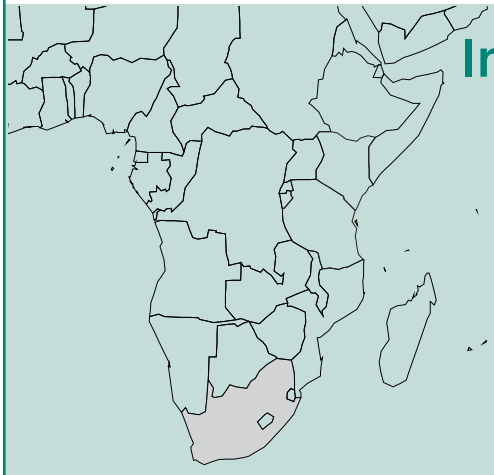
Smith, who was speaking at a workshop facilitated by the Analytical Division of the South African Chemical Institute, stressed the need to impart transferrable skills onto graduates as well as a need for continued professional development in order to improve the technical competence of analysts through short courses, either in-house or those that might be offered by specialist groups such as the chemical society.

*Friedrich Wilhelm Ostwald (1853–1932) was a Baltic German chemist. He received the Nobel Prize in Chemistry in 1909 for his work on catalysis, chemical equilibria and reaction velocities. (Wikipedia).

Definition and Role of Analytical Chemistry

Smith defined analytical chemistry as the science, implementation, and interpretation of measurements and emphasized that **it is not** simply making measurements without an understanding of what is being done, as such numbers need to be analytically valid to generate useful information. He added that analytical chemistry overlaps with physical, organic, and inorganic chemistry, as is integral to electronics, sensors, and biochemistry.

Smith argued that analytical chemistry has an important role in society because consumers need information on the quality of pharmaceuticals, medical care, food, water, drink, and the environment. In addition, the quality of export products needs to be monitored in order to meet trade requirements. For example, in pharmaceuticals, there is a need to not only understand the production of drugs and meet the requirements of various regulatory bodies, but there is also a need to further understand and enforce these protocols to confront counterfeiting and to monitor



Improving Analytical Chemistry in South Africa

Report from a Workshop

"Driving the Triple Helix: Linking Academia, Industry, and Government" was the theme of a workshop held 6 November 2009 at the Birchwood Hotel in Johannesburg, South Africa. Facilitated by the Analytical Division of the South African Chemical Institute (SACI), the workshop is part of an initiative to link academia, industry, and government in order to ensure that all parties are aware of what the others are doing so that the responsibilities can be aligned with the components of the triple helix. The purpose of the workshop was to map the way forward for the efficient interaction of the three pillars to shape and improve the capability and capacity of analytical chemistry competence in South Africa.

The workshop featured stakeholders from the academic, government, private, and public sectors who presented on their experiences, challenges, and needs

the quality of imported drugs or herbal products. He stressed the importance of analytical chemistry in point of care, diagnostics, and in sports. For instance, there is a need to know the quantities of pesticides in water, fruits, or vegetables as these impact directly on the health of individuals. Because wine is such an important export for South Africa, he also reminded delegates of the glycol scandal that impacted negatively on wines from Austria and hence illustrated that without the requisite capacity and resources that enable point-of-sale or production monitoring, a disaster looms.

Smith concluded this component by articulating the fact that analytical chemistry can also be crucial in government as it impacts on customs and excise, forensic activities, police and regulatory activities, agriculture and environmental surveys, defence procurement, and regulation and control in general.

Capacity Development in Analytical Chemistry

Innovative research is dependent upon measurements, Smith insisted. However, for such measurements to be of any value, they must be conducted by personnel with analytical skills and technical competence. New techniques need to be developed, evaluated, and their relevance to particular applications assessed. Hence, this continuously creates a demand for technical operators, qualified chemists with analytical skills, and research analysts whose skills can all be developed and established at schools, colleges, universities, and industry.

Smith suggested that there are challenges facing universities and colleges as they attempt to meet the task of producing the requisite skills. This is because students usually cannot be trained for the precise needs of one company as it takes time to change and develop curricula. It also it takes three to four years of education after the development of the course before the students enter the job market, by which time the industry focus might have changed. Another challenge is that graduates may choose to use their skills in other areas.

A memorial to Friedrich Wilhelm Ostwald in the center of Riga, Latvia.

Continued Professional Development

Because the training of graduates can't be specific, their background knowledge should enable them to be trained for new roles in various sectors. Hence, Smith stressed the need for continued professional development through short courses, either in-house

related to analytical chemistry, either in terms of expertise, capacity, funding, or training. Some of the key issues that were highlighted included the need for chemists to be able to work in very strict quality management systems, importance of sample handling and investment in the analytical process, challenges facing water and environment, and industry's role in strengthening research at South African universities.

An open discussion session provided delegates with the opportunity to share their experiences and also to start discussions around the issues presented by speakers. The challenges that were raised included poor school science training, lack of exposure to industry among university students, lack of analytical facilities in South Africa, the need for a centralized facility to house state-of-the-art instrumentation, lack of participation in professional development courses, and lack of recognition of analytical chemistry in South Africa as it was not included in the research chairs initiative (SARChI).

The challenges that were highlighted in the presentations and discussion sessions are summarized in the following recap of the meeting.

Nelson Torto, the chairman of the Analytical Division of SACI, began the workshop by providing a brief background of the interactions between Sasol, SACI, the Department of Science and Tecnology (DST), and the Department of Trade and Industry, which were part of the preliminary discussions that cemented the need for driving the Triple Helix to facilitate knowledge generation and innovation, with a focus on analytical chemistry. He concluded by thanking the invited keynote speaker, Roger Smith, sponsors (DST, Sasol, Chemetrix, Metrohm, Bruker, Microsep, and Rhodes

or offered by specialist groups such as chemical societies. He emphasized the need for graduates to take specialized courses at the Master's level, as these will ensure that they acquire the requisite skills. He noted that in the UK there are 71 B.Sc./MChem courses listed for analytical chemistry at 21 universities, many of which include a sandwich year of practical experience in industry providing the student with firsthand knowledge of the expectations and opportunities of an industrial career. He also pointed out that there are M.Sc. courses offered that combine analytical chemistry with related fields such as pharmaceutical or environmental science, and information technology.

The common core of these courses includes projects, transferable skills, and coverage of an area of specialization. Competence can be developed further through a Ph.D. program where individuals work on research topics for at least three years, and are trained in organization and planning, research methodology, report writing, and presentation skills.

Group photo of participants at the November 2009 SACI workshop on "Driving the Triple Helix: Linking Academia, Industry, and Government" in Johannesburg, South Africa.

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Improving Analytical Chemistry in South Africa Report from a Workshop

University), speakers from various sectors, participants, and members of the organizing committee (Patricia Forbes, Zenixole Tshentu, Ewa Cucrowska, Priscilla Baker, and Heidi Assumption) for their participation in what he hoped would be the start of a greater and fruitful interaction between the three partners.

Chris Stubbs (Aspen Pharmacare) informed the participants that the local pharmaceutical industry is manufacturing based with very little opportunity for research. He said that a very small percentage of chemists are involved in research as South Africa does not have a pharmacological development and clinical trials industry. As a matter of fact, this role is filled by only a few international companies. Stubbs said that in South Africa, the biggest need is for chemists who are able to work in very strict quality management systems as compliance to regulations and international standards is of utmost importance. They typically employ one senior chemist for every five analysts, and basic to mid-level analytical techniques are used. Stubbs indicated that the biggest challenge was the need for quality management systems training. In conclusion, he predicted that biopharmaceuticals will increase in importance which will lead to a higher demand for microbiologists and biochemists to become analytical chemists.

Bongani Nkosi (Sasol) expressed Sasol's support for the development of analytical chemistry to help drive the triple helix. In his presentation, he gave an overview of the different operations at Sasol, both locally and abroad. He focused on the support function of the analytical labs for Sasol Technology, Global Chemicals, and the SA Fuel and International Energy business units. He explained that the labora-

Driving the Interaction between Academia, Industry, and Government

Smith pointed out that just because the roles of academia, industry, and government overlap, this may not be sufficient to drive the constructive dialogues that characterise a successful Triple Helix and other parties such as chemical societies or networks have an important place in facilitating contacts and creating interactions.

He said the role of academia is to train (through higher education and continuing professional development), support with skills and consultancy, promote innovation and discovery (through research and publishing), and to interact with government. Some of the roles of industry are to keep in touch with academia (taking up new ideas and employing fresh graduates), employing best practices in production, and keeping up to date with new trends and legislation. Government has the responsibility to use science for the common good and benefit of the people, develop strategic plans (define systems of innovation, conduct foresight analysis, shape long-term visions and missions), provide a regulatory framework, and support research institutes by providing infrastructure that can meet the needs of the country. In addition, professional bodies such as SACI can provide linkages, continuing professional development, and networking opportunities.

Promotion of Analytical Chemistry

For the purposes of promoting and increasing the visibility of analytical chemistry, Smith suggested involving graduate students in conferences where they are expected to give presentations. The Royal Society of Chemistry (UK) already holds annual research conferences for graduate students in order to promote the discipline. The meetings are primarily for early-stage analytical science researchers (industrial scientists, Ph.D. students, and postdoctoral fellows) to present their latest results in the context of the wider analytical science community. At these meeting, they have the opportunity to interact, network, and learn professional skills. He also encouraged outreach programs that involve members of the National Assembly as well as press releases and presentations to Parliament or the parliamentary committee on science.

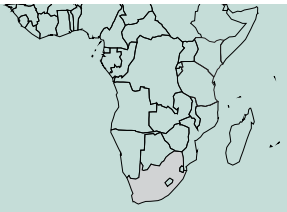
Analytical Chemistry and Society

Roger Smith concluded by saying there is strong mutual interest in advancing the field and in developing skills and training. In particular, he encouraged the design of courses at all levels that demonstrate the value of analytical chemistry and provide the skills and background students need to lead to fruitful and fulfilling careers in industry, government, and academia.

Zeni Tshentu was program director and Nelson Torto <N.Torto@ru.ac.za> is the chairman of the Analytical Division of SACI, the South African Chemical Institute.

tories typically have three different roles: developing new methods or adapting technology for specific applications (research), providing analytical services and conducting routine and nonroutine analyses for in-process monitoring or market support, and performing quality control and ensuring standardization or validation. Nkosi said that Sasol recognizes the importance of sample handling and investment in the analytical process that goes into it, as it is a necessary step to ensure quality data and it is the biggest contributor to analysis error.

He concluded by discussing Sasol's extensive University Collaborations Initiative which aims to build capacity in both human capital and infrastructure by partnering with a chosen university. The program ensures that Sasol meets its talent needs for existing and future ventures. Sasol places equipment and/or personnel at a particular university in order to grow a specific research field.



Lia Marantos (Sasol Polymers) discussed polymer science development in South Africa. She noted that Sasol has three key funding initiatives in place and uses a hub and spoke model to facilitate research funding. As Stellenbosch University was recognized as the strongest university in teaching and research in polymer science, it was assigned as the secondary hub (Sasol remains the primary hub). Funding is therefore aimed at improving infrastructure and existing teaching capabilities, as well as at leveraging Stellenbosch Polymer Institute's capability to develop and strengthen other polymer spokes in the country. Sasol Polymers supports an international expert in polymer analytical chemistry in line with the South African Chairs initiative. This was done specifically because no such

Improving Analytical Chemistry in South Africa

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expertise existed in South Africa. The chair serves to significantly enhance existing teaching and research capability and also to help attract high-caliber South African students into polymer science.

