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Responsible Care in Canada

Role Models in Chemistry: Linus Pauling

Pure and Applied Chemistry: Citation Highlights 1998–2003

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Managing Editor: Fabienne Meyers
Production Editor: Chris Brouwer
Design: CB Communications

All correspondence to be addressed to:
Fabienne Meyers
IUPAC, c/o Department of Chemistry
Boston University
Metcalf Center for Science and Engineering
590 Commonwealth Ave.
Boston, MA 02215, USA

E-mail: edit.ci@iupac.org
Phone: +1 617 358 0410
Fax: +1 617 353 6466

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From the Editor

There have been many efforts worldwide to increase public trust in the chemical industry, in specific chemical companies, and even in the science of chemistry in general. A feature article on "Responsible Care in Canada" (page 4) shows how a simple commitment to ethical behavior, openness, and responsiveness has greatly benefited Canadian society and the chemical industry. As Jean Bélanger describes, the Responsible Care movement has evolved over 25 years from three fundamental principles to which the industry committed itself:

- doing the right thing
- caring about products from cradle to grave
- being open and responsive to public concerns

These seemingly simple values are worth emulating.

In our own sphere, I believe that *doing the right thing* can mean asking questions. It is a pleasure, therefore, to announce the beginning of a new series on "Emerging Issues in Developing Countries" (page 16). According to Kip Powell, president of the Analytical Chemistry Division, the series will provide a forum for views and discussion on one of IUPAC's goals, which is to "foster communication among individual chemists and scientific organizations, with special emphasis on the needs of chemists in developing countries." The first article in this series rightly asks how can IUPAC facilitate international collaborative research.

Further examples of how IUPAC *cares about its products* can be found in the Project Place (page 20). Walter Benson presents a new cooperative project between IUPAC and IOCD in which analytical practices in emerging regions will be surveyed with the goals of improving how standards are met and establishing remedial measures to build analytical capacity.

At last, and following the principle of *openness and responsiveness* to the public, Lida Schoen eagerly reports on a project that took her, IUPAC, and Science Across the World to Taipei for a YAC day held in the world's tallest building. Read on page 20 how this project encourages enthusiastic young ambassadors for chemistry to learn about the wonders of chemistry.

Fabienne Meyers
fabienne@iupac.org
www.iupac.org/publications/ci

Cover: Variation on the Canadian Chemical Producers' Association report titled Canada's Chemical Industry— A Keystone Sector Contributing to Our Standard of Living.

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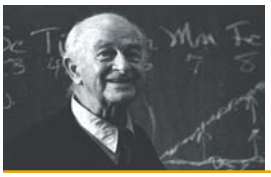

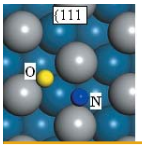

Officer's Column

Welcome to Beijing!

by Chunli Bai

On behalf of the Chinese Chemical Society and the Organizing Committee for the 40th IUPAC Congress, it is my pleasure to earnestly and warmly invite you to Beijing this coming August.

The 40th IUPAC World Chemistry Congress will be held in Beijing, China, 14–19 August 2005. The biennial Congress is one of the major international conferences in chemistry. It takes place in a different country each time it is held. In recent years, the Congress was held in Berlin, Germany (1999); Brisbane, Australia (2001); and most recently Ottawa, Canada (2003). The IUPAC Congress is a well-established event and is a significant feature on the global chemistry calendar.

The IUPAC Congress is also one of the few, major international congresses with an interdisciplinary approach to chemistry. IUPAC Congresses are dedicated to exploring "Frontiers in Chemistry"—especially the intersections of cutting-edge chemistry with other disciplines.

The importance of the Congress is also evident from the number of lecturers who are Nobel Prize winners. In 1999, four out of the eight plenary lecturers were Nobel Prize laureates: T.R. Cech, R. Hoffmann, J.E. Walker, and R. Huber. Nobel Prize laureates Y.T. Lee, J.M. Lehn, and F.S. Rowland spoke at the 2001 Congress. And in 2003, J.C. Polanyi addressed the Congress in Ottawa. This year, four Nobel Prize laureates will present plenary lectures at the Congress: Alan J. Heeger, 2000 Nobel Laureate (University of California at Santa Barbara, USA); William N. Lipscomb, 1976 Nobel Laureate (Harvard University, USA); John E. Walker, 1997 Nobel Laureate (University of Cambridge, UK); and Kurt Wüthrich, 2002 Nobel Laureate (ETH Hönggerberg, Switzerland).

The other plenary lecturers are Jiming Wang (SINOPEC, China), Charles M. Lieber (Harvard University, USA), Akira Fujishima (University of Tokyo, Japan), Yuri Oganessian (Joint Institute of Nuclear Research, Russia), and Jianguo Hou (University of Science and Technology of China).

This year in Beijing, the specific theme for the Congress is "**Innovation in Chemistry**." Congress attendees will learn of advances and innovations in the following parallel sessions:

- Environmental Chemistry and Green Chemistry
- Chemistry in the Life Sciences and Chemical Biology
- Materials Chemistry, Supermolecular Chemistry, and Nanochemistry
- Information Technology in Chemistry and Computational Chemistry
- Innovation in Physical Chemistry and Biophysical Chemistry, Research Methods and Techniques
- Innovation in Methodology, Techniques, and Instrumentation in Analytical Chemistry
- Innovation in Chemical Education and Teaching Methods
- Innovation in the Chemical and Petrochemical Industries and the "Responsible Care" movement

Each session will feature 8 to 10 invited speakers who have made substantial contributions to their fields. The detailed program and schedule is available on the Congress Web site.

The IUPAC Congress was last held in Beijing in 1993. However, since then China has welcomed many chemists to IUPAC-sponsored conferences. Just in the past few years, China hosted the World Polymer Congress-MACRO 2002, the 17th International Conference on Chemical Education, the 5th IUPAC/UNESCO Workshop on Safety in Chemical Production (SINOPEC Corporation), the 17th IUPAC Conference on Physical Organic Chemistry, the 18th IUPAC Conference on Chemical Thermodynamics, the 7th International Conference on Heteroatom Chemistry, the International Symposium on Biological Polyesters, and the ISMOM 2004—Environmental Significance of Mineral-Organic Component-Microorganism Interactions in Terrestrial Systems.

Like in Ottawa in 2003 and Brisbane in 2001, the Congress will be held concurrently with the biennial IUPAC General Assembly (GA). The GA is a meeting of the statutory bodies of the Union, specifically the Council, Bureau, Division Committees, and Standing Committees. As a member of the IUPAC Executive Committee, it is therefore an honor and a pleasure to welcome in advance all members of IUPAC bodies and to wish them fruitful meetings.

Young chemists are especially encouraged to participate in the 40th IUPAC Congress and also as

observers to the GA. IUPAC and the Congress organizers have established programs for young chemists to facilitate their participation. Also in Beijing, we will welcome and award the most recent 2004 and 2005 IUPAC Prizes for Young Chemists.

The Congress will also offer an exhibition of scientific instruments and equipment from leading manufacturers, as well as books and journals.

The Congress and GA will be held at the Beijing International Convention Center. The nearly 69 000 square-meter convention center is one of China's biggest facilities specifically designed for conferences and exhibitions. Nearby hotels (five to three stars and a less expensive one for students) are within 10- to 20-minute walking distance and a shopping center is about a 10-minute walk from the convention center.

Beijing, the capital of the People's Republic of China, serves as the center of politics and culture, with an area of 16 800-square km and a population of 13 million. As the capital of seven ancient dynasties, Beijing has numerous imperial gardens and a great cultural heritage, including the famous Forbidden City (Palace Museum), Summer Palace, Temple of Heaven, Ming Tombs, and Great Wall. Beijing is also known for it traditional handicrafts; Cloisonné and silk flowers are popular examples. Following the rapid development of tourism and transportation in the last decade, especially as a result of its successful bid to host the 2008 Olympics, Beijing has now become a world-famous, modern metropolitan city.

A few post- and pre-conference tours, as well as accompanying person tours, have been arranged through Beijing North Star International Tourism, Co. Please visit its Web site for details <www.chinatravelreference.com>.

For further information or to register, please visit the Web site (below) or contact the conference secretary Xibai Qiu: E-mail:qiuxb@iccas.ac.cn; Tel: +86(10)62568157, +86(10)62564020; Fax: +86(10)62568157.

Chunli Bai <clbai@cashq.ac.cn> is an elected member of the IUPAC Executive Committee and Bureau, and president of the Chinese Chemical Society and the 40th IUPAC Congress.

IUPAC 40th Congress

Innovation in Chemistry

14–19 August 2005 ◆ Beijing, China

www.IUPAC-Congress05.org.cn
www.ccs.ac.cn/IUPAC2005.htm

Call for Papers

Contributed papers are expected in the form of either oral or poster presentations. Participants wishing to present a paper are invited to submit an abstract of no more than one page by **30 April 2005**. The abstracts in electronic format will be described in the Second Circular, together with the submission procedure.

Organized by:

Chinese Chemical Society
Institute of Chemistry, CAS

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Program Committee Chairman: Fu Xi

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The Evolution of an Ethic and a Commitment

by Jean M. Bélanger

To tell the story of Responsible Care and Sustainable Development in Canada is to tell the story of how an industry has evolved over a quarter century. The recurring theme in this story is trust—the key driver in the movement.

The initial concepts of Responsible Care in Canada grew out of a growing concern in the early 1980s that the chemical industry risked losing its public license to produce in Canada. In that period, pressures to regulate the chemical industry were building up and were particularly exacerbated by the major derailment of a hazardous-material train in late 1979 that resulted in the evacuation of Canada's fifth largest city. The leaders of the chemical industry, through their membership on the Board of Directors of the Canadian Chemical Producers' Association (CCPA), saw themselves at a difficult crossroad. The normal path forward would have led them to engage regulators in case-by-case discussions and challenges that, in the end, would have sapped totally the industry's capabilities to develop its economic potential.

The Environmental Track

Those leaders, however, had the foresight to understand that the crux of the problem was much deeper. They understood, and this judgment was later confirmed in a major poll of public opinion, that the public's concern was one of trust. The public, in fact, believed that the industry knew about the dangers associated with its products, but it did not tell anyone and even worse, it just did not care. A ranking of the chemical industry between the nuclear and tobacco industries became a real wake up call for the companies.

The industry leaders, therefore, deliberately chose to take the other path—one that would be anchored on gaining the trust of the public in communities near chemical plants and throughout Canada. Public trust, therefore, became the key driver. They quickly learned that trust could not be imposed and could not be gained by simply saying that they knew what to do and were doing it. Building trust required the application of three fundamental principles, which formed the cornerstones of Responsible Care:

- **Doing the right thing**—Up until then, the industry had, in large part, responded to the laws and regulations in existence, and worked to prevent new laws and regulations from being promulgated. Trust, however, required a commitment to do the right thing, whether or not laws and regulations existed in a specific area. In fact, visible performance in doing the right thing was an essential cornerstone before trust could hope to be achieved. This step radically changed the industry from simply focusing on regulatory compliance to being ethically oriented, which sometimes meant advocating for regulation if it was needed to implement improvement beyond the reach of member companies. Furthermore, any ethical basis had to have a societal component to it. The major difficulty was that, while an individual from a company might believe that he/she had strong values, issues had become extremely complex and involved a multiplicity of stakeholders. This complexity required companies to engage in meaningful dialogue with interested parties that incorporated the following principles:
  - —active listening to truly understand the underlying sources of concerns
  - —accurate presentation of the risks involved in operations and products, and efforts being made to minimize them
  - —visible effort to integrate inputs from interested parties into planning and implementation processes
  - —broad consensus that the benefits of the company outweigh the risks

Placing Responsible Care within an ethical framework also represented a radical departure from what could have been a simple environmental management process, that is, another program just to be implemented. As an ethic, it required a radical change in the very nature or culture of

companies, where the CEO had to obtain buy-in from all employees and had to take account of their environmental performance in an integrated and balanced manner with their economic performance.