Vicky Anderson (Anglo Research) focused on the challenges associated with running a lab that deals with environmental samples in which there is demand for lower detection limits and increasing complexity in the sample composition. She stated that the Anglo research lab has shifted its focus from occupational exposure to hazardous chemicals in air, especially sampling and analysis of air-nickel. Some of her concerns for a nonspecialist laboratory were the ability to stay abreast with technology developments as well as a low data throughput. She attributed the low throughput partly to the lack of background information on the samples as well as to the availability of certified reference materials. She again highlighted the importance of sample handling and concluded that it was a major component of uncertainty in analysis. Hence, from a regulatory perspective, the uncertainty of the analysis should be reported to understand the significance of the final number obtained.

Arie Dercksen of the South African Association for Food Science & Technology provided an account of the development of analytical techniques, particularly gas chromatography and mass spectrometry and how they impacted on quality monitoring especially in the food and beverage industry. Despite all the analytical developments and state-of-the-art instrumentation, he argued that good chemical knowledge and intuition are still important ingredients in developing analytical techniques. Hence, a day in the library can serve a chemist for a month in the laboratory, he said.

Jonathan Okonkwo (Tshwane University of Technology) gave an overview of the challenges faced in water and environmental analysis, which are mainly the low concentration of analytes, complex sample matrices, and an increasing number of analytes whose immediate impact on health is still unknown. He argued that natural processes were being disrupted by anthropogenic activities. Such a trend poses a threat to the quality of life necessitating the need for analytical methods that can monitor the extent of disruption. He indicated that environmental standards for air, water, and soil quality were established to protect human health and thus ensure the long-term sustainability of an environmental resource. However, he believes that the major challenge rests in monitoring and that is where analytical chemistry plays a major role since concentrations of pollutants are generally low and the matrices of samples are complex. He also urged the development of more sensitive methods to deal with trace amounts of pollutants in water and air.

Thabo Moloi and **Gerhard Gericke** (ESKOM) reported on the Tertiary Education Support Programme in place at ESKOM's academy of learning, which offers programs in environmental water treatment, electrocatalytic processes, nanotechnology, fuel cells, and ash chemistry. They provided funding to students so they may pursue M.Sc. and Ph.D. degrees after their Bachelor's degrees, and, in some cases, they are encouraged to become part of the lecturer pool at a particular university. Their vision is to develop expertise and establish a pool of skilled researchers and sustainable centers of excellence.

Sibulelo Vilakazi (Mintek's Advanced Material Division) discussed the company's research and development of nanostructured materials and their applications in health, water, and related areas. She said that Mintek views fundamental research and generation of knowledge as the role of universities and that Mintek's contribution to the triple helix involves the next step, whereby this knowledge is applied through innovation and development into marketable products. For example, she said, Mintek acquired nano-gold particles technology and is developing it for use in selective drug delivery in obesity research and in test kits for TB. These point-of-care diagnostic kits could be used in remote parts of the country.

Ralf Zimmermann (University of Rostock, Germany) described how the triple helix is driven in Germany. As an example, he used the health effect of ambient aerosols and the analytical challenges associated with them. He informed participants that legislation by government forces industry to be involved in environmental monitoring to ensure compliance. However, for industry to achieve this, it needs the universities which are involved in developing methods and using advanced analytical equipment. In Germany, the government funds fundamental research and industry has the responsibility of funding applied research.

Mathoto Thaoge-Lefyedi, the government representative from the Department of Science and Technology, reported on the Human Capital and Knowledge Development program. She said they spend a lot of time on science and technology awareness and they understand the shortages in M.Sc. and Ph.D. candidates and have set targets to increase

these numbers. She described an internship program where recent graduates are placed in industry for in-service training while their salaries are paid by DST.

Thaoge-Lefyedi raised concerns over the low scientific publications in ISI journals, absence of an innovation culture in South Africa, and the decrease in the number of science graduates. To address these issues, she said, DST has increased its support of faculty chairs and funding of research and development. She emphasized that a higher proportion of university staff need to be trained to the Ph.D. level and there needs to be a major increase in the number of Ph.D. students. She challenged industry to play a role in sponsoring post-doctoral fellowships and to create placement opportunities through professional development programs.

Open Discussion Session

After the presentations, workshop participants had the opportunity to deliberate on all aspects of the workshop. The following were some of the key points raised:

Training and Curricula

There is generally not enough analytical chemistry taught even at the top six South African universities. The level of competence in this area has decreased for most graduates simply because of the lack of the industrial attachment component (graduates have very limited practical analytical experience and no knowledge of quality-management systems). There is a crucial need for academia to spread the training from technicians to specialists in areas of analytical chemistry and to develop analytical chemists for quality management. Mentoring of math and science teachers by graduates and retired experts was seen as important for the human-capacity development chain.

Continued Professional Development

Even though there is a need to continuously offer bridging and refresher courses, generally the level of participation has been limited. Participants felt that some degree of success was being achieved in areas such as chromatography compared to others. Participants expressed the need for additional short courses in basic spectroscopic methods and asked that SASS, SAAMS, ChromSA, and SACI look into facilitating this.

Recognition of Analytical Chemistry

There is a lack of appreciation for the role of analytical chemistry in the value chain according to participants. They were surprised that analytical chemistry had not been included in the SAR chairs program. The government representatives in attendance acknowledged and recognized that there has been no focus on analytical chemistry as a discipline in South Africa. Since it is a core science that supports several sciences, the matter will be discssed at DST.

Infrastructure and Human Capacity

Some participants suggested that having centralized national facilities for very expensive equipment would be an effective way of managing the shortage of advanced analytical equipment. No single university has the funding available to keep their analytical facilities updated. A national facility could also be used for forensic and regulatory activities as well as for agriculture and environmental surveys. Even developed countries see the need for creating a large national facility to ensure a critical mass of specialists and infrastructure in tackling routine and especially nonroutine tasks. Someone used the dioxin scandal in the Belgian poultry industry as an example of what dangers might befall South Africa's agricultural exports without adequate analysis capabilities. There is simply no facility on the whole continent that would be able to verify or to counter allegations of trace contamination of South Africa's produce—let alone search for and eliminate the source of contamination. The participants recognized, however, that there would be a need to train extensively to supply the required expertise for such a facility.

Promotion of Analytical Chemistry

Participants agreed that one of the best ways to foster recognition of analytical chemistry would be through direct links with parliament. Publicity through print media should also play a role in the advancement of the field in South Africa.

A Global Experiment for the International Year of Chemistry

by Tony Wright and Javier Garcia Martinez

In 2011, the International Year of Chemistry,* school students around the world will be invited to explore one of Earth's most critical resources, water. The results of their investigations will contribute to a Global Experiment, which will possibly become the biggest chemistry experiment ever.

The global experiment—an initiative of the IUPAC Committee on Chemistry Education—has been developed to appeal to students from primary school to senior high school. The activities that make up the experiment will help students appreciate the role of chemistry in issues of water quality and purification. At the same time, students will contribute to an online global map, reporting on their investigations of water quality and water treatment.

The Global Experiment directly addresses the IYC goal of "Increasing the public appreciation and understanding of chemistry in meeting world needs and encouraging interest in chemistry among young people." The central theme of the experiment will be Water: A Chemical Solution. This will provide an outstanding educational opportunity to learn about the key role of chemistry in providing clean, safe water and the challenge of meeting the Millennium Development Goal of greatly improving access to safe drinking water before 2015. This activity will be used to emphasize the close relationship between water and climate change, human health, and energy security.

The theme for the global experiment project—"Water: A Chemical Solution"—implies the dual meaning of "solution." First, solutions are the answers that chemistry can provide to questions about delivering safe water to people all over the world. Second, in the chemical sense, the term is helpful for introducing important chemical principles such as pH, salinity, and solubility.

In the global experiment, teachers will involve classes of students in the investigation. Consider for a moment how many students might participate—100 countries, 1 000 schools per country, 10 classes per school, and 10 students per class would lead to millions of participants and a giant experiment! With such an extensive reach comes a responsibility to achieve valuable educational goals. The context of water provides relevance and the experiment will give students learning experiences that are engaging and edifying so that they learn valuable practical skills and useful chemistry. At the same time, students will discover the power of chemistry to provide reliable information and data within our society.

. . . students will discover the power of chemistry to provide reliable information and data within our society.

The Activities

The activities that make up the experiment have been designed to require minimal equipment and resources, but at the same time, allow increasing levels of sophistication. Four activities, which are being tested, have been developed to examine local water sources:

- Two activities related to water treatment involve purification by filtration and evaporation. The filtration activity will investigate local water treatment methods and results will be reported on a

* For further information go to the International Year of Chemistry website at www.chemistry2011.org.

global map. This activity can be elaborated to investigate disinfection.

- The other two activities will involve tests relating to water quality, namely measuring acidity and salinity. The measurements also will be reported on a global map.

These activities have been designed to be used as a stand-alone experiment for classes that want to participate in the event, or to be built into an existing water-related curriculum unit. Many science or environmental units in existing school curricula involve more extensive measurements of water quality and treatment and will require, at the most, minor adjustments to include reporting for the global maps. The resources provided can simply be added to those already used in the school. In the other cases, the resource materials will provide detailed procedures and background knowledge to allow teachers at each level of schooling to implement them with their class and enjoy the reporting of results to the global maps as a culminating event.

A young girl fills a family water pot from a nearby well refurbished by the UN Children's Fund to make clean water accessible to villagers and meet one of the Millennium Development Goals (March 2008, Korhogo, Côte d'Ivoire).
UN Photo/Ky Chung.

A fisherman in Baucau, East Timor, casts a net in the water to catch small fish (December 2008).
UN Photo/Martine Perret.

Dissemination

The Global Experiment is generating interest among a wide variety of organizations in science and in education. Collaboration and support will be critical for the dissemination and implementation of the experiment:

- National adhering organizations affiliated with IUPAC or UNESCO will be invited to join in the process of distributing information and resources associated with the Global Experiment. Their collaboration will be acknowledged on the Global Maps and they will be able to draw on the results of the experiment for their own use.
- Active partnerships with national and transnational organizations, both chemical and educational, are being explored and arranged to help the process of developing the infrastructure for the experiment and its dissemination. Organizations such as the European Chemical Industry Council, CEFIC, and the American Chemistry Council are providing direct support. The European Schoolnet is providing support and expertise in both development and implementation through its European members and international associates.
- Partnerships with organizations specifically focused on water issues (e.g., the organizers of World Water Monitoring Day, the Water Environment Federation, and the International Water Association) are being discussed.

Dissemination of the experiment to countries that do not have affiliated organizations will be carried out through invitations to national education authorities and by direct communication via the Internet.

The resources for the experiment will be placed on the Global Experiment website along with a link for teachers to register their school or class. This will limit the volume of conventional mail required for schools without Internet access.

Sponsorship is being sought for kits that would be distributed to areas in which schools have few science resources. The kits will contain sufficient materials so that the students can participate in the data collection for the Global Experiment.

The Experiment

The Global Experiment will be launched early in the International Year of Chemistry. A dedicated website will be open for data submission at that time and will remain available through the culminating event. The experiment is being developed as a stand-alone student investigation that will mesh with material that many schools already cover around the topic of water. The experiment will offer a range of participation levels.

It is expected that most teachers will work with their classes to carry out the four activities, which will have explicit instructions and background materials. These will be helpful for teachers who don't have science backgrounds. In their current round of testing, the activities give students the opportunity to learn about two ways in which chemistry contributes to our understanding of water quality and water treatment. The activities cover important topics and conceptual understanding in science and also provide a variety of opportunities to learn important experimental and data gathering skills.

- Acidity: Students will use colorful indicators, either from their school's supplies, or from the resource kit, to measure the pH of their local body of water. They will be learning about acidity, one of the most common chemical properties encountered around the home. At the same time they will be learning good experimental techniques to test the reliability of their results. Combining the results for the class will provide a robust result that can be recorded on the Global Map.
- Salinity: The salinity activity will give students the opportunity to use either a homemade or commercial meter to measure the conductivity of water samples. Students will learn about salts and determine concentrations of salts in solutions.
- Filtration: In the filtration activity students will use household materials to build a water filtration unit and identify the efficiency of different filtration materials. Then, as a follow up, they will carry out a treatment of the water. In addition, they will research the methods of their local water treatment plant and report the results of their research to the Global Experiment website.
- Solar Still: Students will explore an alternative way of purifying water using a solar still, learning about the distillation process and the states of matter. The activity will provide students with the opportunity to design and build their own more efficient stills.

Alternatively, teachers can select to undertake a single activity if they want their students to collect some data and contribute to the Global Experiment without using the other activities, perhaps because water is studied at a different year level. If, on the other hand, an existing curriculum unit studying water is part of the curriculum during 2011, appropriate parts of the Global Experiment activities can be added selectively to the existing curriculum and give students the chance to participate in the experiment.

A group of Australian science teachers test one of the activities for the IYC Global Experiment.

A Global Experiment for the International Year of Chemistry

In the Classroom

The Global Experiment has been designed for use across a range of educational settings. Each of the activities comes with resources to help teachers implement the activities at the level of sophistication appropriate for their classes. For example, the acidity activity, with the working title of measuring the "pH of the Planet," has been written for three levels of students:

- In the middle or upper primary school, students are introduced to acidity as a concept related to experiences they have had in the home. They learn about pH simply as a number associated with acidity. In an ancillary activity, teachers are encouraged to explore acidity with their students using homemade red cabbage indicators.
- In the junior high school where students are learning about ions and simple chemical formulae, they learn to associate acidity with hydrogen ions and the strength of acids.
- In senior high school they learn about the logarithmic relationship between hydrogen (or hydronium) ions and pH. At the same time, they extend their measurements of pH with pH meters if they are available in the school.

The Global Experiment has been designed for use across a range of educational settings.

The Website

The interactive Global Experiment website will be the central source of information both for schools and for other interested groups. The site will be the sole portal for reporting data from the experiments. Resources being developed for the project include the following:

- A toolkit for schools containing the necessary materials for carrying out the activities. These materials will be available for downloading and will include a teacher guide, activity protocols, suggestions for how the activities could be integrated into the curriculum, and guidance on how and where to order special equipment. Logos and branding materials are being developed for publicizing the experiment within schools and in the wider community.
- A registration site for schools where teachers can register their interest in the project and sign up their school to the activities.
- A mapping tool that will that will both display the global data as it is submitted and also display school information, including a Google map of schools taking part in the experiment.
- School coordination tools that will facilitate collaboration and data submission and may include file archives, an internal messaging system, and chat groups and forums. The possibility of students being invited into this space for debates and/or chats with experts is being explored.

The Global Experiment Task Group

So far, the task group for the Global Experiment includes folks from fields, sectors, and regions far and wide, demonstrating the wide interest and global reach of the project:

- Franco Bisegna, Claudine Drossart, and Madeleine Laffont, CEFIC
- Mark Cesa, INEOS, USA and IUPAC Organic and Biomolecular Chemistry Division, and IUPAC Committee on Chemistry and Industry (COCI)
- Robert Bowles and Richard Porter, RSC
- John Bradley and Erica Steenberg, University of the Witwatersrand, Johannesburg, and CCE Microchem project
- Filomena Camões, University of Lisbon and IUPAC Analytical Chemistry Division
- Johanna Coleman and Jacqueline Haider, BASF
- Javier Garcia-Martinez, University of Alicante, IUPAC Inorganic Chemistry Division and IUPAC Committee on Chemistry Education (CCE)
- Julia Hasler, Magalie Lebreton, and Rovani Sigamoney, UNESCO
- Colin Humphris, IUPAC Bureau and IYC Management Committee
- Alexa Joyce, SchoolNet
- Masahiro Kamata, Tokyo Gakugei University
- Frances Lucraft, International Water Association
- Mary Ostrowski and Ben Zingman, American Chemistry Council
- Cristiane Reiners, Universität zu Köln and CCE
- Lida Schoen, CCE and the Young Ambassadors for Chemistry program
- Tony Wright, The University of Queensland, Australia, and CCE

Tony Wright <tony.wright@uq.edu.au> and Javier Garcia Martinez <j.garcia@ua.es> are joint chairs of the Global Experiment Subcommittee of the IUPAC Committee on Chemistry Education and of the IUPAC Global Chemistry Experiment for the International Year of Chemistry project.

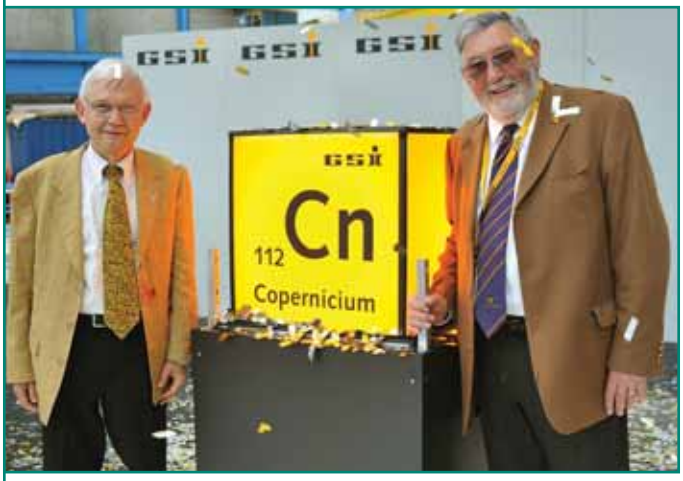
Naming Ceremony for Element 112 in Darmstadt

On 12 July 2010, the chemical element with the atomic number 112 was "christened" copernicium at the Gesellschaft für Schwerionenforschung (GSI) in Darmstadt, Germany, where it was discovered. This symbolic christening celebrated the element's eternal entry into the periodic table of elements. Copernicium is 277 times heavier than hydrogen and the heaviest element officially recognized in the periodic table. Its name honors the great astronomer Nicolaus Copernicus (1473–1543).

The July 2010 celebration of element 112 at Gesellschaft für Schwerionenforschung (Center for Heavy Ion Research) in Darmstadt, Germany.

IUPAC Treasurer John Corish, former president of the Inorganic Chemistry Division, participated in the ceremony. Corish is the corresponding author on the IUPAC 2010 recommendations releasing the name and symbol of the element with atomic number 112.

Element 112 was discovered by an international team of scientists headed by professor Sigurd Hofmann at GSI. The new element has officially carried the name copernicium and the symbol "Cn" since 19 February 2010.* Naming the element after scientist Nicolaus Copernicus follows the longstanding tradition of choosing an accomplished scientist as eponym. Copernicus' work in astronomy is the basis of our modern world view, which states that the Sun is the center of our solar system with the Earth and all the other planets circling around it.



IUPAC Treasurer John Corish (right) and Gottfried Münzenberg, a driving force in the GSI team.

Copernicium is the sixth chemical element that GSI scientists discovered and named. The other elements carry the names bohrium (element 107), hassium (element 108), meitnerium (element 109), darmstadtium (element 110), and roentgenium (element 111).

*www.iupac.org/publications/ci/2010/3202/iw1_copernicus.html
www.gsi.de/portrait/presse/Pressemeldungen/12072010_e.html

InChI 1.03 Released

The InChI Trust and IUPAC are pleased to announce the release of a new version of the IUPAC International Chemical Identifier (InChI) software. Version 1.03 of the open source software was made available on 28 June 2010.

The InChI algorithm turns chemical structures into machine-readable strings of information. Among other enhancements, version 1.03 integrates the generation of the standard InChI string and nonstandard, customized strings. The standard InChI/InChIKey should be used as a public identifier to allow linking and interoperability. Options to generate the nonstandard InChI within the same package make it easier for organizations to use these additional options within their internal systems allowing them to conform to their business rules.

Developers and users can download the new software from <www.iupac.org/inchi/download>.

Version 1.03 also fixes a number of minor bugs, with respect to stereochemistry. It clarifies how undefined/unknown stereochemistry is handled, and clarifies some structure perception and stereo interpretation option issues.

"For the first time, users can generate both the standard and nonstandard versions of InChI from the same software." says Jason Wilde, chair of the InChI Trust. "This release also marks the first of many public outputs from the newly formed InChI Trust."

IUPAC and the InChI Trust recommend the use of the standard InChI, an interoperable standard, as it enables linking between journals, databases, and other sources of chemical information. This interlinking is one of the major advantages of the InChI standard.

Originally developed by IUPAC, InChIs are unique to the compound they describe and can encode absolute stereochemistry. The InChI was developed as a new, nonproprietary, international standard to represent chemical structures. The software is open source, with ongoing development done by the community.

Formed in 2009, The InChI Trust is a not-for-profit organization, established to expand and develop the InChI chemical structure representation algorithm. InChI Trust Members and Associates help support, shape, and direct the Trust's ongoing development: ACD/Labs, ChemAxon, Elsevier, FIZ CHEMIE, Informa/ Taylor & Francis, IUPAC, Microsoft, Nature Publishing Group, OpenEye, The Royal Society of Chemistry, Symyx Technologies, Thomson Reuters, and Wiley.

For further information, contact Project Director Stephen Heller <Steve@InChI-Trust.org>.

www.iupac.org/inchi
www.inchi-trust.org

Noureddine Yassaa Awarded the 2010 CHEMRAWN VII Prize

The 2010 CHEMRAWN VII Prize for Atmospheric and Green Chemistry has been awarded to Noureddine Yassaa of the Faculty of Chemistry, University of Sciences and Technology Houari Boumediène, Algiers, Algeria.

Yassaa received the award in recognition of his outstanding research on the occurrence and the chemistry of gas- and particulate-phase organic compounds present in the atmosphere, employing both laboratory and field measurement techniques. These compounds include species with carcinogenic and mutagenic properties and/or acute toxicity, as well as nontoxic species that may contribute to the greenhouse effect, stratospheric ozone depletion, or ozone and hydroxyl radical generation in the troposphere. He has published more than 30 scientific articles in peer-reviewed journals on such subjects as gas chromatography, mass spectrometry, emission and flux measurements of volatile organic compounds, and the sampling and analysis of pollutants in air and airborne particles. He has recorded measurements of hundreds of organic species including organonitriles, carbonyls, organohalides, terpenes, organosulfur compounds, and aromatic species across the globe.

CHEMRAWN Prizewinner Noureddine Yassaa.

This inaugural CHEMRAWN VII Prize comprises a plaque and a cash award of USD 5000. The plaque is signed by IUPAC President Nicole Moreau, Gerrit-Jan Koomen, chair of the Prize Selection Committee and president of the Organic and Biomolecular Chemistry Division, and IUPAC Secretary General David StC. Black.