- **Caring about products from cradle to grave.** Industry leaders quickly recognized that caring about products and their potential impact on people and the environment was not a divisible concept; it could not stop at the plant gate. While customers had to take on their own responsibilities in use and disposal, chemical companies' ethics drove them to advise and assist those customers with proper handling. In fact, companies might even withhold products from customers who failed to handle them appropriately, thus practicing true product stewardship. Industry leaders also realized that the public would not understand differentiations about who had control of a product at any one time nor would the media encourage that understanding to take place.
- **Being open and responsive to public concerns.** Openness is the basis of accountability. In the end, the public had to determine, from its own observations, that an issue was being addressed because of a responsible management initiative and that the initiative was indeed addressing its own concerns. The public, however, was not the only beneficiary of openness. Companies, conscious that the weakest link could undermine everyone's efforts at credibility, required confidence that all other companies were taking this as seriously as they were. This was further entrenched when a reputation survey found that a plant's reputation was the same as the industry's reputation once you reach 25 miles from the plant; as a result, individual positive reputations could be erased quite easily by another company's actions. Finally, and perhaps most crucial, companies needed to satisfy themselves that they were not the weakest link in the system and that their efforts could stand up to external scrutiny. Because an individual company's reputation was seen as dependant on that of its colleagues, CCPA was called upon to play a central role in bringing all the membership to the same level of commitment. The association accomplished this through the medium of Responsible Care Leadership Groups. All CEOs, or the most senior executive contacts in Canada, were brought together in six regional groups and asked to meet four times a year. Substitutions from that senior level were not generally allowed nor were other member company representatives included. At each meeting, led by CEOs, each company was expected to discuss its progress towards culture entrenchment and code completion, its successes, and its difficulties. Gradually, a spirit of trust and openness progressed to a point where CEOs/senior executive contacts felt able to challenge each other and accept concerns as well as offers of help.

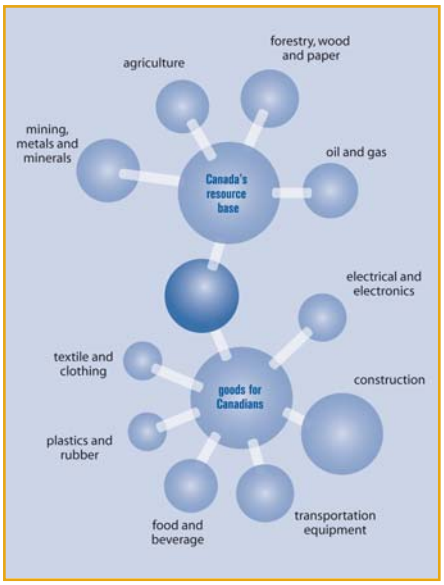
Methanex, a Responsible Care company, operates this methanol and ammonia plant in Kitimat, British Columbia, Canada.

The first public concerns about the chemical industry revolved around the environment and it became crucial for the industry to begin by examining its own behavior to ascertain that it was indeed doing the right thing. This started a voyage, an evolution, which took the chemical industry through publication of a Statement of Guiding Principles in 1983. Between 1985 and 1988 a set of codes was developed—accelerated by the Bhopal tragedy—that demonstrated industry's commitment to environmental concerns from conception of products to their final disposal. Thus were laid the first two cornerstones of the trust foundation. The CEOs of the member companies then assured each other that they had indeed met their commitments through a signed statement to that effect.

There remained the third element of the trust foundation—accountability to the public. The first code developed by CCPA dealt with Community Awareness and Emergency Response. The industry intended to

establish, right at the outset, credibility with its neighbors. Equally important was the establishment of a National Advisory Panel where all codes were scrutinized by a cross-section of public advocates prior to their adoption by the Board of Directors. These industry leaders knew what they were committing to, but it would have been meaningless if the commitment meant nothing to the public in which trust had to be achieved. This panel's unedited report on the performance of the industry continues to this day. Parallel community advisory panels (CAPs) in each chemical plant location perform similar functions for each company and monitor the verification processes on an ongoing basis.

Even after the development of these cornerstones of Responsible Care, however, accountability was only a promise. The fact that CEOs stated they had met their commitment meant nothing to an untrusting public. In 1993, the process of public verification was initiated. Equally important was the voluntary establishment of an exhaustive report on all emissions that gave the means to track exactly the progress of each company and its promises for the next five years.



Linking Resources to Consumer Goods, from A Kestone Sector Contributing to Our Standard of Living, *published by CCPA.*

The Social Track

Since the Responsible Care initiative had to respond to public concerns, there was no doubt that the chemical industry first had to focus on meeting environmental, health, and safety (EH&S) issues. However, parallel to this effort, another international development was crystallizing public attention. In 1983, the United Nations appointed an international commission to examine the state of the environment globally, and to propose strategies for improvement. This commission, chaired by Norwegian Prime Minister Gro Harlem Brundtland, culminated in the publication of the report *Our Common Future*, which focused attention on the interrelationships between the economy and the environment. However, the report further underlined how the social dimension was crucial in achieving this precarious balance.

One of the chemical industry leaders in Canada at the time was David Buzzelli, who had been appointed chairman, president, and CEO of Dow Chemical Canada, Inc. in 1986. He was a key thinker in the evolution of Responsible Care, committed to the concept of economic development, but without sacrificing environmental and social responsibilities. Following closely the issues raised by the Brundtland report and with his Responsible Care background, he became very active in the Canadian multistakeholder discussions that then took place on implanting the sustainable development culture within Canadian public policy processes. He participated in a task force that recommended Canada entrench the spirit of the Brundtland report in a permanent manner. The task force met in Winnipeg, Canada, and was unique in its composition. The members included environment ministers, labor leaders, business leaders, environment leaders, and representatives of native peoples. The task force recommended the formation of a National Roundtable on the Environment and the Economy (NRTEE), which would be responsible for shaping Canada's response to the Brundtland Commission recommendations.

Buzzelli was appointed as an initial member of the NRTEE. This is now an independent agency of the federal government in Canada, reporting directly to the prime minister, that provides advice on the economic-social-environmental interrelationships of issues and how to integrate them into public policy and implement them in the private sector. It consists of 25 senior multistakeholder representatives.

The social dimension has never been far from the surface of Responsible Care thinking. While environmental aspects could demonstrate a relatively causal relationship between the chemical industry and its impacts, the social dimension presented different challenges that had to be wrestled with, not only by the chemical industry, but also by almost all agents of

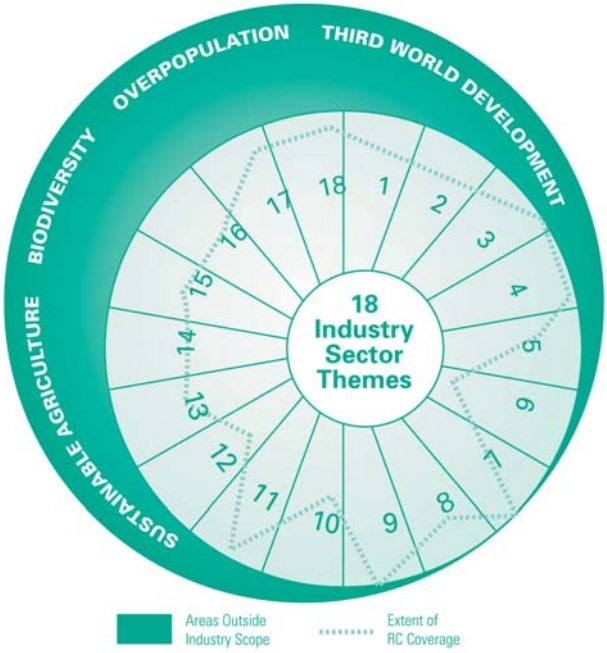
economic society. In cooperation with a number of other Canadian industry associations, CCPA came to a conclusion that social responsibility had to be examined on two levels. First, a societal level where all stakeholders must reach consensus on their ever-evolving needs and the allocation of resources to each stakeholder in meeting them; this can include consideration of poverty, third-world development, human rights, and many others. Second, a sectoral or company perspective where industry must preserve and grow its natural and human capital.

The second level represents a more direct causal relationship with the industry, but the demarcation boundaries are not as clearly defined as for environmental responsibilities. The chemical industry struggled—as did many other organizations in Canada—and is still struggling with the appropriate allocation of corporate social responsibility. In 1994, CCPA published *A Primer on Responsible Care and Sustainable Development* in which it tried to describe both the cohesion of the two concepts and equally, the uncertain areas where the scope of sustainable development clearly extended beyond Responsible Care. A review was carried out of principles of sustainable development integrated in a number of organizations, including the International Chamber of Commerce Business Charter for Sustainable Development, the National Round Table on the Environment, and the Economy Objectives for Sustainable Development, Agenda 21, of the United Nations Conference on Environment and Development. CCPA chose 18 sectoral themes common to many of these organizations and in its primer attempted to describe visually their relationship with Responsible Care. As can be seen in the figure to the right, there is a very high degree of congruence between the themes of sustainable development and those of Responsible Care. The pictorial description, however, provides recognition that certain social elements are truly societal in nature and beyond the scope of direct company actions.

As the public identified social concerns through the CAPs, these were integrated into each company's responsibility portfolio. Community concerns have varied greatly from company to company, because of their operations, and so, social integration by individual companies has been experienced in very diverse manners. While Responsible Care had initially focused on EH&S concerns that were high on the collective agenda of the Canadian public and our industry, at the

How Much of Sustainable Development Does Responsible Care Cover?

The figure below represents the scope of sustainable development as a globe, showing that there is a portion (not to scale) within the domain of industry. This area is divided into the 18 themes of sustainable development covered by CCPA's Responsible Care initiative. The dotted line is intended to show the extent, ranging from zero at the "core" to 100% at the outer edge, to which Responsible Care might be seen to specifically address each theme. The shaded area represents the concept that much of sustainable development is beyond the role of the chemical industry.



18 Themes of Sustainable Development

Policy and Planning

1. Integrating environment into business planning
2. Need for economic health
3. Continuous improvement
4. Precautionary principle
5. Life cycle analysis
6. Full cost accounting

Operations

7. Employee education
8. Pollution prevention
9. Waste minimization
10. Resource and energy conservation
11. emergency preparedness
12. Environmental rehabilitation

Reaching Out

13. Product stewardship
14. Stakeholder and public involvement
15. Reporting to stakeholders and the public
16. Technology and management practices sharing
17. Shared responsibility and the role in public policy
18. International scope

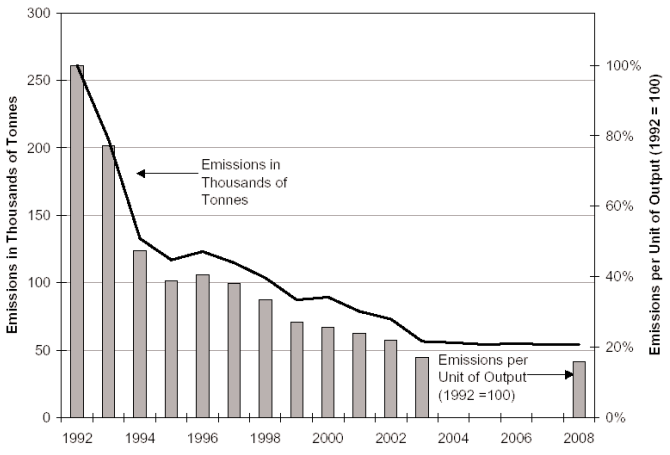
Source: *A Primer on Sustainable Development*, published by CCPA in 1994.

local plant level it was often the social issues that had to be addressed first. Many company examples can demonstrate this, all of which reflect the type of social context in which each company and company location operates.

The chemical divisions of Nexen Inc. have been leaders in Responsible Care in Canada since its inception. More recently, segments of the petroleum operations of Nexen Inc., namely Balzac and the wholly owned subsidiary Canadian Nexen Petroleum Yemen (CNPY), became the first in Canada to become full Responsible Care Partners and, therefore, to submit to full compliance and verification. Operating in a totally different social context, CNPY has greatly expanded the vision of social responsibility normally perceived by other member companies and provides an excellent example of the need to respond to concerns as they are raised. CNPY along with the Masila Block Partners works cooperatively with the Ministry of Oil and the governor of Hadhramout to deliver community affairs programs in the area of its Yemen operations. It has focused these efforts in the areas of water, power, health, and education in a way that encourages capacity building within the communities. The sustainability of projects is viewed as a high priority. A number of examples clearly demonstrate this:

- CNPY's field operations are very remote from the nearest medical facilities so the company provides free medical care to the communities in the vicinity of its operations. The average number of villagers that visit the clinic totals over 12000 per year. Clinic medicine and consultation are provided free of charge to all users. In life threatening cases, local villagers are flown, by the CNPY contracted aircraft, to the hospital in Mukalla for further treatment. The company is also supporting improvements to the local medical capacity by helping to fund the construction of a new hospital in the coastal town of Ash Shihr through a grant to the Governor's Office and the purchase of laboratory instruments for two other health centers.
- CNPY's contribution covered the cost of several educational facilities. This funding, through the local authorities, ranges from maintenance of existing school buildings to building new basic education and secondary schools as well as supplying school furnishings for newly built schools. The company has also sponsored 20 post secondary Yemeni students to study at the University of Calgary and Southern Alberta Institute of Technology.
- CNPY has contributed financial support for a number of power plant and water supply projects as well. These include infrastructure projects to provide diesel-powered generators to remote villages as well as projects to extend the local power grid to small communities. The company has also brought fresh water to a number of small communities.
- CNPY has funded studies of fresh water resources in its area of operation and has drilled a number of water wells to support local communities. The operation of the wells and the water distribution networks is left to the local communities to manage. The company has also committed to a UN project to fund water and sanitation projects in the local community.

Product Output vs. Emissions from CCPA Member Operations



Based on CCPA members' total chemical production, emissions per unit of product are down as much as 83 percent since 1992. Source: **Reducing Emissions—2003 Emissions Inventory and Five Year Projections** *published by CCPA.*

The efforts to expand Responsible Care into the societal dimension continue to this day. In 2003, the CCPA approved a new statement of "The Responsible Care Ethic" which integrated formally this third dimension by stating:

> "We are committed to do the right thing and be seen to do the right thing. We are guided towards environmental, societal, and economic sustainability by the following principles:
> —We are stewards of our products and services

during their life cycles in order to protect people and the environment.
—We are accountable to the public, who have the right to understand the risks and benefits of what we do and to have their input heard.
—We respect all people.
—We work together to improve continuously.
—We work for effective laws and standards, and will meet or exceed them in letter and spirit.
—We inspire others to commit themselves to the principles of Responsible Care."

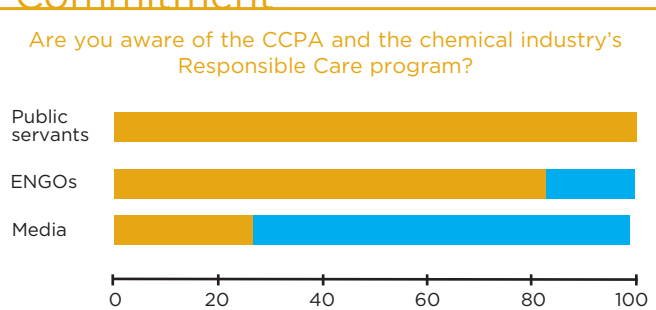
In addition, the sustainable development primer likely will be updated over the next year to include a section on social responsibility based on feedback received from the current public/peer Responsible Care verification process. Teams of activists, plant neighbors, and industry experts verify every company every three years. Between 2002 and 2005 they probed what companies were doing to meet their understanding of social responsibility expectations. Based on this, plus other stakeholder input, a code or guidance material on this aspect of Responsible Care may be developed.

Reflection on Drivers

The factors that have driven progress in Responsible Care are many and intricately woven. There can be little doubt that, at the outset, the initiative rested on the need to maintain the industry's license to operate and the way to ensure this was to build trust, which, in some way became the initial proxy driver. Over time, however, as CEOs came to see the wisdom and intrinsic value of moving towards responsible behavior, trust became the main driver in its own right. The chosen route was to build trust and so, this aspect became the basic derived driver for the initiative.

Summary

Responsible Care is a dynamic statement of ethical concern, in a constant state of evolution. It was initiated in the early part of the 1980s as a simple one-page statement of principles touching the singular aspect of environmental responsibility. It has since evolved into a set of codes, verification processes, visible performance measurement and deeper understanding of the generality of the principles first stated. There has, however, been one constant, namely, that the whole exercise of Responsible Care is about building trust through ethical behavior, listening attentively to the evolving concerns of the public and providing responses that clearly demonstrate the concerns have been heard. In the same way, Sustainable Development has become the integration, in decision-making processes, of the economic-environmental-social concerns of that same societal public through mutual listening processes. The CCPA, by pursuing a dynamic and evolving Responsible Care approach is well aware of its ongoing commitment to meeting the sustainable development aspirations of Canadian society.



Awareness of the Responsible Care program is very high among public servants and quite high among ENGOs. Conversely, media awareness of Responsible Care is quite low. Source: **Responsible Care in Your Neighborhood**, *published by CCPA.*

Jean M. Bélanger was president of the Canadian Chemical Producers' Association from 1979 to 1996. He is an Officer of the Order of Canada, Fellow of the Chemical Institute of Canada, and Fellow of the Engineering Institute of Canada. He is now partly retired but sits on the National Round Table on the Environment and the Economy. He was named to the UNEP Global 500 Roll of Honour in 1990.

www.ccpa.ca

Linus Pauling

by Balazs Hargittai and István Hargittai

Linus Pauling (1901–1994) was one of the greatest scientists of the twentieth century. He received two unshared Nobel Prizes. The first was in 1954 in chemistry "for his research into the nature of the chemical bond and its application to the elucidation of the structure of complex substances." Less than 10 years later, he was awarded the Nobel Peace Prize 1962.

In 1984, Clarence and Jane Larson recorded an interview with Pauling as part of an extensive interview project with over 60 famous scientists. Clarence Larson (1909–1999) was a former chemistry professor who participated in the Manhattan Project, researched isotope separation, and served as commissioner of the U.S. Atomic Energy Commission (1969–1974). After his death, his widow Jane donated their tapes to us and encouraged us to disseminate the information they contained. With this article, we pay tribute to Linus Pauling on the tenth anniversary of his death by quoting some excerpts from that interview.

Quotes from Linus Pauling from his 1984 Interview

When I was 10 or 11, I became interested in insects, and I got books from the library about insects. When I was 12, I got interested in minerals, and again got books from the library, and I made tables for my own use. I made some efforts to collect some minerals, not very successfully because I didn't have transportation, and our valley was not an especially good place for finding minerals. Then, when I was 13, in my second year of high school, a boy of my own age, Lloyd Jeffress, said to me as we were walking home one day, "Would you like to see some chemical experiments?" I said yes, and he said, "Come on in," and I went to his home. He was an only child, and he carried out some experiments, which impressed me immensely. I became very enthusiastic about chemistry. That same day, I found a book that had belonged to my father about elementary chemistry, and I immediately repeated some experiments with materials around the house. And from there on I was a chemist.

. . . When we were 15, my grandmother in Oswego [Oregon] said to me, "What would you like to be when you grow up?" I said, "I'm going to be a chemical engineer," but Lloyd [Jeffress] immediately said, "No, he is going to be a professor."

I studied chemical engineering at Oregon State [College]. . . because not having any money, it was the cheapest school for me to go. There was Reed College only a couple of miles from where my mother lived, but I knew you had to pay tuition there and it didn't seem that there was much chance for me to go there. Also, I didn't know that there was any profession that would involve chemistry, except chemical engineering. At that time, 65 years ago, chemical engineering was to a much greater extent taught in a practical way. The first two years the chemical engineering students

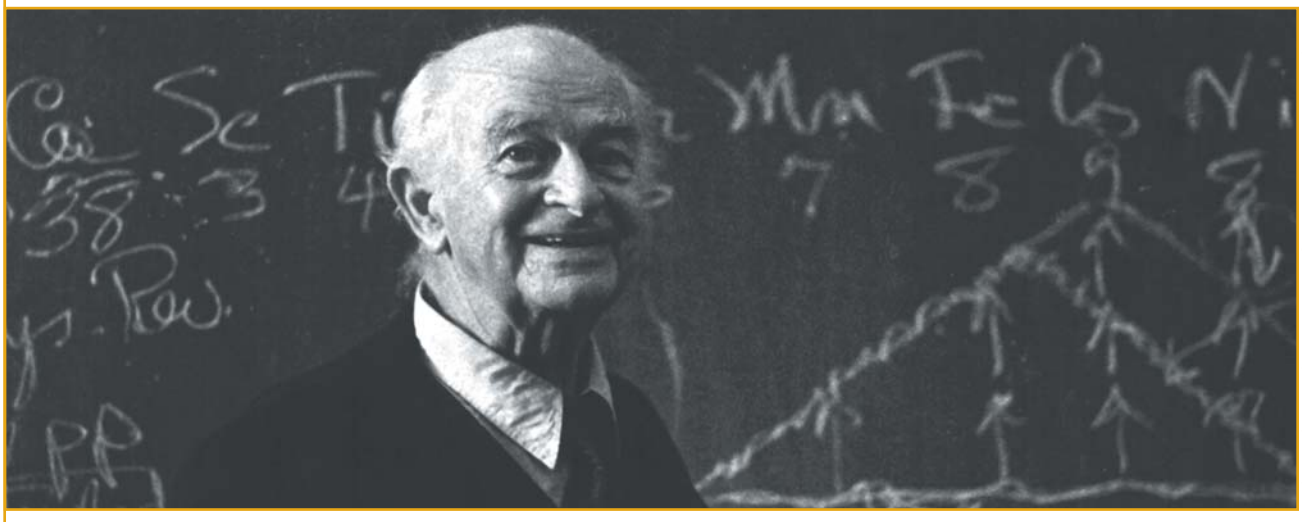


Photo by and courtesy of Larissa A. Zassourskaya, Moscow

Linus Pauling lecturing at Moscow State University in 1983.

were combined with the mining engineering students. I had four years of mathematics at Washington High School [Portland, Oregon] and time went by without me getting additional training in mathematics. So I got some instruction in mining engineering, blacksmithing, and making of drills, too. After my sophomore year, I was working as a paving plant inspector in the summer in southern Oregon.

. . . I was 18 years old in 1919. A very interesting event occurred during this year when I was teaching. I had a desk in the chemistry library. No one else came into the chemistry library, but the journals arrived and I read. I had a little spare time despite the heavy teaching load and I read the journals. The *Journal of the American Chemical Society* came with a couple of articles by Irving Langmuir on the shared electron pair theory of the chemical bond. He referred back to 1916, to G.N. Lewis, so I got out the 1916 copy of the journal with G.N. Lewis's paper, and I gave a seminar on chemical bond theory of the shared electron pair. It was the only seminar that was given that year. A chemistry seminar was not a very common thing, and I continued to be interested in the chemical bond ever since.

. . . I have been very fortunate during my life in that several times something has happened that, in retrospect, I see, turned out to have been just the right thing to have happened.

. . . I have been very fortunate during my life in that several times something has happened that, in retrospect, I see, turned out to have been just the right thing to have happened. For me to have gone to [Caltech in] Pasadena [California] in 1922 was really most fortunate. I don't believe I could have gotten better training or to work under better circumstances anywhere in the world than there, in Pasadena. . . . There were remarkable teachers in Pasadena and it was a small place [back in 1922], a total of 300 undergraduate students, 30 or 40 graduate students, and 50 faculty members. The man with whom I did my doctoral work, Roscoe Gilkey Dickinson, was the first person to get a Ph.D. from the California Institute of Technology. He got it in 1920; then there were a couple every year until 1925 when quite a number got it in physics and chemistry.

. . . My first scientific paper was published in 1923 on a crystal structure. By 1925, I was publishing papers on the old quantum theory. Richard C. Tolman and I published a paper in 1925 on the entropy of crystals and supercooled liquids; this was a publication in quantum mechanics.

. . . My work with nucleic acids came about through the natural outgrowth of my interests in molecular structure. . . . I thought here is an interesting substance—hemoglobin. I didn't know much about biology, but I knew about hemoglobin. It had been found a few years earlier, in 1927. The molecule contains four iron atoms in the heme groups. I [had] heard about [the] sigmoid equilibrium curve of oxygen (O_2), so I applied physical chemistry and structural chemistry to that [and] I worked out a theory of the oxygen equilibrium curve. That was my first paper on proteins.