This award was first conceived through the cooperative efforts of the CHEMRAWN VII Future Actions Committee and the Organic and Biomolecular Chemistry Division of IUPAC to recognize a young scientist from a developing country whose research contributes to the field of green chemistry, while emphasizing atmospheric chemistry.

Noureddine Yassaa was born and raised in Algiers, Algeria. He completed his studies in chemistry at the University of Sciences and Technology Houari Boumediène (USTHB) in Algiers, where he received the High Studies Diploma in Chemistry (Baccalaureate + 4) in 1995 after graduating first in his class. Thereafter, he obtained a Master's Degree in Applied Organic Chemistry at USTHB in 1997 and a Doctorate in Applied Organic Chemistry in 2001. He is currently a professor in the Faculty of Chemistry at USTHB and is also the Group Leader of the Analysis of Organic Pollutants in the Environment Research Group in the Laboratory for Functional Organic Analysis. In 2003, Yassaa was named the Best Young Researcher in Algeria, an achievement for which he received the Emeritus Medal from the National Conference of Universities. He also was awarded a special medal in 2007 from the Algerian Ministry of Environment for his work in environmental chemistry.

A 60-Year-Old Journal Reborn

The *Israel Journal of Chemistry*, which celebrated its 50th volume this year, has undergone a major transformation aimed at enhancing its international visibility and increasing its influence. This metamorphosis involved the translocation of the IJC from its previous publisher, Science From Israel, LPPLtd., to its new home at Wiley-VCH. At the same time, the IJC has become the official journal of the Israel Chemical Society. As of 2010, the IJC features a new cover format, new article layouts, conference reports, science news, online submission of manuscripts, Early View (online publication of individual articles in advance of issue publication), and many advantages that characterize the other top chemistry journals published by Wiley-VCH.

The IJC, which has a 60-year tradition of publishing seminal research results, is an international, strictly peer-reviewed forum for special issues on timely research topics in all fields of chemistry. Each topical issue is edited by one or several Guest Editors and primarily contains invited, short review articles of approximately 10 journal pages. Volume 50, 2010, representing a transition period, will comprise six issues, while all of the following volumes will consist of 12 issues.

Although the IJC does not accept independently submitted manuscripts, leading scientists worldwide are encouraged to consider becoming Guest Editors of future issues on specific topics at the forefront of the chemical sciences.

For inquiries, questions, suggestions, contact Editor-in-Chief Ehud Keinan <keinan@technion.ac.il>.

www.ijc.wiley-vch.de

IUPAC/ACS 2011 Challenge Grants

In 2007, the American Chemical Society (ACS) Board of Directors approved funding for challenge grants to encourage scientific contributions to the IUPAC 2011 World Congress, which will take place 30 July to 7 August 2011 in San Juan, Puerto Rico. The grants were intended to help the Colegio de Quimicos de Puerto Rico in its bid to host the event—to be held in Latin America for the first time.

The IUPAC 2011 scientific organizing committee and its challenge grant review panel selected three challenge grant applications to receive support to organize symposia for the 2011 IUPAC World Congress:

- "Physical-Chemical Techniques to Solve Environmental Challenges," Laura L. McConnell, research chemist, USDA-ARS
- "Challenges for Materials Chemistry in the 21st Century," Leonard V. Interrante, chair, IUPAC Interdivisional Subcommittee on Materials Chemistry, Department of Chemistry and Chemical Biology, Rensselear Polytechnic Institute
- "Are Women Still Underrepresented in Science?," Ingrid Montes, professor of chemistry, Department of Chemistry, University of Puerto Rico at Río Piedras

The 2011 IUPAC World Congress in Puerto Rico is a cornerstone event of the 2011 International Year of Chemistry.

"Physical-Chemical Techniques to Solve Environmental Challenges"

Advances in environmental science are occurring rapidly with the introduction of new analytical approaches to better characterize the chemical and physical interactions between pollutants and complex natural systems. Large databases of important physical and chemical properties of pesticides and other organic and inorganic pollutants exist for use in environmental fate models. However, the fate of these pollutants will also be strongly influenced by the chemical nature of the heterogeneous environmental compartments like sediments, colloids, soils, atmospheric particles, and living organisms. The nature of environmental compartments will vary widely in different parts of the world, influencing the distribution, transport, and persistence of compounds. Scientists are utilizing innovative analytical techniques and technologies to

better characterize natural media and the interaction of pollutants with these media in order to understand and solve environmental problems. This symposium will highlight some of the newest developments in this field of research with respect to analytical technologies, environmental problems, and regions of the world.

This symposium is a partnership among the IUPAC Division of Chemistry and the Environment, the Agrochemicals and Environmental Chemistry Divisions of ACS, and the Society of Environmental Toxicology and Chemistry. The two-day symposium will be organized by representatives of all four organizations, including Edgard Resto-Rodríguez, IUPAC national representative from Puerto Rico.

"Challenges for Materials Chemistry in the 21st Century"

The goal of this symposium is to illustrate how materials chemistry has contributed, and will continue to contribute, to many important needs of society. Rather than general poster sessions, two or more workshops in various areas of materials chemistry will be offered in the evenings. Potential topics under consideration include Materials Chemistry Approaches for Energy Generation (solar H_2, thermoelectrics); Nanostructured Carbon for Fuel Cells, Batteries, Structural Reinforcement and Electronics; and New (Non-Carbon) Materials for Energy Storage. The workshops will be open to all Congress registrants and involve the active participation of experts in the chosen areas.

"Are Women Still Underrepresented in Science?"

Over the years, the representation of women in science, technology, engineering, and mathematics (STEM) has provoked worldwide discussion. Research has offered a number of possible explanations for lower numbers of women in these fields: education environments, lack of role models, and poor preparation and lack of encouragement in STEM subjects, among others. It has also been suggested that underrepresentation is mainly a cultural phenomenon and that policies can affect workforce diversity. With this in mind, a full day program will be held at the Congress in order to recognize the contributions of women to chemistry.

The program will start with a plenary lecture by Ada Yonath, the 2009 Nobel Prize winner in chemistry. This will be followed by a full-day symposium to discuss statistics in different countries, possible causes of underrepresentation, and ongoing challenges around the world. Each presenter will also discuss the attitudes, behaviors, opportunities, and resources that lead to their success.

Following the symposium, the play *A Living History of Marie Curie* by Susan Marie Frontczak will be presented. The presentation will help meet the IYC 2011 objective of celebrating the 100th anniversary of the Nobel Prize in Chemistry awarded to Marie Sklodowska Curie. In addition, a brochure that will feature 12 eminent women chemists and Marie Curie will be distributed to participants of the Congress and online.

www.iupac2011.org

The IUPAC–Jiang Novel Materials Youth Prize

The IUPAC–Jiang Novel Materials Youth Prize is presented every two years on the occasion of the IUPAC International Conference on Novel Materials and their Synthesis (IUPAC NMS). The purpose of the prize is to promote international collaboration and understanding between developed and developing countries. The prize is given on the basis of scientific merit for independent research dealing with novel materials in the broadest context of fine chemicals, polymers, energy storage and conversion, nano materials, and other chemicals. Candidates must be not above 40 years of age as of 1 January in the year in which the prize is awarded and should also have at least six months of graduate study or working in at least one developed country and at least one developing country.

Call for Applicants

The next IUPAC conference NMS-VII, will be held in Shanghai, China, from 16–21 October 2011.

The prize is awarded to two scientists under 40 years of age whose research has had a major impact on novel chemical materials including their characterization, performance, and/or application.

The winner will be awarded USD 1000 plus travel and hotel expenses to attend NMS 2011, where he/she will present a keynote lecture.

Application materials should include the following information, and be submitted to the selection committee no later than 30 December 2010:

- name and business address
- biographical sketch, including education (college or university, location, major field, degree, year awarded) and work experience (position, organization, duties, dates)
- list of publications including papers, patents, unpublished reports, papers presented at meetings (please include a list of those you deem pertinent)
- honors, awards, and other supporting information
- scientific achievements
- one recommendation letter from one developed country where the applicant studied (at least graduate level) or worked for at least six months
- one recommendation letter from one developing country where the applicant studied (at least graduate level) or worked for at least six months

Submit applications to Prof. Yuping Wu <wuyp@fudan.edu.cn>.

www.nms-iupac.org

In Memoriam

Gerard Rieck, 1911–2010

Gerard Daniel Rieck died 11 May 2010 at the age of 98. He obtained his Master's Degree in chemistry from the Municipal University of Amsterdam in 1939; during this time he worked as a research assistant for Bijvoet for two years. From 1939–1941 he was a teacher at different high schools, after which he became a research scientist in the laboratory of physical chemistry of the Philips Lighting Division in Eindhoven. In 1945 he became group leader of this laboratory.

With some delay due to the Second World War, he received his doctoral degree from the University of Utrecht in 1945 on the thesis "X-Ray Diffraction Studies of the Crystal Structure of Alpha-Succinic Acid." From 1949–1959 he worked at the Philips Research Laboratories, mainly on X-ray diffraction studies and metal research. This work resulted in several papers on crystallographic aspects of tungsten crystals and wires and, in 1967, the book entitled *Tungsten and its Compounds*.

In 1959, Rieck was appointed professor at the chair of physical chemistry of solids at the newly founded Eindhoven University of Technology, a post he occupied until his retirement in 1982. Under his leadership, his research group published many papers on interdiffusion studies of metals, often resulting in new phase diagrams. In these studies, X-ray diffraction was an important tool (e.g., studies of texture-structure relationships in intermetallic diffusion). He liked teaching and illustrated his lectures with carefully prepared experiments.

Rieck performed several functions in the Dutch organization for crystallography (FOMRE). From 1952–1966 he was co-editor of volume III, *Physical and Chemical Tables of the International Tables for X-Ray Crystallography*; from 1966-1975 he was a member of the teaching Committee of the International Union of Crystallography, and several times he acted as Dutch delegate to the IUPAC General Assembly. Starting in 1963 he was a member of the IUPAC Commission for High Temperatures and Refractory Materials. From 1969–1979 he was secretary of the commission.

He held several positions in the Faculty of Chemical Engineering. Among others, he was dean from 1976 to 1982 and he was a member of the board of the university from 1971–1973. In these positions he showed his managerial capacities.

Gerard Rieck.

His favorite sport was Alpine skiing, which he continued until his 90th birthday, proud of being the oldest active Dutch skier.

Gerard Rieck was appointed by her majesty the queen as Knight of the Order of the Netherlands Lion.

Those who knew him will remember him as a kind and helpful colleague, able organizer, and involved teacher.

Assessment of Stable Isotopic Reference and Inter-Comparison Materials

While many school text books still consider the terrestrial abundances of the stable isotopes of the elements as constants and characteristic for the planet or for the solar system, this is not really true and needs to be refined. Some of the elements contain radiogenic isotopes, and the respective abundance changes can, for instance, be used for dating the age of stones or sediments. In particular, the light life-science elements carbon, nitrogen, oxygen, and hydrogen exhibit variations originating from fractionation processes:

- Upon evaporation, the water isotope ^{2}H is depleted in the gas phase, similarly ^{18}O. Conversely, during condensation, ^{2}H and ^{18}O preferentially accumulate in the liquid. Repeating this process, as is permanently happening in precipitation, can leave a larger trace in form of significant isotope abundance alterations, which form the basis for paleo-climatic investigations using ice cores from Antarctica or Greenland ice sheets.
- During photosynthesis, the light isotope ^{12}C in CO_2 is preferred, hence the resulting organic material is depleted in the heavier ^{13}C isotope. Generation of all living matter starts with CO_2 from air (or in the oceans). The $^{13}C/^{12}C$ ratio of CO_2 in air has varied very little over billions of years, hence all fossil organic carbon has a lower $^{13}C/^{12}C$ ratio (roughly 0.0110 instead of 0.0112).

The stable isotope ratio changes due to fractionation processes such as the ones above (there are many more in nature, in particular in living matter, where the reactions mostly are catalyzed and proceed close to the threshold) appear small; yet, they are both, significant and robust. They also can be analyzed reliably with specialized technology that was developed in the early 1950s. We now have more than 2000 stable isotope ratio laboratories world wide, and one of the major challenges is to have any two laboratories produce identical results from the same materials. Fractionation processes in general also happen during sample preparation (all carbon bearing material has to be converted to CO_2 for stable isotope measurement). Therefore, best results are obtained from identical chemical compounds or classes of compounds. This contrasts with the fact that international standards often are carbonates, water samples, or a few other compounds. There is a need for a larger chemical variety in stable isotope reference materials. Solving this problem entails accurate calibration of these materials.

Accurate calibration often is a major challenge, in particular for materials that are chemically very different or that have a large deviation in isotopic composition. Therefore, a number of calibration studies are always under way somewhere; the results of which are then published and the results made available (e.g., through NIST or the IAEA in Vienna). What we are missing is an authority that audits the respective analytical results and is capable of separating "the wheat from the chaff."

The project is aimed at producing an authoritative, citable reference table for Stable Isotope Ratio Reference Materials, with a biennial update cycle.

For more information contact Task Group Chair Willi A. Brand <wbrand@bgc-jena.mpg.de>.

www.iupac.org/web/ins/2009-027-1-200

Terminology and Definition of Quantities Related to the Isotope Distribution in Elements with More than Two Stable Isotopes

This new project, coordinated by the Inorganic Chemistry Division, will seek to define terminology and to identify the most suitable definitions of quantities that characterize the isotope distribution in elements with more than two stable isotopes, including so-called mass-independent fractionation, nonmass dependent fractionation, isotope anomaly, 17O excess, and other terms.

Most atmospheric oxygen-bearing species show deviations in their triple oxygen isotope ratios from mass-dependent fractionation (MDF) relationships predicted by the theories of Urey, Bigeleisen, and Mayer. Similar deviations have also been found in sulfur and other elements with more than two stables isotopes (e.g., Hg, Cd, Zn), often preserved in nonatmospheric reservoirs, including rocks, minerals, soils, ice, and waters. Despite the ubiquity of this type of isotope anomaly, there has never been an attempt to clearly define the terminology and physical quantities used to measure these anomalies and the processes

that lead to their formation. Terms like mass-independent fractionation, nonmass dependent fractionation, isotope anomaly, and isotope excess, have been used in the historic and recent literature, but are often not carefully distinguished.

The realization that MDF comprises a range of possible relationships between the isotopes of one element led to further complications because it meant that apparent isotope anomalies could be created by a combination of different MDF processes. At the moment, at least four different definitions to quantify isotope anomalies are being used. Furthermore, coefficients used in these definitions vary, which makes the comparison of data from different sources very difficult. A consistent set of recommendations on how to express and quantify the isotope distribution in elements with more than two stable isotopes is highly warranted. From our experience as academic teachers, we are woefully aware how impenetrable the field is for young researchers at the moment because of the lack of consistency and the lack of understanding between different groups. This project seeks to alleviate this situation.

For more information contact the task group chair Jan Kaiser <j.kaiser@uea.ac.uk>.

www.iupac.org/web/ins/2009-046-2-200

Postgraduate Course in Polymer Science

The Institute of Macromolecular Chemistry of the Academy of Sciences of the Czech Republic in Prague, Czech Republic, with its more than 100 scientists and a total staff of about 250, is among the largest laboratories devoted to basic research in polymer science worldwide. For 50 years, the Institute has offered postgraduate studies. In the mid-1990s, the Institute launched the Postgraduate Course in Polymer Science with the mission to enable young university graduates and Ph.D.s from countries with limited research facilities to acquire knowledge on recent advances in polymer science and professional skills needed for promotion of polymer science in their home countries. The course was granted UNESCO sponsorship from the beginning, with IUPAC adding its sponsorship soon afterwards. The course has gained international recognition as a most commendable educational activity in the IUPAC Polymer Division and was awarded the IUPAC-Samsung Education Prize for 2005 (see www.iupac.org/publications/ci/2005/2706/iw1_samsung.html).

So far, 13 iterations of the course have been completed, with the 14th in progress and the 15th starting in October 2010. Each course lasts 10 months and comprises about 50 hours of lectures in modern polymer science and experimental work on research projects under the supervision of senior scientists of the Institute. The results of the research are published in international technical journals and presented at meetings. As of 1 January 2010, the cumulative results of the Course held so far are as follows: 116 graduates, 152 papers published in international journals, and 201 communications at international meetings. The papers co-authored by the course graduates have been cited more than 2000 times. For a list of papers, see <www.imc.cas.cz/unesco/papersUI.html>.

The graduates of the 13 completed courses, students in the current course, and those admitted to the 15th course have been from the following 22 countries: Algeria, Bangladesh, Brazil, Bulgaria, China, Hungary, India, Iran, Kazakhstan, Macedonia, Mexico, Poland, Romania, Russia, Serbia, South Africa, Spain, Ukraine, Uruguay, Uzbekistan, Venezuela, and Vietnam.

Follow-up with graduates has shown that the Course has been very helpful for professional promotion of the graduates in their home countries. Cooperation with a number of alumni continues through joint projects with their home laboratories.

The 15th Postgraduate Course in Polymer Science will be one of the contributions of the Czech Republic to the International Year of Chemistry 2011.

For more information contact the task group chair Pavel Kratochvíl <krat@imc.cas.cz>

www.iupac.org/web/ins/2010-015-1-400

Toward Higher Quality of Chemistry Teacher In-Service Training in Croatia

The primary objective of this project is to organize the first Croatian Workshop on Chemical Education (1stCWCE), scheduled for 10–14 November 2010 in Split, Croatia. The workshops is intended to improve the process of in-service training of chemistry teachers in Croatia and the region and catalyze the dissemination process of in-service experiences between neighboring countries.

The Project Place

The project is planned as a continuing series of workshops on chemical education that will be held in Croatia. The short- and long-term goals of the project may be best described as follows:

- provide international support to the ongoing modernization of chemistry teaching/learning strategies at the primary and secondary education level in Croatia
- promote incorporation of inquiry learning, particularly the discovery-based small-group learning method, into the new Croatian Chemistry Curriculum and thus enhance the opportunities for students to learn chemistry in a meaningful way
- promote the needed awareness of research into the teaching-learning process in one's own classroom (this is defined as a basis for change and encouragement of this process (although with very modest expectations), which should be seen as a continuing activity
- give needed support to the institutionalization process of the graduate study Ph.D. in Science Education at the Faculty of Science of the University of Split
- create a dynamic and challenging atmosphere that will encourage career development of young chemistry teachers
- enhance social-networking of chemistry teachers in Croatia as well as in the geopolitical region and correspondingly enable further dissemination of good teaching practices, classroom activities, and teaching experiences
- help national chemical societies in the region to coordinate exchange of information and to reduce the differences in chemistry teaching caused by different social and political environments
- enlarge the number of experts acquainted with the inquiry learning strategy who are capable of training others

For all of this to happen, the support of IUPAC's Flying Chemist Program is vital because its assistance will certainly compel further enhancement of the existing collaboration between the neighboring countries National Chemical Societies and will enable the organizers to introduce participants to experts in the field. The Flying Chemists Program is an initiative of IUPAC's Committee on Chemistry Education; <http://media.iupac.org/standing/cce/FCP.html>.

For more information, contact Task Group Chair Nenad Judaš <judas@chem.pmf.hr>.

www.iupac.org/web/ins/2009-055-1-050

Provisional Recommendations

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

Terminology of Polymers and Polymerization Processes in Dispersed Systems

A large group of industrially important polymerization processes is carried out in dispersed systems. These processes differ with respect to their physical nature, mechanism of particle formation, particle morphology, size, charge, types of interparticle interactions and many other aspects. Polymer dispersions, and polymers derived from polymerization in disperse media, are used in diverse areas such as paints, adhesives, microelectronics, medicine, cosmetics, biotechnology and others. Frequently, the same names are used for different processes and products or different names are used for the same processes and products. The present list of recommended terms and definitions is necessary for the unambiguous description of processes, products, parameters and characteristic features relevant to polymers in dispersed systems.

Comments by 30 November 2010
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www.iupac.org/web/ins/2002-017-1-400

Crop Protection Chemistry in Latin America

by Kenneth Racke

More than 225 scientists, government regulators, and industry leaders representing some 20 countries gathered in balmy Rio de Janeiro, Brazil during 9–12 November 2009 to participate in the **3rd IUPAC International Workshop on Crop Protection Chemistry in Latin America**. The theme of the workshop was "Environment, Safety, and Regulation." A key objective was to encourage exchange of the latest information regarding harmonized approaches for scientific and regulatory evaluation of pesticides in Brazil and the surrounding region.

The workshop was organized by the National Association of Specialists in Residues, Contaminants, and Organic Pollutants, the Brazilian Chemistry Association, and the IUPAC Division of Chemistry and the Environment (DCE or Division VI). Leadership for the workshop was provided by Irene Baptista de Alleluia of GARP. IUPAC contributions were coordinated by Laura McConnell and Ken Racke. Key local organizing team leaders were Celso Augusto Caldas Fernandes of ABQ and Pedro Luiz de Freitas of EMBRAPA.

Participants in the three-day workshop had the opportunity to attend 38 plenary and invited lectures and view more than 50 posters organized around five major scientific topics. Along with many excellent scientific presentations from international and regional experts, the program included 10 IUPAC lecturers from the Division VI's Subcommittee on Crop Protection Chemistry, who highlighted the findings and recommendations of several IUPAC projects. [1–7]

Innovative Chemistry and Technology for Crop Protection

Increased agricultural production in Brazil and other Latin American countries will be critical to meet the world's burgeoning requirements for food and fiber, and intensive investments in innovative research efforts will be required.

Gerry Stephenson of the University of Guelph, Canada, pointed out that the population of South America is expected to reach 500 million by 2050, and this increase will present significant challenges for increased efficiency of agricultural production. Pesticide use for management of insect, weed, and disease pests has played an important role in doubling the theoretical food crop yield experienced since 1965. Worldwide sales of agricultural pesticides have exceeded at least USD 20 billion per year since the 1990s. Unfortunately, 30 percent to 40 percent of the theoretical yield is still being lost today due to pest impacts, so additional efficiencies are required to continue to meet the world's needs without bringing more of the world's marginal lands into production. Stephenson noted that the increased efficiency derived from use of agricultural pesticides had, during the past half-century, saved conversion of one-half of today's forested land to food production.

José Otavio Menten of ANDEF, Brazil, emphasized that pesticides are particularly relevant for tropical agriculture, where pest pressures are often experienced with greater frequency and more severity than in the temperate zone. He noted that agricultural production in Brazil recently had increased to the point where the country is now numbered among the top users of pesticide chemicals in the world. To continue to provide new and safer tools for pest management and stay ahead of pest resistance development, intensive R&D efforts are required. Introduction of one new chemical pesticide may involve screening of more than 200 000 candidate molecules and can take 10–12 years and an investment of USD 300 million for completion of development, safety, and environmental testing.