Then I thought, nobody knows how the oxygen molecules stick to the hemoglobin molecules. Some people say it is sort of an adsorption onto this large molecule. Other people say there is a chemical bond formed. Oxygen has two unpaired electrons, it is paramagnetic. You can pick up liquid oxygen by a magnet–liquid oxygen will hang between the poles of the magnet. I knew that. I knew that G.N. Lewis, back in the 1920s, interpreted measurements of the magnetic susceptibility of solutions of liquid oxygen and liquid nitrogen to show that there is an equilibrium between the paramagnetic O_2 and diamagnetic O_4. He had determined the equilibrium constant, the standard free energy and standard free enthalpy of the reaction. Very clever of G.N. Lewis to have done that. He discovered O_4, the dimer of O_2. So, I thought, why don't we measure the magnetic susceptibility of oxyhemoglobin? It will be paramagnetic due to the oxygen molecules or at least there will be a paramagnetic component.

. . . I had a student, Charles Coryell, he had [received] his Ph.D. and came to me as a postdoc fellow. He and I set up an apparatus, got some blood, and measured oxy-hemoglobin. It was diamagnetic, which showed that you had chemical bonding, but the hemoglobin without the oxygen was strongly paramagnetic, and I hadn't predicted that. This was one of those rare occasions when something has come along due to an experiment that I carried out that was a surprise to me. But the change in the magnetic properties of the iron atom permitted us to gain great insight into the arrangement of the other atoms around the iron

atoms in hemoglobin. Moreover, this technique of measuring magnetic susceptibility permitted us to measure equilibrium constants and rates of reactions, so over the next five years my students and I published 15 to 20 papers on hemoglobin and hemoglobin derivatives. The method was also then used in Sweden to study heme compounds and iron proteins.

Then I thought, what about the rest of the hemoglobin molecule? [William] Astbury in England was making X-ray diffraction photographs of hair and finger nails. And other people, too, starting in Japan and Germany, had made photographs of silk and wool. I took some of these photographs in 1937 and tried then to find the structure in way of coiling the polypeptide chain. Other people were trying, too, but without success.

I thought, "I know a lot about these atoms and how they combine with one another, but the structures that I have been predicting don't seem to be the right ones, so there must be something that I don't know about proteins." Nobody has ever determined the structure of an amino acid or a dipeptide, a simple peptide. So why don't we go ahead and do that. The Rockefeller Foundation gave us money and Robert Corey had just come that summer, in 1937, to work with me. I talked with him about this problem, which interested him. We decided to go ahead, and for 10 years at our institute, with a good number of different people involved in it, we determined these structures for about 10 amino acids and several simple peptides. Nobody else in the whole world had turned out a single structure for any of these fundamental substances during this whole period.

Later on my wife said to me "If that was such an important problem, why didn't you work harder at it?"

. . . Ten years later when I was an Eastman professor at Oxford, I thought, "I better think about that problem again. I failed in 1937, and here it is in 1948." . . . There was nothing surprising about the amino acids or the simple peptides. They all had just the structures that I had designed to them back in 1937, but I thought I would try again and I would forget about the X-ray diffraction photographs. First, I [didn't] have them [there]. But they weren't any good anyway—these fiber-diagrams [Pauling points to his hair]. Second, I'll just forget about them.

Suppose, I assume the residues are equivalent to one-another. Back in 1928 I had written a paper about structural principles involving silicates and such substances. One of the principles was that the different kinds of units are to be as few as possible in number. So I'll assume that all the amino acids in the polypeptide chain are equivalent. In a course that I had from Bateman in 1927, it was shown that the most general symmetry operation that converts an asymmetric object into an identical object is rotation around some line in space coupled with translation along it. If you repeat this operation you get a helix. So I said that I haven't looked at any helical structures; I know other people have. I am not sure if I knew that then, but other people have looked at the helical structures for the polypeptide chains, but haven't found them. So I'll look at them. I took a sheet of paper, made a sketch on it, then folded the paper to get those bond angles of the α-carbon correct, and kept folding it parallel, until it came around again and I tried to form a hydrogen bond from this turn to the next turn and couldn't do it. I tried again, putting the folds in a different way, and finally got this hydrogen bond. And that was the α-helix.

So I predicted the properties of this α-helix and the X-ray diagram. This showed the repeat in 5.4 Å. Actually that was the pitch of this helix, 5.4 Å . The X-ray diagram showed 5.1 Å and there you have about 5% error and I couldn't see how that was possible. I waited more than a year before publishing anything about it, and in 1950, a paper was published in the *Proceedings of the Royal Society* by Bragg, Kendrew, and Perutz on the structure of the polypeptide chain of α-keratin. They described about 20 structures, all of which were wrong. I said to Corey that we better publish about the α-helix and the γ-helix, so we sent off a short note to be printed and started writing a longer paper. . . .

. . . And then, of course, I thought that I would work out the structure of DNA and started to work on it, rather desultorily, I suppose. Later on my wife said to me "If that was such an important problem, why didn't you work harder at it?" . . .

The full interview will be published in *Candid Science V: Conversations with Famous Scientists*, written by B. Hargittai and I. Hargittai (Imperial College Press, London, 2005).

www.icpress.co.uk/books/popsci/p366.html

Dr. Balazs Hargittai is at St. Francis University in Loretto, Pennsylvania, and Dr. István Hargittai is at the Budapest University of Technology and Economics.

Citation Highlights 1998–2003

by James R. Bull and Bohumir Valter

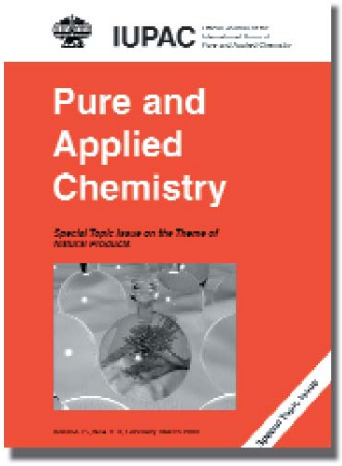
The publication policy of *Pure and Applied Chemistry* (*PAC*) has undergone significant changes in the years that have followed the decision to resume self-publication. The scope of conference coverage has broadened in response to the increasing number of international events enjoying IUPAC sponsorship. Special Topic features and issues appear regularly,[1] offering in-depth coverage of topical themes and identifying IUPAC with new and emerging areas of pure and applied chemistry. Reports and Recommendations arising from IUPAC projects continue to form part of the journal's core, and occupy about 30% of the annual average of about 2 400 pages.

The most recent changes affecting *PAC* have their origins in the deliberations of the Conference Policy Development Committee, which met in 2001 and 2002 in order to review and refine policy for granting IUPAC sponsorship and managing attendant publication options. It was recognized that internationally representative and well-established series in the conference calendar are entitled to a preferential claim on publication coverage in *PAC*. These conferences, together with occasional or start-up events on innovative and forward-looking themes, were identified as the strategically vital elements in an evolving publication policy.

As a result of these deliberations a scientific editor was appointed in 2003 to implement an appropriate publication policy[2] and to oversee peer review of manuscripts emanating from conference presentations. Peer review was formerly a discretionary option available to conference organizers, but general and equitable imposition of this important practice is expected to impact favorably on overall editorial standards. How can these standards be measured in the future, and how can progress toward strategic objectives be evaluated? A starting point is obviously to measure recent performance, and to use that as a yardstick against which to monitor progress toward improved performance.

The impact factor[3] (i.e., the ratio of total citation hits for papers published during the preceding two years to the total number of citable works) has been widely used as a yardstick for comparative evaluation of scientific publications for nearly 40 years and, however controversial, continues to play a pivotal role in the acquisition policies of many science libraries. It is therefore important to understand this index of performance and to learn from it, if *PAC* is to prosper in the competitive arena of scientific publication. In the absence of other objective criteria, citation data provide us with at least one standard by which to monitor our performance and identify strengths and weaknesses. Furthermore, most readers and prospective authors are aware of citation credentials when considering what to read and where to publish. We may thus conclude that we ignore citation data at our peril, even if we are skeptical about their absolute worth in isolation. The impact factor for *PAC* during recent years tells us that the journal is operating fairly consistently (1998: **1.677**; 1999: **1.141**; 2000: **1.257**; 2001: **1.535**; 2002: **1.750**; and 2003: **1.471**), although at a lower level than leading research and review media in general chemistry. With such impact factors, *PAC* was ranked thirty-fifth out of 123 journals in the ISI category "chemistry multidisciplinary" in 2003, a fairly typical ranking throughout this review period.

How meaningful are these data for comparative evaluation of *PAC*? In reality, the publication policy of *PAC* differs distinctively from the policies of many comparable review media, and has evolved largely as an instrument of service to the international community. For example, Reports and Recommendations arising from IUPAC projects are not normally assessed by citation criteria, and previous publication guidelines to organizers of IUPAC-sponsored events conveyed an implied commitment to publish outputs irrespective of their citation potential. Although this concept of service remains inviolate in the changing policy, it is hoped that more rigorous evaluation of events and their publishable outputs will ensure that future coverage is devoted increasingly to the most successful international events having the greatest citation potential.



Accordingly, a more in-depth analysis of the historical performance of discrete events and features was undertaken in search of guidelines for future strategic planning. We elected to extract a data set comprising

total citation hits from publication date to 30 April 2004 for all works published in *PAC* during the period 1998–2003. A comprehensive report based upon these data was presented to the IUPAC Committee for Printed and Electronic Publications in July 2004, and will be used for planning and evaluation purposes. Publication of the unabridged report is beyond the scope of this article, but it seems timely and appropriate to publicize some of the more notable highlights of this period. It should be emphasized that these data are unrelated to the impact factor, since they allude to absolute and cumulative numbers of citations for papers and events covered in a given year, and are most useful for ranking purposes within that year.

The ensuing sections report the most highly cited events, individual authors, and reports and recommendations featured in *PAC* during the period 1998 to 2003. Of course, we cannot compare the older sources directly with the more recent, but we may assume that citation rates generally start to taper off after perhaps five years. Data sets for 1998 and 1999, therefore, offer a quite reliable approximation of the total citation potential of a paper or group of papers, and a measure by which they can be compared. Data sets for more recent years are necessarily incomplete by comparison, and those for 2003 will inevitably be biased in favor of coverage in the earlier issues of the year. Nevertheless, more recent data sets do hint at citation trends and future potential.

Most Highly Cited Conference Collections

The five most highly cited conferences and Special Topic features are listed for each year of the survey period in table 1. These data reveal that all three Special Topics issues in 1998 and 2000 led the total citation tally, whilst the issue devoted to "Green Chemistry" included the most highly cited *PAC* paper of recent years, as well as an exceptional citations per paper score. The early trends for subsequent Special Topic issues are generally encouraging. It is worth noting that "Environmental Oestrogens" and "Green Chemistry" arose out of divisional initiatives and major international and interdisciplinary collaboration. The "Advanced Materials" series was also initiated through individual and divisional effort and cooperation, and exemplifies the opportunities for promoting and regularizing new and emerging science themes as part of IUPAC's core program.

The most consistently successful conference series is "Organometallic Chemistry Directed Towards Organic Synthesis." All three of these conferences covered during the review period were among the most highly cited. The 10th Conference has achieved a record citation score as well as the unprecedented average of 19.4 citations per paper!

For the rest, there are no immediately obvious general trends in the listings, but encouraging indications that any of the established core series in the IUPAC calendar has potential to feature widespread interest.

Table 1. Most Highly Cited Conferences and Special Topic Features in *PAC* between 1998–2003[a]

1998	
229 (11.5)	*Special Topic*: Environmental Oestrogens
216 (12.0)	8th Bioinorganic Chemistry
206 (12.9)	9th Organometallic Chemistry directed towards Organic Synthesis
180 (5.0)	20th Chemistry of Natural Products
126 (12.6)	1st Supramolecular Science and Technology
1999	
369 (19.4)	10th Organometallic Chemistry directed towards Organic Synthesis
134 (12.2)	9th Novel Aromatic Compounds
133 (7.8)	5th Heteroatom Chemistry
104 (3.9)	21st Natural Products
85 (4.3)	4th Functional Dyes
2000	
321 (16.9)	*Special Topic*: Green Chemistry
244 (7.6)	*Special Topic*: 1st Workshop on Advanced Materials. Nanostructured Systems
183 (15.3)	15th Physical Organic Chemistry
131 (4.2)	13th Organic Synthesis
26 (4.3)	5th Bioorganic Chemistry
2001	
146 (8.6)	Green Chemistry
103 (3.0)	19th Organometallic Chemistry
89 (3.6)	18th Photochemistry
67 (2.9)	*Special Topic*: Electrochemistry and Interfacial Chemistry
65 (2.7)	14th Chemrawn Green Chemistry
2002	
62 (2.5)	11th Organometallic Chemistry directed towards Organic Synthesis
34 (14)	*Special Topic*: 2nd Workshop on Advanced Materials. Nanostructured Advanced Materials
23 (1.0)	15th Plasma Chemistry
18 (0.8)	*Special Topic*: 2nd Science of Sweeteners
13 (1.1)	13th Carotenoids
2003	
25 (0.9)	*Special Topic*: 23rd Chemistry of Natural Products
14 (0.3)	*Special Topic*: Endocrine Active Substances
12 (1.5)	16th Physical Organic Chemistry
9 (1.5)	20th Organometallic Chemistry
8 (1.0)	14th Organic Synthesis

[a] Numbers refer to total citations collected as of 30 April 2004 (averaged citations per paper in parentheses).