Areas of emphasis for industrial R&D efforts were highlighted by Ken Racke of Dow AgroSciences, USA, and Keiji Tanaka of Mitsui Chemicals Agro, Japan. Racke noted that there has been an increased emphasis on developing pesticides with enhanced human safety and reduced environmental impact as part of a "reduced risk" initiative that originated in the USA in the mid–1990s. Based on a government-industry cooperation that accelerates regulatory evaluation and approval for successful candidates, nearly 50 new, reduced-risk active ingredients, including several biopesticides, have been introduced for agriculture in the USA and worldwide since 1994. Tanaka emphasized the efforts of industry in developing products that provide effective pest management with reduced environment loading (20–100 g/ha active ingredient instead

of 1000–3000 g/ha) and with advanced formulation and delivery technologies that minimize worker exposures (e.g., water-soluble sachets or tablets in place of jugs of high-volume liquid products). Finally, Maria de Fátima Grossi de Sá of EMBRAPA, Brazil, highlighted new developments for employment of biotechnology and genetic engineering to agricultural pest management. Introduction of genetically modified cotton, soybeans, and maize has already resulted in a shift to more effective and environmentally compatible weed and insect management practices in Brazil and other countries.[1,5] Research is now focused on new crops and pests, and Grossi de Sá highlighted ongoing efforts at EMBRAPA to develop crop plants engineered for resistance to soil nematode pests.

Risk Assessment, Regulation and Global Harmonization

Progress is being made toward the adoption of science-based and internationally-harmonized approaches to regulation of crop protection chemistry, but further efforts and increased Latin American participation is required.

Bernhard Johnen of CropLife International, Belgium, emphasized the principles of sound regulation and highlighted existing international treaties, conventions, and initiatives which provide the framework for harmonized approaches. Some of the most important principles include availability of a sound policy framework to ensure high standards of use and protection for human health and the environment, reliance on scientific principles and risk/benefit evaluation, and transparency of the regulatory process with clear roles defined for the various stakeholders.

Keith Solomon of the University of Guelph, Canada, outlined the importance of the risk assessment approach in the pesticide regulatory process. Risk assessment is a process of assigning magnitudes, probabilities, and relevance to the adverse effects that may result from a particular activity or set of activities and is critical in making correct decisions in evaluating new crop protection chemistry products and uses. Solomon emphasized the critical nature of integrating numerical estimates of toxicity, exposure, and the probability of exposure to support a more objective decision-making process.

The importance of adopting measures to ensure high-quality and reliable chemical and biological data for use in the regulatory evaluation process was emphasized by Elisa Rosa dos Santos of INMETRO, Brazil. Rosa dos Santos highlighted the "Good Laboratory Practices" or GLP system which was first developed for the pharmaceutical industry and more recently applied to the crop protection chemical industry. This intensive system of quality procedures, record-keeping, documentation, and independent auditing is applied to entire research facilities as well as to each individual study, and is increasingly being relied upon by the Brazilian regulatory authorities ANVISA, IBAMA, and MAPA.

Recent progress for international harmonization of evaluation and regulation of crop protection chemistry was highlighted by several government and industry lecturers. Volker Bornemann of BASF Corp., Germany, highlighted the efforts of the Organization for Economic Cooperation and Development (OECD) in the elaboration of a harmonized set of guidelines for human safety and environmental testing, and noted very recent progress with a harmonized guideline for pesticide residue testing in food crops. Jeff Herndon of the U.S. Environmental Protection Agency (EPA) outlined an innovative program of joint evaluations for new pesticide active ingredients initiated during the past several years. The OECD joint evaluation allows a single dossier of core studies to be simultaneously evaluated in multiple, cooperating countries through a work-sharing arrangement. Final risk assessments

Members of the IUPAC Subcommittee on Crop Protection Chemistry, including "Rio Organizers" (in front row, from left) Laura McConnell, Pedro Freitas, Irene Alleluia, and Ken Racke.

and regulatory decisions are left to the participating countries, but the result has been more harmonized outcomes of the evaluation process. So far, primary participants in the OECD joint evaluations have included Australia, Canada, Germany, UK, and USA, but both Mexico and Brazil are becoming increasingly active.

Environmental Chemistry and Risk Assessment

The need for agricultural production must be balanced by protection of environmental resources, and this will be facilitated in Latin American countries by more widespread adoption of risk assessment-based approaches.

Environmental fate and ecological risk assessment were important areas of emphasis for the workshop, particularly in light of growing environmental awareness in the Latin American region. Lecturers highlighted advances in understanding pesticide fate in soil, water, and air. Jan Linders of the National Institute for Public Health and Environment, The Netherlands, highlighted simulation modeling advancements for prediction of surface and ground water levels of pesticides in agricultural catchments. Cathleen Hapeman of the U.S. Department of Agriculture (USDA) summarized field research approaches to estimate pesticide movement in runoff sediment and water and evaluation of potential mitigation practices. Laura McConnell, also of USDA, shared recent developments in modeling and monitoring the fate of pesticides and other volatile agricultural chemicals in air. She also highlighted conclusions of the critical evaluation of methodology now being completed as part of an IUPAC project.[4]

Lecturers also placed significant emphasis on the need for integration of environmental fate and effects information to support the risk assessment paradigm. Rafaela Maciel Rebelo of the Brazilian Institute of Environment and Renewable Natural Resources highlighted current regulatory evaluation approaches and future needs for Brazil. At present, environmental management of crop protection chemistry in Brazil is based on a hazard classification and scoring system. There is a future need to better employ the principles of environmental risk assessment (probability, exposure, effects) in supporting the regulation of pesticides in Latin American countries, and two lecturers highlighted recent case studies.

The first study, presented by Joseph Dulka of DuPont, USA, involved a cooperative project between the Colombian government and CropLife Latin America for development of a tiered evaluation scheme for predicting pesticide concentration and impacts in surface and ground water. Without the tiers, simple screening examinations tend to trigger the need for extensive field monitoring studies. Standardized evaluation scenarios based on representative soil, climate, and crop conditions for Colombia were developed by adapting available dissipation and transport models utilized in the USA and European Union. This approach allows the regulatory authorities to make more rapid, science-based decisions using available data rather than waiting for months or years for additional studies.

The second case study was presented by Keith Solomon of the University of Guelph, Canada. It involved a cooperative effort between the University of Guelph and Universidad del Tolima, Colombia, and focused on evaluation of potential nontarget amphibian effects associated with herbicidal management of illicit cocaine agriculture. Based on comparing distributions of aerial spray deposition patterns developed from wind tunnel experiments with differential sensitivity of various amphibian species noted from laboratory studies, it was determined that the probability of adverse effects for the vast majority of scenarios could be reduced to negligible levels by employing a five-meter spray buffer setback.

Pesticide Residues in Food and Human Exposure

The need for agricultural production must be balanced by protection of human health, with emphasis placed on measures to ensure safety of consumers exposed to trace levels in food.

Several lecturers brought attention to evaluation of pesticide residues in food, and noted that the primary means of local management of pesticide residues in food is via establishment of maximum residue limits or MRLs. The MRL is defined as the "Maximum concentration of a residue that is legally permitted or recognized as acceptable in, or on, a food, agricultural commodity or animal feedstuff as set by Codex or a national regulatory authority,"[3] and is established for a particular pesticide/crop combination to reflect the

trace residues to be expected when farmers follow Good Agricultural Practice and approved labeling. In Brazil and several other Latin American countries, the evaluation process includes development of field residue trials to estimate the MRL, and as explained by Eloisa Caldas of the University of Brasilia, a dietary risk assessment is prepared to confirm safety of these levels. Luiz Cláudio Meirelles of ANVISA, Brazil, described the post-registration monitoring, which is coordinated by 37 regional laboratories distributed within the agricultural areas of Brazil. As exports of high-value commodities have increased in recent years, the level of residue monitoring activities has also had to increase.

Adélia Cristina Pessoa Araújo of the Institute of Technology of Pernambuco, Brazil, noted that for fresh fruits, the state lab had increased the number of samples examined per year for as many as 400 pesticides from fewer than 500 samples in 2002 to more than 3000 samples in 2008. As emphasized by Phil Brindle of BASF Corp., USA, one continuing challenge faced by farmers, food exporters, and the chemical industry is the lack of global harmonization of MRL standards among countries. As pointed out by Luis Rangel of MAPA, Brazil, the problem is particularly acute for various minor crops such as tropical fruits (e.g., papaya, mango, starfruit), which are often not grown in countries in the temperate zone so tend to lack MRLs in important destination regions such as the EU, Japan, and North America. Caroline Harris of Exponent, Inc., UK, and Eloisa Caldas of the University of Brasilia both emphasized the importance of seeking greater national recognition of the international MRL standards established via the CODEX process.

View of Rio Janeiro, site of the 3rd IUPAC International Workshop on Crop Protection Chemistry in Latin America.

Education and Information Management in Crop Protection

Adoption of sound evaluation approaches and good stewardship for the use of crop protection chemicals requires additional emphasis on education and training of regulatory authorities and farmers. In an era of information proliferation, there is a critical need for adoption of good information management practices including availability of up-to-date, electronic databases of pesticide properties.

The workshop included several lectures focused on education, training, and communication. Ron Parker of the U.S. EPA shared preliminary outcomes of an IUPAC project[6] designed to promote widespread availability of tools and training for environmental risk assessment. The e-VALUATE tool is an internet-based, pesticide ecological risk assessment and training module developed with support from IUPAC, FAO, and U.S. EPA. Both English and Spanish versions of the module have been developed, and training sessions or seminars have already been held in several countries including China, Costa Rica, and India.

Learning approaches and options for use within the laboratory context were described by Elizabeth Carazo of the University of Costa Rica. In cooperation with the FAO and IAEA, an internet-based, e-training system for such important topics as analytical residue methods, GLP, safety, and laboratory accreditation has been made available.[2] Training farmers and pesticide applicators for good stewardship practices was the subject of several lectures.

José Otavio Menten of ANDEF, Brazil, described industry efforts for promoting good product stewardship, which have included an emphasis on a "train the trainer" approach. He noted that during the past 20 years, around 32 000 trainers had participated in 500 industry-sponsored educational events organized throughout Brazil. Courses and training have focused on such practical aspects as integrated pest management, safe transportation and storage practices, use of appropriate personal protective equipment and clothing during mixing and application, and good waste disposal practices.

With respect to protective clothing and equipment for pesticide handlers and applicators, Hamilton

Humberto Ramos of the Agronomic Institute, Brazil, described improvement efforts of the past 20 years. Although Brazilian regulations dating from the late 1970s mandated the use of protective clothing, gloves, and respiratory devices, it has only been recently that his laboratory and others have developed quality standards for such materials and also sought to identify improved technologies. With respect to container disposal practices, Mário Kazuchira Fujii of the National Institute for Processing Empty Containers, Brazil, described the nationally mandated program of empty container recycling. Finally, John Unsworth, a consultant based in the UK, described the tremendous challenge for regulatory authorities, industry, and academia in managing the vast amount of information becoming available on crop protection chemistry. He described the internet-based system at http://agrochemicals.iupac.org, developed as the outcome of an ongoing IUPAC project.[7] The website has centralized and organized access to key electronic crop protection chemistry information including the IUPAC pesticide glossary, regulatory requirements and testing guidelines, GLP practices, pesticide profiles, and training resources.

Outcomes and Future Plans

As a consequence of holding the workshop in Rio de Janeiro, five new members were recruited to join the work of the Subcommittee on Crop Protection Chemistry, including scientists from Brazil, Colombia, and Uruguay. IUPAC has historically struggled to maintain good participation from Latin America, and participation of these new members will greatly assist crop protection chemistry efforts of IUPAC. Also, new IUPAC project proposals are under development to address three areas of need identified at the workshop: 1) development of better methods for extrapolating data on the soil fate of pesticides from region-to-region, 2) elaboration of regional guidance for harmonized assessment methods for crop protection chemicals, and 3) better estimation of volatility and pesticide inhalation exposure to workers. Finally, a project was agreed for industry sponsorship to translate the IUPAC pesticide glossary[3] and the noteworthy textbook *Pesticides and the Environment*[8] into the Portuguese language.

The IUPAC workshop in Rio de Janeiro was the 9th in a series of such crop protection chemistry-related workshops organized by the Division VI since 1988 and the 3rd to be held in Latin America. Past workshops have been held in Brazil (1996), China (1988, 2007), Costa Rica (2005), Korea (2003), Taiwan (2000), and Thailand (1992). The DCE Subcommittee on Crop Protection Chemistry is now considering proposals for the next workshop, and welcomes input and suggestions from the worldwide IUPAC community.

Lecture presentation slides have been posted to the workshop website <www.iupacrio2009.org/presentations.html>.

References

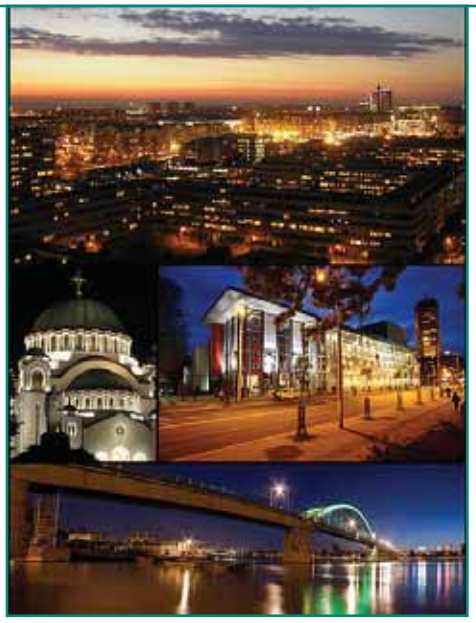
1. IUPAC Project 2001-024-2-600 (Kleter)
2. IUPAC Project 2003-013-1-600 (Carazo)
3. IUPAC Project 2004-002-1-600 (Stephenson); project outcome published in *Pure Appl. Chem.* 78(11), 2075–2154, 2006.
4. IUPAC Project 2006-011-1-600 (McConnell)
5. IUPAC Project 2006-015-3-600 (Kleter)
6. IUPAC Project 2008-011-2-600 (Parker)
7. IUPAC Project 2008-041-1-600 (Unsworth)
8. Stephenson, G.R., and Solomon K.R. 2008. *Pesticides and the Environment*. Canadian Network of Toxicology Centres, University of Guelph, 425 pp. ISBN 978-0-9808847-0-8. www.uoguelph.ca/cntc/educat/pesticide

Ken Racke <kracke@dow.com>, senior scientist with Dow AgroSciences in Indianapolis, USA, is past president of the IUPAC Division on Chemistry and the Environment, and has been active with the Subcommittee on Crop Protection Chemistry for several years. His interests include environmental impact assessment of pesticides, food safety standards for pesticide residues in food, and international harmonization of the regulation of crop protection chemistry.

www.iupac.org/web/act/Rio_de_Janeiro_2009-11-09

Electrochemistry

by Vesna Miskovic-Stankovic



Views of Belgrade, Serbia.
(Source: Wikimedia Commons).

The **2nd Regional Symposium on Electrochemistry of South-East Europe** (RSE-SEE) was held in Belgrade, in Congress Center Sava, 6–10 June 2010. The symposium was organized by the Bulgarian Electrochemical Society, Czech Chemical Society, Croatian Society of Chemical Engineers, Electrochemical Committee of the Hungarian Academy of Sciences, Chemical Society of Montenegro, Romanian Chemical Society, Electrochemical Division of the Serbian Chemical Society, Slovenian Chemical Society, and Society of Chemists and Technologists of Macedonia.

The mission and main objectives of the 2nd RSE-SEE can be summarized as follows: promotion of the power of electrochemistry in science and modern technology, creation and promotion of international cooperation and personal contacts among electrochemists, particularly among young researchers entering the field of electrochemistry, and establishment and maintenance of high-quality methods and standards in electrochemical research.

The 2nd RSE-SEE involved all fundamental and applied aspects of electrochemistry: Experimental and Theoretical Methods in Electrochemistry, Physical Electrochemistry and Analytical Electrochemistry, Organic Electrochemistry, Environmental Electrochemistry, Bioelectrochemistry and Biomedical Applications, Nanoscale and Molecular Electrochemistry, Energy Conversion and Storage Devices, Corrosion, Passivation and Anodic Films, Electrochemistry of Functional Structures and Materials, Electrochemical and Electronic Sensor Devices, Electrochemical Synthesis, Deposition, Electrolysis, and Engineering.

The 2nd RSE-SEE gathered 9 plenary lecturers, 18 keynote lecturers, and 197 participants from 27 countries. Papers were published in a book of abstracts and in a CD proceedings, while selections of plenary and keynote lecturers are available on the conference web page <www.rse-see.net>.

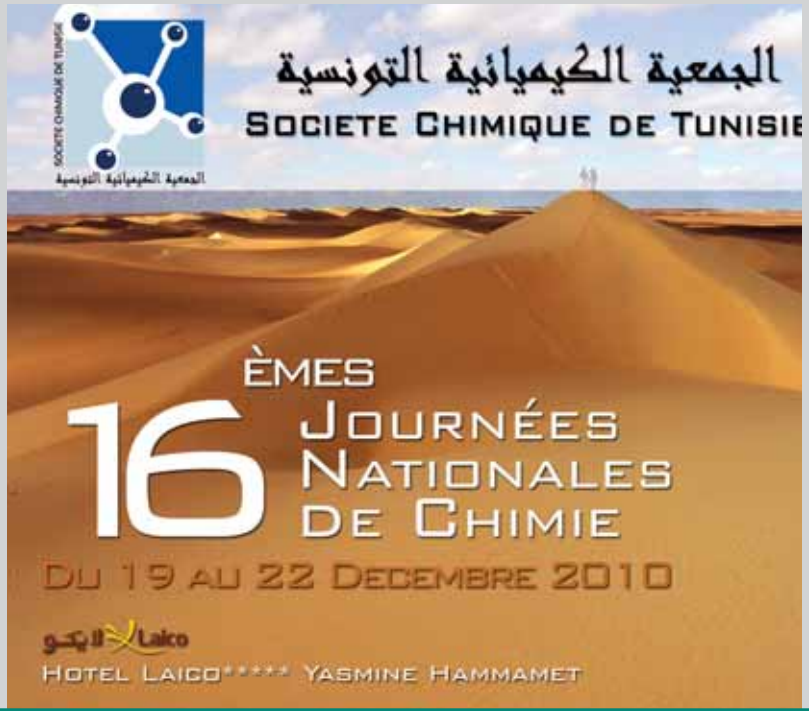
A one-day ISE (International Society of Electrochemistry) Satellite Student Regional Symposium on Electrochemistry, held 6 June 2010, was organized by young members of the Electrochemical Division of the Serbian Chemical Society in order to promote young electrochemists from the region by giving them an opportunity to exchange and discuss their experiences. A teaching lecture was given by Christos Comninellis, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland, and 17 participants from 7 countries presented 17 oral contributions.

The 2nd RSE-SEE was organized with the support of IUPAC; Organization for the Prohibition of Chemical Weapons; International Society of Electrochemistry; European Association for Chemical and Molecular Sciences; Ministry of Science and Technological Development, Republic of Serbia; Faculty of Technology and Metallurgy, University of Belgrade; Institute for Chemistry, Technology, and Metallurgy, University of Belgrade; and American Elements, Los Angeles, USA. The 2nd RSE-SEE received media coverage by *Info Review*, a magazine for business communications; RTS, the national television station, and TV Studio B.

Vesna Miskovic-Stankovic, IUPAC representative, made a brief presentation about the Union's support of the symposium. Informational material about IUPAC was displayed throughout the conference and was included in the conference material. Four invited lecturers and 10 students received IUPAC grants.

Eight lecturers have accepted invitations to submit manuscripts for publication in Pure and Applied Chemistry based on their symposium presentations: B. Grafov (Moscow, Russia), P.L. Bonora (Trento, Italy), P.L. Cavalotti (Milan, Italy), I. Milošev (Ljubljana, Slovenia), L.M. Murešan (Cluj-Napoca, Romania), G. Inzelt (Budapest, Hungary), T. Pajkossy (Budapest, Hungary), and V. Tsakova (Sofia, Bulgaria).

Vesna Miskovic-Stankovic <vesna@tmf.bg.ac.rs>, Faculty of Technology and Metallurgy, University of Belgrade, was the chair of the Organizing Committee for 2 RSE-SEE.



Chemistry in Tunisia

19–22 December 2010
Hammamet, Tunisia

www.sctunisie.org

IUPAC SPONSORED

Conducting Polymers

10–14 July 2011, Prague, Czech Republic

Conducting polymers are studied because of their conductivity, as functional materials, and for their ability to respond to external stimuli. Polyaniline and polypyrrole are typical, but are by no means the only, conducting polymers. They are investigated alone, or as components of compound materials. The synthesis of conducting polymers and the preparation of their composites, their structural characterization, their physical and chemical properties, and their applications both in well-established and new surprising directions will be discussed at the **75th Meeting on Macromolecules**, 10–14 July 2011, Prague, Czech Republic.

Following are the specific meeting topics:

- **Chemical and electrochemical synthesis of conducting polymers,** the control of molecular structure and supramolecular morphology. Preparation of thin films, colloidal particles, and coatings. Composite materials comprising conducting polymers, combinations of conducting polymers with noble metals, carbons, and other inorganic and organic components. Related oligomers. The chemical modification and carbonization of conducting polymers. Processing of conducting polymers and their stability.
- **Characterization of conducting polymers** by spectroscopic methods. Modelling and simulations. Molar masses and molecular architecture. Electrical, magnetic, mechanical, optical and other physical properties of conducting polymers. Charge transport. Chemical properties of conducting polymers. The relations between the chemical and physical properties of conducting polymers.
- **Applications of conducting polymers** as conducting materials or inks (e.g., in flexible electronics). The use of conducting polymers in corrosion protection, in electrorheology. Conducting polymers in energy conversions, as electrode materials in fuel cells, batteries, and supercapacitors. The design of analytical devices, sensors, and actuators. The role of conducting polymers in catalysis and electrocatalysis, separation science and membrane technologies, in biomedical applications and other fields.

See Mark Your Calendar on page 36 for contact information.

www.imc.cas.cz/sympo/75pmm

Functional Polymeric Materials & Composites

27–29 April 2011, Stellenbosch, South Africa

The **11th Annual UNESCO/IUPAC Conference on Functional Polymeric Materials & Composites** will focus on the synthesis, characterization, properties, and application of these materials. The conference and accompanying workshop will be held 26–29 April 2011 at the Wallenberg Research Centre at the Stellenbosch Institute for Advanced Studies in Stellenbosch, South Africa. The conference venue is within walking distance of the Department of Chemistry and Polymer Science at the university, as well as most of the guest houses and the Stellenbosch city center.