Credit is due to the relevant organizers for their essential roles in achieving this measure of success, and an enviable place in the archival record of *PAC*. At the same time, it is hoped that the absence of certain series from these listings will serve to challenge organizers of future events, to compile scientific programs with the potential to generate highly citable works.

Most Highly Cited Papers

Citation records of individual papers are clearly less useful for planning purposes than those of events. However, the list in table 2 identifies some of the component parts of notable successes, and recognizes those authors whose papers have contributed significantly to the overall impact of the journal.

Table 2. Most Highly Cited Papers in *Pure and Applied Chemistry* between 1998–2003 (as of 30 April 2004)

1998 (8th Bioinorganic Chemistry)
57 citations: V.L. Pecoraro, M.J. Baldwin, M.T. Caudle, W.-Y. Hsieh and N. A. Law. 'A proposal for water oxidation in photosystem II'. *Pure Appl. Chem.* **70**(4), 925-929 (1998)
1999 (9th Novel Aromatic Compounds)
61 citations: L. T. Scott, H. E. Bronstein, D. V. Preda, R. B. M. Ansems, M. S. Bratcher and S. Hagen. 'Geodesic polyarenes with exposed concave surfaces'. *Pure Appl. Chem.* **71**(2), 209-220 (1999)
2000 (*Special Topic*: Green Chemistry)
132 citations: M. J. Earle and K. R. Seddon. 'Ionic liquids. Green solvents for the future'. *Pure Appl. Chem.* **72**(7), 1391-1398 (2000)
2001 (Green Chemistry)
43 citations: R. S. Varma. 'Solvent-free accelerated organic syntheses using microwaves'. *Pure Appl. Chem.* **73**(1), 193-198 (2001)
2002 (15th Plasma Chemistry)
9 citations: P. Roca i Cabarrocas, A. Fontcuberta i Morral, S. Lebib, and Y. Poissant. 'Plasma production of nanocrystalline silicon particles and polymorphous silicon thin films for large-area electronic devices'. *Pure Appl. Chem.* **74**(3), 359-367 (2002)
2003 (14th Organic Synthesis)
6 citations: J. A. Ellman. 'Applications of *tert*-butanesulfinamide in the asymmetric synthesis of amines'. *Pure Appl. Chem.* **75**(1), 39-46 (2003)

Most Highly Cited Reports and Recommendations

Reports and Recommendations are stand-alone features, and cannot readily be compared with event collections or with individual papers, since they form part of the Union's perceived service-driven activity to the international community, sometimes targeting readers whose primary business may be to utilize the data without citation. Nevertheless, a high level of citation certainly demonstrates that the publishing scientific community has taken note of particular Reports or Recommendations. Some of the works in this category have attracted a great deal of interest. This level of attention is amongst the highest expressions of achievement for IUPAC project activities.

Table 3. Most Highly Cited Reports and Recommendations in *Pure and Applied Chemistry* between 1998–2003 (as of 30 April 2004)

1998
148 citations: *Technical Report.* 'Isotopic compositions of the elements 1997'. *Pure Appl. Chem.* **70**(1), 217-236 (1998)
1999
35 citations: *Technical Report.* 'Critical compilation of scales of solvent parameters. Part I. Pure non-hydrogen bond donor solvents'. *Pure Appl. Chem.* **71**(4), 645-718 (1999)
2000
83 citations: *Recommendations.* 'Guidelines for terms related to chemical speciation and fractionation of elements. Definitions, structural aspects and methodological approaches'. *Pure Appl. Chem.* **72**(8), 1453-1470 (2000)
2001
22 citations: *Technical Report.* 'Atomic weights of the elements 1999'. *Pure Appl. Chem.* **73**(4), 667-683 (2001)
2002
17 citations: *Technical Report.* 'Polyaniline. Preparation of a conducting polymer'. *Pure Appl. Chem.* **74**(5), 857-867 (2002)
2003
2 citations: *Technical Report.* 'Critical evaluation of stability constants and thermodynamic functions of metal complexes of crown ethers'. *Pure Appl. Chem.* **75**(1), 71-102 (2003)

Conclusion

The record of recent years offers encouraging evidence that *PAC* does perform a distinctive service in the review literature, and that all the component features have potential to contribute toward a high citation profile. The challenge is to learn from the achievements highlighted here, and to use them as planning instruments to refine content selection and evaluation. The changing policies governing publication in *PAC* are intended to facilitate this process, and to ensure that the journal continues to occupy a secure and indispensable place in the contemporary chemistry literature.

References

1. For easy access to *PAC* Special Topics, see <www.iupac.org/publications/pac>
2. *PAC* Publication Policy: www.iupac.org/publications/pac/policy.html; "New Look at Special Topics and an Evolving Policy for Pure and Applied Chemistry" Sep-Oct 2003 *CI*, p. 10; <www.iupac.org/publications/ci/2003/2505/4_bull.htm>
3. *Thompson ISI Journal Citations Report* <www.isinet.com/>

James R. Bull <bull@science.uct.ac.za> is a professor at the University of Cape Town in South Africa and scientific editor of *PAC*. Bohumir Valter is editorial manager of the *Collection of Czechoslovak Chemical Communications* and a member of the IUPAC Committee on Printed and Electronic Publication.

A forum for members and member organizations to share ideas and concerns.
Send your comments by e-mail to <edit.ci@iupac.org>.

Emerging Issues in Developing Countries

The following letter introduces a new series of articles on "Emerging Issues In Developing Countries," which will provide a forum for views and discussion on one of IUPAC's goals: "IUPAC will foster communication amongst individual chemists and scientific organizations, with special emphasis on the needs of chemists in developing countries."

The series, which will run through 2005–2006, was initiated by Kip Powell, president of the IUPAC Analytical Chemistry Division (Division V). It is being coordinated by Jan Åke Jönsson who leads the Division V team with responsibility for "developing countries and emerging analytical communities." As well as informing readers and exploring new ideas and opportunities, it is hoped that the series will promote wide discussion. If you wish to contribute to this series, please contact <jan_ake.jonsson@analykem.lu.se> or <kip.powell @canterbury.ac.nz>.

How Can IUPAC Facilitate International Collaborative Research?

by Elias A.G. Zagatto, Carol H. Collins, and Jan Åke Jönsson

The foreword of the *IUPAC Biennial Report* (2002–2003) states that IUPAC "facilitates and encourages international agreements and aids coordination of numerous activities carried out by national and regional chemistry organizations." In this context, could IUPAC also assist graduate students/fellows, particularly those from developing countries, who further their studies in foreign countries or research institutes? Could IUPAC adopt an advisory role with respect to graduate student training abroad or in research institutes, and identify the issues and challenges that arise for the institution (or country) that these students come from? Could IUPAC identify host research organizations/universities that are most responsive to the needs of such graduate students/fellows and their countries of origin?

Many graduate students/fellows from developing countries extend their studies by working in other institutions, often in other countries. However, the benefits of such arrangements are sometimes devalued due to a mismatch of local needs and resources relative to the research programs and facilities offered at these institutes.

Jan Åke Jönsson (center), at Lund University in Sweden, with visitors Tarekegn Berhanu (left) and Ahmed Hussen of the University of Addis Ababa, Ethiopia.

As a rule, the programs of the host institute, rather than the needs of the graduate student/fellow and his/her country, drive the opportunities for advanced studies. Further, the infrastructure of the research centers to which the graduate students/fellows are linked may not be suitable for proper continuation of their research activities. The activities carried out at the host centers may be too sophisticated, hence less suitable to be continued in a developing country. As a result, retention of the young scientist in the country of origin is sometimes difficult. Differences in salaries and standards of living may also contribute to this difficulty.

A further problem, which often impedes a prospective candidate from seeking the most appropriate laboratory for carrying out his or her work in a developed country, is the so-called "bench fee." A number of well-established laboratories (or their institutions) charge fees for "use of space/equipment," which often seem to be exorbitant, especially to the agency sending the fellow/graduate student. To complicate matters, these fees may be waived for special groups, but are charged to others who (at first glance, at least) appear to meet the same criteria. At the least, a uniform policy should be established to address this problem. Even better would be a "sliding scale," which would feature realistic fees, appropriate to the actual need of the fellow, not a flat fee without consideration of the actual project to be developed.

Some programs recognize these disadvantages and take counteracting measures. One example is the so-called "sandwich programs" of the Swedish SIDA/SAREC, (the Swedish International Development Cooperation Agency, Department for

Research Cooperation), which substantially support the originating institution in terms of equipment and other resources in order to improve its research infrastructure.

In this context, there *are* fields where research incentives are strongly needed. In these fields, the relevant strategies and experiences should be widely disseminated and made available in advanced centers in developed and developing countries.

An important aspect that should not be overlooked is the presence of research institutions in some developing countries that are focused on specific topics of relevance and at which "state of the art" research is being carried out. Such centers of excellence should be identified and encouraged to participate in hosting graduate students/fellows from less well-established institutions. This process would not only support these advanced centers, but also encourage the originating institution to appreciate the effort and promise of organizations in their own country or region that have reached a certain level of achievement. A side benefit might be that the "sending" country would not feel as "threatened" with the loss of good people as sometimes occurs when people are sent to a center of excellence in a developed country.

In adherence to its long-range goals, IUPAC could consider the development of guidelines that help to solve or circumvent the problems discussed above. One possible approach would be to establish specific or generic issues that are common to a developing country (or countries) and to identify suitable advanced research centers that could meet these requirements. National Adhering Organizations would be contacted to assist in defining specific areas where research is needed and should be facilitated.

In this way, there would be significant gains for all participants—the graduate student or research fellow, his/her country, and the host institution. The training would be more effective and relevant to the country of origin. The transfer of knowledge and technology would be more effective. The trained fellow and his/her organization would be more respected. The host institution then would be more favorably rated by the scientific community, as only some institutions would be recognized by IUPAC as suitable Advanced Research Centers.

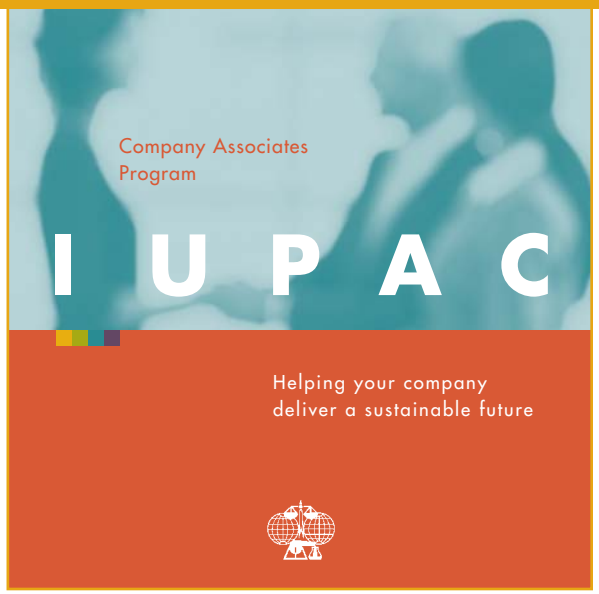
Elias A. G. Zagatto <ezagatto@cena.usp.br> is a professor at the Universidade de São Paulo, Brazil, and a titular member of the Analytical Chemistry Division. Carol H. Collins <chc@iqm.unicamp.br> is a professor at Universidade Estadual de Campinas, Brazil, and executive secretary and representative of the Brazilian NAO—the Brazilian Chemistry Committee for IUPAC—on the IUPAC Union Advisory Committee. Jan Åke Jönsson <jan_ake.jonsson@analykem.lu.se> is a professor at Lund University, Sweden, and a titular member of the Analytical Chemistry Division.