The conference will be part of the International Year of Chemistry, bringing together leading scientists from various fields of macromolecular science to give lectures and informative plenaries. A preconference workshop will be held especially for students and young scientists.

Stellenbosch is situated about 50 km from Cape Town (which has an international airport) and is in the heart of the Cape Winelands, which feature 106 wineries.

The deadline for abstract and poster submission is 30 November 2010.

See Mark Your Calendar on page 35 for contact information.

http://academic.sun.ac.za/UNESCO/Conferences/Conference2011/

Stamps International

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

The Stone that Came in from the Cold

The first stamp depicting cryolite, a rare mineral whose name is derived from the Greek terms for "cold" and "stone" and is composed mainly of sodium hexafluoroaluminate (Na_3AlF_6), was issued in Greenland on 19 October 2009. It is a belated but fitting tribute to a mineral that played a fundamental role in the development of the world's modern aluminum industry. Commercial mining of a huge deposit of cryolite found in the town of Ivittuut near the southwestern tip of Greenland started in the late 1850s and continued for more than a century even though the massive amounts of cryolite needed by the aluminum industry led over time to the invention of several processes for making synthetic cryolite. A whopping 3.7 million tonnes of the snow-white mineral had been extracted from the Ivittuut mine by the time it shut down in 1987!

In any event, cryolite's claim to fame was attained in 1886, when Charles Martin Hall in the United States and Paul Héroult in France independently (and almost simultaneously) discovered that it could be used as a flux in the industrial production of aluminum. The large-scale electrolysis of purified alumina (Al_2O_3), which has a melting point of about 2000 °C, was prohibitively expensive until then, but the use of cryolite lowered the melting point of the mixture to about 900 °C and rendered the so-called Hall-Héroult process economically viable. Aluminum was on its way to quickly becoming the most widely used nonferrous metal in the world, with applications ranging from construction and the aerospace industry to the manufacture of cooking utensils and packaging materials.

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

Mark Your Calendar

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

2010 (later than 1 September)

IUPAC poster prizes to be awarded

13–17 September 2010 • Hyperfine Interactions and Nuclear Quadrupole Interactions • CERN, Switzerland
Joint International Conference on Hyperfine Interactions and Symposium on Nuclear Quadrupole Interactions
Professor Reiner Vianden, Universität Bonn, Helmholtz Institute für Stahlen und Kerphysik (HISKP), Nussallee 14-16, D-53115 Bonn, Germany, Tel.: +49 228 733 355, Fax: +49 228 732 505, E-mail: vianden@hiskp.uni-bonn.de

14–18 September 2010 • Biotechnology • Rimini, Italy
14th International Biotechnology Symposium and Exhibition
Prof. Fabio Fava, Università di Bologna, Via Terracini, 28, I-40131 Bologna, Italy
Tel.: +39 051 209 0330, Fax: +39 051 209 0348, E-mail: fabio.fava@unibo.it

19–23 September 2010 • Heavy Metals in the Environment • Gdansk, Poland
15th International Conference on Heavy Metals in the Environment
Prof. Jacek Namiesnik, Department of Analytical Chemistry, Gdansk University of Technology, G. Narutowicza 11/12, PL-80 233 Gdansk, Poland, Tel.: +48 58 347 1345, Fax: +48 58 347 2340, E-mail: chemanal@pg.gda.pl

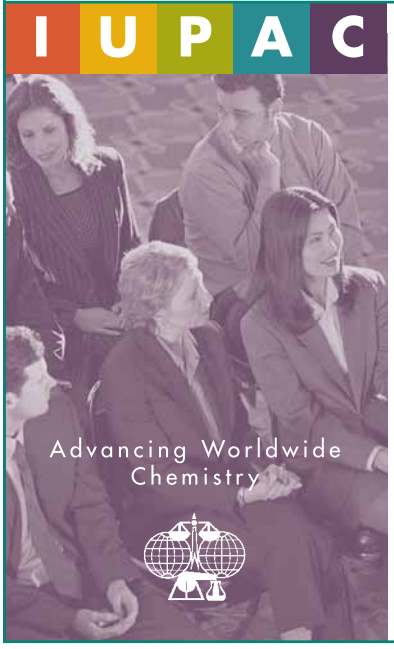
20–23 September 2010 • Polymer Behavior • Lodz, Poland
4th International Conference on Polymer Behavior
Professor Andrzej Galeski, Centre of Molecular & Macromolecular Studies, Polish Academy of Sciences, PL-90 363 Lódz, Poland, Tel.: + 48 426 803 250, Fax: +48 426 803 261, E-mail: andgal@cbmm.lodz.pl

6–9 October 2010 • Vanadium • Toyama, Japan
7th International Symposium on the Chemistry and Biological Chemistry of Vanadium
Tatsuya Ueki, Department of Biological Science, Hiroshima University, Higashi-Hiroshima, Hiroshima 739-8526, Japan
Tel.: +81 82 424 7437, Fax: +81 82 424 7437, E-mail: secretariat@vanadiumseven.com

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

11–14 October 2010 • Novel Materials • Wuhan, China
6th International Symposium on Novel Materials and their Synthesis
Prof. Yu-Ping Wu, Department of Chemistry, Fudan University, No. 220 Handan Road, Shanghai 200433, China
Tel.: +86-21-6564-2141 +86-21-5566-4223, Fax: +86-21-5566-4223, E-mail: nms@fudan.edu.cn

24–29 October 2010 • Polymer Science • Hersonissos, Greece
8th Hellenic Society Symposium on Polymer Science and Technology
Professor Marinos Pitsikalis, Department of Chemistry, University of Athens, Panepistimiopolis, Zografou, GR-15771, Greece, Tel.: +30 210 727 4440, Fax: +30 210 722 1800, E-mail: pitsikalis@chem.uoa.gr



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 or contact the Secretariat by e-mail at secretariat@iupac.org or by fax at +1 919 485 8706.

20–23 November 2010 • Chemistry in Africa • Luxor, Egypt
11th International Chemistry Conference in Africa
Professor Ahmed El-Saghier, University of Sohag, Department of Chemistry, Sohag, 82542 Egypt
Tel.: +20 128 307 176, Fax: +20 934 601 159, E-mail: africaconf2010@yahoo.com

13–16 December 2010 • Nanomaterials and Nanotechnology • Tiruchengode, India
International Conference on Nanomaterials and Nanotechnology 2010
V. Rajendran, K.S.R. College of Technology, Centre of NanoScience and Technology, K.S.R. Kalvi Nagar, Tiruchengode 637 215, India, Tel.: +91 428 827 4880, Fax: +91 428 827 4880, E-mail: veerajendran@gmail.com

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

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

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]9841 390 927, E-mail: nepalpolymer@yahoo.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

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

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

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

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

Conference Call

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

5–8 September 2011 • Asian Chemical Congress • 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 • 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

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

Visas

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

How to Apply for IUPAC Sponsorship

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

www.iupac.org

43 rd IUPAC World Chemistry Congress
46 th IUPAC General Assembly
70 th CQPR Annual Conference and Exhibition
July 30 to August 7, 2011

"Chemistry Bridging Innovation Among the Americas and the World"

Organized by the Colegio de Químicos de Puerto Rico (CQPR) on behalf of IUPAC, the Congress will provide the appropriate forum to foster the bridging of innovation in Chemistry and related fields among the Americas and the World and establish a gateway for the new interdisciplinary fields of science developed in the last decade.

Call for Abstracts

The IUPAC Congress call for abstracts opens in summer 2010. For your opportunity to present your work at this prestigious international congress submit an abstract by March 31, 2011 through *www.iupac2011.org*.

Themes include

- Alternative Energy Sources
- Chemical Analysis and Imaging
- Chemical Education and Heritage
- Chemical Synthesis
- Chemistry and the Environment
- Chemistry of Life
- Industrial and Applied Chemistry
- Macromolecular, Supramolecular and Nanotechnology
- Materials Science
- Theoretical, Physical and Computational Chemistry

A more detailed list of topics and invited speakers are published on our regularly updated website.

Confirmed Plenary Speakers

- **Professor Aaron Ciechanover**
  Israel Institute of Technology, Israel
- **Professor Richard R. Ernst**
  ETH Zürich, Switzerland
- **Professor Robert H. Grubbs**
  Caltech, USA
- **Professor Roald Hoffmann**
  Cornell University, USA
- **Professor Mario Molina**
  UC-San Diego, USA and Mexico
- **Professor Richard R. Schrock**
  MIT, USA
- **Professor Ada E. Yonath**
  Weismann Institute of Science, Israel

Sponsorship and exhibition: Promote your organization at the congress, contact us at info@iupac2011.org for more details.

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International Union of Pure and Applied Chemistry

Advancing the worldwide role of chemistry for the benefit of Mankind

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

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Bulgarian Academy of Sciences *(Bulgaria)*
National Research Council of Canada *(Canada)*
Sociedad Chilena de Química *(Chile)*
Chinese Chemical Society *(China)*
Chemical Society located in Taipei *(China)*
Croatian Chemical Society *(Croatia)*
Sociedad Cubana de Química *(Cuba)*
Pancyprian Union of Chemists (*Cyprus*)
Czech National Committee for Chemistry *(Czech Republic)*
Det Kongelige Danske Videnskabernes Selskab *(Denmark)*
National Committee for IUPAC *(Egypt)*
Chemical Society of Ethiopia *(Ethiopia)*
Suomen Kemian Seura—Kemiska Sällskapet i Finland *(Finland)*
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Association of Greek Chemists *(Greece)*
Hungarian Academy of Sciences *(Hungary)*
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Royal Irish Academy *(Ireland)*
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Consiglio Nazionale delle Ricerche *(Italy)*
Caribbean Academy of Sciences—Jamaica Chapter *(Jamaica)*
Science Council of Japan *(Japan)*
Jordanian Chemical Society *(Jordan)*
Korean Federation of Science and Technology Societies *(Korea)*
Kuwait Chemical Society *(Kuwait)*
Fonds National de la Recherche *(Luxembourg)*
Institut Kimia Malaysia *(Malaysia)*
Koninklijke Nederlandse Chemische Vereniging *(Netherlands)*
Royal Society of New Zealand *(New Zealand)*
Norsk Kjemisk Selskap *(Norway)*
Chemical Society of Pakistan *(Pakistan)*
Polska Akademia Nauk *(Poland)*
Sociedade Portuguesa de Química *(Portugal)*
Colegio de Químicos de Puerto Rico *(Puerto Rico)*
Russian Academy of Sciences *(Russia)*
Serbian Chemical Society *(Serbia)*
Slovak Chemical Society *(Slovakia)*
Slovenian Chemical Society *(Slovenia)*
National Research Foundation *(South Africa)*
Ministerio de Educación y Ciencia *(Spain)*
Institute of Chemistry, Ceylon *(Sri Lanka)*
Svenska Nationalkommittén för Kemi *(Sweden)*
Swiss Chemical Society *(Switzerland)*
Tanzania Chemical Society *(Tanzania)*
Chemical Society of Thailand *(Thailand)*
Société Chimique de Tunisie *(Tunisia)*
Türkiye Kimya Dernegi *(Turkey)*
National Academy of Sciences of Ukraine *(Ukraine)*
Royal Society of Chemistry *(United Kingdom)*
National Academy of Sciences *(USA)*
Programa de Desarrollo de Ciencias Básicas *(Uruguay)*