COCI Campaigns for the Company Associates Program

In the 1960s, IUPAC established the Company Associates program to improve collaboration between the chemical industry and the Union. According to the Union's Statutes, organizations such as industrial companies, research and development institutions and laboratories, scientific societies, or any other bodies interested in the activities of the Union may become involved with it as Company Associates (CAs).

The IUPAC Committee on Chemistry and Industry (COCI) is responsible for developing and maintaining—in collaboration with the National Adhering Organizations—an active program to recruit, guide, and inform CAs on IUPAC programs and policies. To facilitate the recruitment of CAs, COCI has produced a new brochure presenting clearly and succinctly why companies should join IUPAC and the benefits of becoming a CA. According to David Evans, chairman of COCI, it is important to foster the "A" in IUPAC, and COCI contributes to this goal.

A copy of the new brochure is enclosed with the mailing of this issue of *CI* and is available upon request from the IUPAC Secretariat. If you belong to an organization that is eligible to become a CA, you can help IUPAC by informing the relevant department/office in your company or institution. Please review the brochure and see how IUPAC and your company can pair up to *deliver a sustainable future*.



For more information, please contact the IUPAC Secretariat by e-mail <secretariat@iupac.org> or by phone +1 919 485 8700.

Piet Steyn Wins One of South Africa's Highest Science Awards

On 3 November 2004 at a ceremony in Pretoria, South Africa, IUPAC Past President Piet Steyn was awarded the 2004 South Africa Medal (Gold) of the Southern Africa Association for the Advancement of Science, one of the highest awards to a scientist in Southern Africa.

Steyn, an expert in the chemistry of toxic fungal secondary metabolites, has also made significant contributions to the management of science in South Africa and abroad. He has served the South African scientific community as a member of the Executive Committee of the Council of the SA Chemical Institute, assistant editor for the *SA Journal of Chemistry*, president of the SA Joint Council of Scientific Societies (1986–1987), founding member of the Academy of Science of SA (1994), and as a current member of the Council of the Royal Society of SA and fellow of the Council for Scientific and Industrial Research.

The SA Chemical Institute has recognized his contributions to chemistry with three top awards, the Raikes Gold Medal (1975), Gold Medal (1987), and the Hendrik van Eck Gold Medal (2002). Die Suid-Afrikaanse Akademie vir Wetenskap en Kuns honored him with the Havenga Gold Medal for Chemistry (1992). In 1999 he also received the prestigious Ernest Oppenheimer Memorial University Travelling Fellowship.

Steyn has played a vital role internationally. In addition to serving as IUPAC president, he was president of the International Association for Cereal Science and Technology. His research career was devoted to the isolation, structural elucidation, synthesis, and biosynthesis of mycotoxins (toxins produced by fungi) and to some extent to toxic and medicinal substances from plants. He is the author or joint author of 190 scientific papers and reviews. In 1986 he was rated in the A-category for chemistry by the National Research Foundation.

First ICSU Regional Meeting for Africa

The First ICSU Regional Meeting for Africa, held 9–11 October 2004 in Harare, Zimbabwe, was organized by the International Council for Science (ICSU), the National Research Foundation (NRF) of South Africa, the Research Council of Zimbabwe, and Zimbabwe's Department of Science and Technology Development in the Office of the President and Cabinet. The meeting, which was officially opened by Dr. O.N. Muchena, Zimbabwe's minister of state, was attended by 45 scientists representing ICSU National Members, ICSU Scientific Unions, and other international organizations.

Background

ICSU, founded in 1931, is a non-governmental, global organization representing 101 National Members and 27 international scientific unions. It coordinates interdisciplinary research to address issues of relevance to science and society, actively defends freedom in the conduct of science, promotes access to scientific data and information, and facilitates science education and capacity building.

At the ICSU 27th General Assembly meeting in 2002, it was agreed that four ICSU Regional Offices—to be located in Sub-Saharan Africa, the Arab world, Asia, and Latin America and the Caribbean—should be created. The Regional Offices will help ICSU to provide better service to developing countries by fulfilling the following functions:

- enhancing the participation of scientists from developing countries and regional scientific organizations in ICSU activities
- strengthening science and capacity through South-South and North-South collaboration

Objectives of the First ICSU Regional Meeting for Africa

The main objective of the meeting was to deliberate and define practical guidelines for the activities of the ICSU Regional Office for Africa; this took the form of presentations of key issues followed by discussions focused around a number of themes, such as building on experiences, strengthening partnerships, shaping the future, and defining the agenda.

Outcomes of the Meeting

The meeting explored ways of collaborating with regional and international organizations such as UNESCO, TWAS, IFS, and NEPAD. ICSU has a long working relationship with UNESCO in the natural sciences sector and is also strengthening collaboration with other sectors. Participants agreed that capacity building should be one of the main functions of the Regional Office.

The meeting spent considerable time discussing activities that should be considered (or undertaken) by the Regional Offices:

- collecting and circulating information to scientists via a Web site and e-mail
- establishing a database of African experts in all scientific fields or compiling existing databases
- encouraging and improving capacity building in Africa
- creating an enabling environment for the progress and contribution to development of indigenous and traditional knowledge
- promoting establishment of more centers of excellence for research
- increasing participation of Africa in international programs through networking of regional scientific organizations

The Interim ICSU Regional Committee met during the Regional Meeting to discuss how to proceed with the ICSU Regional Office for Africa. It was agreed that recruiting a director for the office should be a priority. The director—to be appointed by the ICSU Executive Board—will be chosen based on terms of reference and merit, and will have a renewable three-year contract.

Nominations for the Regional Committee have to be made to ICSU by African National Members. The selection of the Regional Committee should reflect sub-regional zones and language differences. The Regional Committee will be appointed by the ICSU Executive Board and will consist of seven members appointed for three years with an initial staggered rotation built into the appointment. It was suggested that the first meeting of the Regional Committee be held as soon as a director is appointed. The meeting should coincide with the official opening of the Regional Office in South Africa.

The meeting coincided with the signing of the formal agreement between ICSU and the National Research Foundation of South Africa for the establishment of the ICSU Regional Office for Africa in Pretoria.

www.icsu.org

Standardization of Analytical Approaches and Analytical Capacity-Building in Africa

A World Bank study in 2003 determined that a major barrier to the export of commodities from many African countries is the inability of laboratories in those countries to provide test results that meet international standards. A new cooperative project among IUPAC's Analytical Chemistry Division, the Chemistry and the Environment Division, and IOCD* seeks to upgrade selected laboratories in Africa so they can produce reliable and internationally accepted analytical results. This will help farmers and enterprises in the private sector to export commodities to markets in the USA, European Union, and Japan, where compliance with international standards is required.

During phase one of the project, IOCD, in partnership with regulatory groups, Ugandan officials, and others, will first find out which laboratories and products are involved and what standards need to be met for specific Ugandan products. For phase two, an IOCD task group of five chemists (including two Africans) will visit Uganda and work closely with individuals in government and the private sector (economists, regulatory officials, farmers and entrepreneurs, laboratory managers, and staff scientists), to establish remedial measures jointly identified by the laboratories to build analytical capacity. Phase three will involve implementing these remedial measures Funding for the third phase will be requested from Ugandans, IUPAC, UNESCO, and other sources.

The support and involvement of IUPAC will be particularly critical in human capacity building (e.g., fellowships, expert visitors, workshops) and in laboratory upgrading (e.g., proficiency testing, quality assurance, research). IUPAC has generously contributed USD 10000 for a three-year period to sponsor training sessions. UNESCO, ALMA (the African Language Materials Archive program), and the U.S. National Academy of Sciences also have agreed to help.

Constructive feedback from IUPAC members and others would be appreciated.

For more information, contact Task Group Chairman Walter R. Benson <WBenson270@aol.com>.

www.iupac.org/projects/2004/2004-017-1-500.html

*IOCD is the International Organization for Chemical Sciences in Development; see May-June 2002 *CI* or <www.iocd.org>.

Young Ambassadors for Chemistry

As part of the Young Ambassadors for Chemistry (YAC) project, the first of a series of four workshops for Science and Language teachers was held 22–26 November 2004 at the National Taiwan Normal University (NTNU) in Taipei. The workshops are intended to encourage public understanding of chemistry through events for young people in public locations.

Two graduate Young Ambassadors for Chemistry.

The event in Taipei was organized with the support of a number of partners—a measure of the level of collaboration that was achieved in preparing for the workshop. Those partners included IUPAC; Science Across the World (SAW); GlaxoSmithKline; NTNU; National Science Council, Taiwan; British Council, Taipei; Chinese Chemical Society, located in Taipei; and GlaxoSmithKline Taiwan. Representatives from all of the partner organizations attended the opening and grand finale of the YAC workshop.

Young Ambassadors for Chemistry Workshop

Four days of workshops, which followed the "train the trainer" model, introduced 25 participants—chemistry and language teachers and science museum staff from all over Taiwan—to the SAW program for increasing public understanding of chemistry. On the final day, the participants hosted students for a YAC day celebration in a public place.

The Graduate Institute for Science Education in Taipei offered an ideal setting for the workshops. Professor Mei-Hung Chíu, from the Institute, along with Dr. Shu-Nu Chang, provided impeccable organization and facilities. A large stand with all of the workshop details and the YAC logo was

One group of students, during the YAC day, presenting a TV commercial about their new line of cosmetics.

displayed the whole week. Visitors could also view a nice selection of posters from last year's successful poster competition. All course materials were collected in a course book adorned with the logo and packed in a wonderful sustainable bag.

During the first two days of the workshops, Professor Choon Do from Korea was a special guest. He is investigating how to organize a YAC event in Korea.

Monday–Thursday

After introductions, the participants gave presentations about their schools or (science) museums, debated science issues, and discussed the concept of "active learning." The participants were also introduced to SAW—which has a membership of over 3100 teachers in 99 countries—and had the chance to join for free.

The workshops concentrated on two topics: "talking about genetics around the world" and "chemistry in our lives." In groups of four, the participants practiced the "experiments." For genetics, they constructed a large DNA molecule from sweets. For chemistry in our lives, they developed a line of cosmetics with three coherent products. Each group then practiced creative TV commercials promoting their new lines of cosmetics. With this training, the participants were ready to help the students during the YAC event. After four days of training, certificates of recognition were handed out.

Friday—YAC day

And then came YAC day! The event wasn't held in just any public place—it was held in the shopping center in Taipei 101, the tallest building (508 m) in the world! Adding more excitement was a strong storm that occurred during the event. Seventy-two students from three different schools in Taipei worked very hard to show the public the wonders of chemistry. They composed, with a little help from the trained teachers, their DNA models and their lines of cosmetics and TV commercials, hardly noticing the storm and the very windy eather.

After Professor Chíu announced the grand finale, a jury had the hard job of determining which student groups had the best DNA models and TV commercials. At the end of the day, the winning student groups received their prizes and all students were offered a certificate of recognition and presents from the different participating organizations.

Teachers and participants at the four-day workshop.

Results from Roving Reporters

Apart from the students who worked on cosmetics and DNA, there were three groups of roving reporters. They asked the public questions about the event and their opinions about chemistry (see table below).

Summary of Responses to Roving Reporters' Questions

Yes/Positive	No/Negative
Question 1: Do you know what these students are doing?	
53%	47%
Question 2: What is your impression about chemistry? Positive or negative?	
73%	27%
Question 3: Do you think the activity is a good idea for students?	
93%	7%

Following are a few comments about the event and chemistry in general that the public made to these reporters:

- "The event should also be organized in elementary schools and community centers."
- "This display helps us understand life and the world."
- "Chemistry has a positive influence on our life and can improve our society."
- "By applying chemistry to everyday life, it is easier to learn."
- "The first thing I think about when I hear 'chemistry' are 'explosions.'"
- "My impression about chemistry comes from tests (exams)."


加點創意 化學可以很貼近

In Taiwan, like so many other countries, this public activity proved very useful. A large percentage of the public never thinks about all the good things chemistry offers to society. We must work on changing the public perception that chemistry is about explosions and exams. The organizers were thrilled to see an article about the YAC event published in the *United Daily News*, Taiwan's largest newspaper!

The Future

Two chemistry activity packs from SAW have been translated into Chinese (you can find these packs at the SAW Web site by following the links to "Chemistry in our Lives" and "Talking about Genetics around the World"). This wonderful achievement gives a large portion of the science education world access to a program that enhances public understanding of chemistry so well!

Seventy-two Young Ambassadors for Chemistry participated in the public YAC event.

(L to R) Choon Do (observer from Korea), Lida Schoen (task group chairman), and Mei-Hung Chíu (local coordinator).

The next stop for the YAC series will be South America this coming summer. Project organizers hope to collaborate with as many organizations in Buenos Aires as they did in Taiwan. Organizers will also aim to include English teachers; participants in Taipei expressed they would have liked more English teachers.

Acknowledgments

The event in Taipei could not have been organized without the support of the previously mentioned partners. In addition we would like to thank Cognis Taiwan for offering the main ingredient for preparing the shampoo, and BioRad, Life Science Education, for donating the "genes in a bottle kit" that enabled students to extract their own DNA.

We also would like to thank all the volunteers and teams of students for their contributions and enthusiastic participation. Without them the week would not have been so successful.

This report was prepared by Keith Kelly (language education consultant) and Lida Schoen (science education consultant). Kelly is FACTWorld coordinator <www.factworld.info> and NILE associate trainer <www.nile-elt.com>. Schoen is a titular member of the IUPAC CCE and task group chairman for this IUPAC project. Go online for more details and more photos.

For more information contact Lida Schoen <amschoen@xs4all.nl>.

www.iupac.org/projects/2003/2003-055-1-050.html
www.scienceacross.org

Provisional Recommendations

IUPAC Seeks Your Comments

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*.

Terminology of Polymers Containing Ionizable or Ionic Groups and of Polymers Containing Ions

This document defines the most commonly used terms relating to polymers containing ionizable or ionic groups and to polymers containing ions. Inorganic materials such as phosphates and silicates that also may be considered ionic polymers are excluded from the present document. Only those terms that could be defined without ambiguity are considered. Terms subsidiary to the main terms are printed in bold type in notes to the main terms.

Comments by 31 May 2005

Prof. Przemyslaw Kubisa
Polska Akademia Nauk
Centrum Badan Molek. i Makromolek.
Sienkiewicza 112
PL-90 363 Lódz, Poland
TEL/FAX:+[48] (42) 684 4014/7126
E-MAIL: pkubisa@bilbo.cbmm.lodz.pl

www.iupac.org/reports/provisional/abstract04/kubisa_310505.html

Nomenclature of Cyclic Peptides

These recommendations extend rule 3AA-19.5 of the Nomenclature and Symbolism for Amino Acids and Peptides (Recommendations 1983) to cover all classes of cyclic peptides. They include rings generated from an acyclic peptide by formation of a peptide or ester bond, by a disulfide link, or by a new carbon-carbon, carbon-nitrogen, nitrogen-oxygen, or carbon-sulfur bond (not esters or amides). The inclusion of modified standard amino acids or amino acids not related to standard amino acids is considered. Any stereochemistry generated by ring formation is indicated using standard organic conventions.

Comments by 31 March 2005

Dr. Gerard P. Moss
Queen Mary, University of London
Department of Chemistry
Mile End Road
London, E1 4NS, United Kingdom
TEL/FAX:+44 (20)7882 3262/7794
E-MAIL: g.p.moss@qmul.ac.uk

www.iupac.org/reports/provisional/abstract04/moss_310305.html

Nomenclature of Organic Chemistry

A major new principle is elaborated in these recommendations. The concept of "preferred IUPAC names" is developed and systematically applied. However, rather than recommend only a single "unique name" for each structure, we have developed rules for assigning "preferred IUPAC names," while continuing to allow alternatives in order to preserve the diversity and adaptability of the nomenclature to daily activities in chemistry and in science in general.

This book covers and extends the principles, rules and conventions described in two former publications: *Nomenclature of Organic Chemistry*, 1979 Edition, and *A Guide to IUPAC Nomenclature of Organic Compounds*, Recommendations 1993.

Comments by 31 March 2005

Prof. Henri A. Favre
2031 Rue Leclaire
Montréal, QC H1V 3A1, Canada
TEL.: +1 514 259 7963
E-MAIL: halfa@contact.net

www.iupac.org/reports/provisional/abstract04/favre_310305.html

Making an imPACt

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

Definition of Terms Related to Polymer Blends, Composites, and Multiphase Polymeric Materials (IUPAC Recommendations 2004)

W.J. Work, K. Horie, M. Hess, and R.F.T. Stepto
Pure and Applied Chemistry
Vol. 76, No. 11, pp. 1985–2007 (2004)

This document defines the terms most commonly encountered in the field of polymer blends and composites. The scope has been limited to mixtures in which the components differ in chemical composition or molar mass and in which the continuous phase is polymeric. Incidental thermodynamic descriptions are mainly limited to binary mixtures although, in principle, they could be generalized to multicomponent mixtures.

The document is organized into three sections. The first defines terms basic to the description of polymer mixtures. The second defines terms commonly encountered in descriptions of phase domain behavior of polymer mixtures. The third defines terms commonly encountered in the descriptions of the morphologies of phase-separated polymer mixtures.

www.iupac.org/publications/pac/2004/7611/7611x1985.html

Characterization of Polyamides 6, 11, and 12. Determination of Molecular Weight by Size Exclusion Chromatography (IUPAC Technical Report)

E.C. Robert, et al.
Pure and Applied Chemistry
Vol. 76, No. 11, pp. 2009–2025 (2004)

This report presents the results from IUPAC Working Party IV.2.2 of the global trial within the framework of IUPAC Commission IV.2, "Characterization of Commercial Polymers." The results were compared on the basis of molecular weight obtained by size exclusion chromatography (SEC) using different techniques practiced in participating laboratories, the majority of which were materials suppliers. The practical methodologies used different solvents for the polymers, in particular, benzyl alcohol, 1,1,1,3,3,3 hexafluoropropan-2-ol and tetrahydrofuran; the latter solvent was used after chemical modification of the polyamides, in general with trifluoroacetic anhydride. Eight laboratories participated in the trial. The repeatability for molecular weight in each laboratory was good, whatever technique was used, the relative standard deviation averaged over all laboratories was around 3%. The

New Online Submission and Peer Review System for *PAC*

During 2004, an online submission and peer-review system was implemented for *Pure and Applied Chemistry*. The new Web-based workflow for manuscript handling will enable Scientific Editor James R. Bull to implement peer review of manuscripts from IUPAC-sponsored conferences, which was formerly a discretionary option of the conference organizers. The system also provides support to John W. Lorimer and Bernado J. Herold, editors of IUPAC Recommendations and Technical Reports and respectively chairman and secretary of the Interdivisional Committee on Terminology, Nomenclature and Symbols .

ScholarOne® Manuscript Central™ is the system IUPAC has chosen for *PAC*. ScholarOne, Inc. is a leading provider for online submission, review, and tracking of scholarly manuscripts. During the first half of 2004, it signed 17 new clients representing 76 unique journals. These journals join the diverse ScholarOne community, whose titles receive annual submissions ranging from 100 to 5 000 submissions per year and cover a broad spectrum of disciplines, including the humanities, life sciences, engineering, computer science, and social sciences. Presently, Manuscript Central has over 1.1 million global registered users and processes more than 27 000 manuscript submissions per month.

For *PAC*, the system was configured to work on invitation only. Authors of conference papers or technical reports are invited to review the instructions for authors and—if it applies—request an invitation to submit manuscripts online <www.iupac.org/publications/authors/instructions.html>.

Questions or comments may be sent by e-mail to <edit.pac@iupac.org>.

deviations in distribution of molecular weights with different experimental methodologies were broader, but were reasonably good despite the diversity of methods. The differences in the distribution correspond to a confidence interval of about 30% in molecular weight.

www.iupac.org/publications/pac/2004/7611/7611x2009.html

Rheological Properties and Associated Structural Characteristics of Some Aromatic Polycondensates Including Liquid-Crystalline Polyesters and Cellulose Derivatives (IUPAC Technical Report)

J.L. White, L. Dong, P. Han, and M. Laun
Pure and Applied Chemistry
Vol. 76, No. 11, pp. 2027–2049 (2004)

Aromatic polycondensates became increasingly important in the 1980s. Characteristic of these polymers are para-linked aromatic rings in their backbones, which tend to make the chains more rigid than aliphatic hydrocarbon (e.g., vinyl) polymers. While such *p*-linked aromatic polycondensates like poly(carbonate) or poly(ethylene terephthalate) had been known since the 1950s, the full implications were only realized in the 1970s with the discovery that concentrated solutions of poly(*p*-phenylene terephthalamide), poly(*p*-benzamide), and similar polymers exhibited rest state birefringence, liquid-crystalline phases, and associated viscosity reductions. This paper describes a comparative experimental study of shear-flow rheological properties of thermotropic polymer liquid crystals by eight different laboratories. The materials involved four different liquid-crystalline polyesters (LCPs), a glass- fiber-filled liquid-crystalline polyester, hydroxypropyl cellulose (HPC), and two non-liquid-crystalline high-temperature polymers, a poly(etheretherketone) (PEEK), and a polyarylate (PAR). Studies were made in both steady shear-flow and dynamic oscillatory experiments. The data from the various laboratories involved were compared. The level of agreement in the data was much less for most liquid-crystalline polymers than for similar isotropic melts. The Cox-Merz rule is valid for PEEK and PAR, but not for the LCPs and HPC. The occurrence of low levels of extrudate swell and high levels of uniaxial orientation in extrudates of the LCPs and HPC is described.

www.iupac.org/publications/pac/2004/7611/7611x2027.html

Name and Symbol of the Element with Atomic Number 111 (IUPAC Recommendations 2004)

J. Corish and G.M. Rosenblatt
Pure and Applied Chemistry
Vol. 76, No. 12, pp. 2101-2103 (2004)

A joint IUPAC-IUPAP Working Party (JWP) confirmed the discovery of element number 111. In accord with IUPAC procedures, the discoverers proposed a name and symbol for the element. The Inorganic Chemistry Division recommended this proposal for acceptance, and it was adopted by IUPAC on 1 November 2004. The recommended name is **roentgenium** with symbol **Rg**.

www.iupac.org/publications/pac/2004/7612/7612x2101.html

Chemical Actinometry (IUPAC Technical Report)

H.J. Kuhn, S.E. Braslavsky, and R. Schmidt
Pure and Applied Chemistry
Vol. 76, No. 12, pp. 2105-2146 (2004)

This document updates the first version of the IUPAC technical report on "Chemical Actinometers" published in *Pure and Applied Chemistry*, 61, 187–210 (1989). Since then, some methods have been improved, procedures have been modified, and new substances have been proposed as chemical actinometers. An actinometer is a chemical system or a physical device by which the number of photons in a beam absorbed into the defined space of a chemical reactor can be determined integrally or per time. This compilation includes chemical actinometers for the gas, solid, microheterogeneous, and liquid phases, as well as for use with pulsed lasers for the measurement of transient absorbances, including the quantum yield of phototransformation. The literature for each of the actinometers is included as well. The actinometers listed are for use in the wave-

length range from UV to the red region of the spectrum. A set of recommended standard procedures is also given. Advantages and disadvantages are discussed regarding the use of chemical actinometers vs. electronic devices for the measurement of the number of photons absorbed. Procedures for the absolute measurement of incident photon flux by means of photodiodes are also discussed.

www.iupac.org/publications/pac/2004/7612/7612x2105.html

Electrochemistry at the Interface between Two Immiscible Electrolyte Solutions (IUPAC Technical Report)

Z. Samec
Pure and Applied Chemistry
Vol. 76, No. 12, pp. 2147–2180 (2004)

An interface between two immiscible electrolyte solutions (ITIES) is formed between two liquid solvents of a low (ideally zero) mutual miscibility, each containing an electrolyte. One of these solvents is usually water, and the other one is a polar organic solvent of a moderate or high dielectric permittivity, such as nitrobenzene or 1,2-dichloroethane, which allows for at least partial dissociation of dissolved electrolyte(s) into ions. Electrochemical processes at ITIES have attracted a great deal of interest for two reasons. First, the biomimetic features of these processes have been a concern for over a century. Second, the electrochemical reaction at ITIES represents an essential aspect of various practical applications in chemistry, including electroanalysis, phase-transfer catalysis, ion extraction, and electrocatalysis.

This document provides an inventory of theoretical and methodological concepts in electrochemistry at the interface between two ITIES. Definitions of basic relationships are given, together with recommendations for the preferred symbols, terminology, and nomenclature. Methods of study of ITIES are briefly described, current experimental problems are indicated, and representative experimental data are shown. The practical applications of electrochemistry at ITIES are summarized.

www.iupac.org/publications/pac/2004/7612/7612x2147.html

IUPAC *Empfehlungen*

The German National Adhering Organization, the Deutscher Zentralausschuss für Chemie, through one of its component Societies, the Gesellschaft Deutscher Chemiker, has arranged for the translation and publication of selected IUPAC Reports and Recommendations in the journal *Angewandte Chemie*. According to Angewandte Chemie, publishing translations of IUPAC Recommendations and Technical Reports is a way to promote the use of chemical professional language in German. Properly defined terms and clear nomenclature form the basis of the understanding among scientists in a discipline and are essential for the exchange among scientific and professional language and general language. All translations are examined, corrected, and authorized by an acknowledged expert, the "Obmann."

For more information, please contact Elisabeth Weber <angewandte@wiley-vch.de> or visit the journal Web site <www.angewandte.com>. Suggestions for themes and experts are welcomed.

Following is a list of recently translated and published Reports and Recommendations:

- "Modeling Lifetime and Degradability of Organic Compounds in Air, Soil, and Water Systems," A. Sabljic and W. Peijnenburg, *Pure Appl. Chem.* 2001, **73**, 1331–1348
- "Definitions of Basic Terms Relating to Low-Molar-Mass and Polymer Liquid," M. Barón, *Pure Appl. Chem.* 2001, **73**, 845–895
- "Concepts and Applications of the Term Dimensionality in Analytical Chemistry," Klaus Danzer, Jacobus F. van Staden, and Duncan Thorburn Burns, *Pure Appl. Chem.* 2002, **74**, 1479–2002
- "Organic Photochromism," H. Bouas-Laurent and H. Dürr, *Pure Appl. Chem.* 2001, 73, 639–665
- "NMR Nomenclature. Nuclear Spin Properties and Conventions for Chemical Shifts," R. K. Harris, E. D. Becker, S. Cabral de Menezes, R. Goodfellow, and P. Granger, *Pure Appl. Chem.* 2001, **73**, 1795–1818
- "Generic Source-Based Nomenclature for Polymers," E. Maréchal and E. S. Wilks, *Pure Appl. Chem.* 2001, **73**, 1511–1519

See the up-to-date list of published IUPAC Empfehlungen on the journal Web site or <www.iupac.org/publications/pac/empfehlungen.html>.

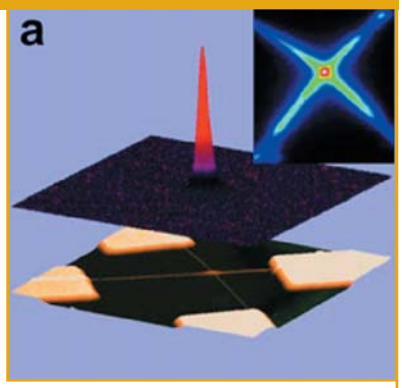
Special Topic Articles Featuring the 2004 Winners of the IUPAC Prize for Young Chemists

Pure and Applied Chemistry
Vol. 76, No. 12, pp. 2051–2099, 2004

The IUPAC Prize for Young Chemists encourages young scientists throughout the world to enter an annual competition that requires candidates to submit short essays based upon the topic of their Ph.D. studies. Starting in 2002, prizewinners have been invited to submit manuscripts on aspects of their research topics for consideration as short, critical review articles to be published in *Pure and Applied Chemistry*. Following peer review, the first collection appeared in *PAC* **74**(11), 2021–2081 (2002) and encouraged the view that it offers sufficient readership appeal to become a regular special topic feature of the journal. The second series, covering the works of the 2003 winners was published in *PAC* **76**(2), 263–319 (2004). The most recent series of articles was published in the Dec 2004 issue of *PAC* and includes the following critical reviews:

"Integrated Nanoscale Electronics and Optoelectronics: Exploring Nanoscale Science and Technology through Semiconductor Nanowires," by Y. Huang

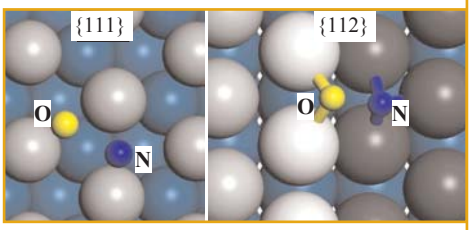
Semiconductor nanowires (NWs) represent an ideal system for investigating low-dimensional physics and are expected to play an important role as both interconnects and functional device elements in nanoscale electronic and optoelectronic devices. In their review, Huang and Lieber look at a series of key advances defining a new paradigm of bottom-up assembling integrated nanosystems using semiconductor NW building blocks. They first introduce a general approach for the synthesis of a broad range of semiconductor NWs with precisely controlled chemical composition, physical dimension, and electronic, optical properties using a metal cluster catalyzed vapor-liquid-solid growth mechanism. Subsequently, they describe rational strategies for the hierarchical assembly of NW building blocks into functional devices and complex architectures based on electric field or microfluidic flow. Next, they discuss a variety of new nanoscale electronic device concepts including crossed NW p-n diode and crossed NW field effect transistors (FETs). Lastly, they describe a wide range of photonic and optoelectronic devices, including nanoscale light-emitting diode (nanoLED), multicolor LED arrays, integrated nanoLED-nanoFET array, single nanowire waveguide, and single nanowire nanolaser. The potential application of these nanoscale light sources for chemical and biological analyses is also discussed.



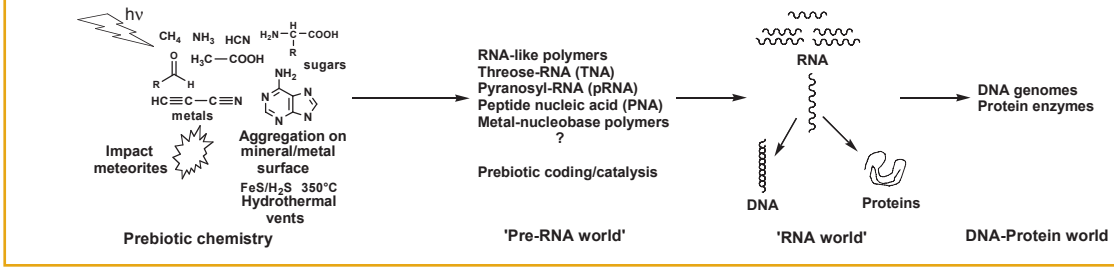
Crossed InP nanowire LED. (top) Three-dimensional (3D) plot of light intensity of the electroluminescence from a crossed NW LED. Light is only observed around the crossing region. (bottom) 3D atomic force microscope image of a crossed NW LED. (inset) Photoluminescence image of a crossed NW junction. Y. Huan and C.M. Lieber, PAC *76(12), 2051-2068 (2004).*

"Chemical Reactions at Surfaces and Interfaces from First Principles: Theory and Application," by Z.-P. Liu

The last decade has seen rapid expansion and development in the field of density functional theory (DFT) simulation on the complex chemical processes that occur at surfaces and interfaces. The understanding of the phenomena in surface science and heterogeneous catalysis has benefited tremendously from these quantum mechanic calculations. Liu reviews the current progress in the theory of reactions on surfaces, in particular those relevant to the barrier and the active site of surface reactions. Two representative reactions, namely NO dissociation and CO oxidation, are selected to illustrate how these theoretical concepts are applied to understand catalytic reactions. Here, the pathways and the energetics of these reactions under various catalytic conditions are described in detail and the understanding of the reactions is generalized. It is concluded that DFT-based methods can be well applied to catalysis to understand



Typical transition state structures of NO dissociation on the close-packed {111} surface and the stepped {211} surface. Z.-P. Liu, PAC *76(12), 2069-2083 (2004).*



Probable events related to the origin of life. S.G. Srivatsan, PAC *76(12), 2085-2099 (2004).*

the electronic structure of chemical processes and to elucidate mechanisms of complex surface reactions.

"Modeling Prebiotic Catalysis with Nucleic Acid-Like Polymers and its Implications for the Proposed RNA World," by S.G. Srivatsan

The theory that RNA molecules played a pivotal role in the early evolution of life is now widely accepted. Studies related to this hypothetical "RNA world" include three major areas: the formation of precursors for the first RNA molecules, the polymerization process, and the potential of RNA to catalyze chemical and biochemical reactions. Several chemical and biochemical studies performed under simulated prebiotic conditions support the role of RNA as both genetic as well as catalytic material. However, due to the lack of credible mechanism for *de novo* nucleic acid synthesis and the hydrolytic instability of RNA molecules, there has been some serious discussion of whether biopolymers that closely resembled nucleic acid preceded the "RNA world." In this context, an overview of prebiotic chemistry, the role of the mineral surface, and the significance of studies related to RNA-like polymers in the origin of life are presented in Srivatsan's review.

www.iupac.org/publications/pac/2004/7612

Natural Products and Biodiversity

Virinder S. Parmar (editor)
Pure and Applied Chemistry
Vol. 77, No. 1, pp. 1-344 (2005)

Nature has vast hidden treasures that may benefit humanity. Bioresources have tremendous potential to lead to the development of new pharmaceuticals, nutraceuticals, and agrochemicals. An impressive number of modern drugs have been isolated from natural sources, particularly from plants. Besides plant materials, the past century has seen an increasing role played by microorganisms in the production of antibiotics and other drugs for the treatment of serious diseases. More recently, marine organisms have proved to be a rich source of novel bioactive agents.

To address these issues, the University of Delhi in collaboration with the Council of Scientific & Industrial Research (CSIR, India) organized a joint meeting of the IUPAC 4th Conference on Biodiversity and the 23rd Conference on the Chemistry of Natural Products, which was held 26–31 January 2004 in Delhi. The nearly 1000 scientists and scholars from around the world who attended enjoyed around 175 plenary and invited lectures, by eminent scientists, and about 450 poster presentations.

The conference themes covered a range of topics, such as biodiversity and bio-prospecting, innovative utilization of bio-resources, novel strategies in integrated pest management, bioremediation of industrial and nuclear waste, and green chemistry. A collection of papers based upon lectures presented at the conference is published in the January 2005 issue of *Pure and Applied Chemistry*. Following are summaries of selected papers from the issue.

Natural Products Chemistry

The curative properties of plants have unfolded gradually over many centuries and, despite the wealth of knowledge that has accumulated through traditional medicine, many species in the plant kingdom still remain to be surveyed systematically for their biologically active chemical constituents. The conference featured many presentations by leading scientists in this area. For example, C. Mahidol, B. Sener, and G.M. Cragg highlighted research intended to discover therapeutic agents in some Thai plants and Turkish marine organisms. Atta-Ur-Rahman explained how his group has identified several new classes of potent cholinesterase,

urease, phosphodiesterase, glucuronidase, and prolyl endopeptidase inhibitors from natural sources. E. Dagne presented results of a phytochemical examination of Commiphora myrrha (Nees) Engl. He has isolated novel furanosesquiterpenoids from this plant source, which show significant analgesic properties.

Biotransformations

Enzymes have been shown to have a wide variety of applications in diverse types of organic reactions, including the preparation of polymeric materials. The stereo-, regio-, and chemoselectivity of enzymes observed in small molecule reactions have also been observed in the synthesis of polymeric materials. The increasing diversity of commercially available enzymes makes possible greater control of molecular architecture.

A.C. Watterson described an extremely flexible chemo-enzymatic synthesis of several families of PEG based amphiphilic polymers with well-defined structures. The methods permit variation of molecular structure over a wide range of monomer units, essentially permitting properties to be tuned to a particular application, for example in the design of drug delivery systems. These block copolymers have been used to target drugs into cells and modify drug intracellular distribution to increase drug-specific activity.

Bioactivity of Natural Products

In recent years, many researchers have shown the detrimental effects of light, dioxygen, and radicals on humans. The consequences may be the onset of cancer, diabetes, cataract, atherosclerosis, inflammation, and possibly many other diseases. Phenols are widely employed by living organisms (as well as food industries) to limit the effects of reactive oxygen species.

M. Foti's paper describes the mechanism of action of the antioxidant activity of phenols and discusses the effect of solvents on the antioxidant activity of compounds. In another paper, H.G. Raj shares his recent discovery of a unique membrane-bound enzyme that catalyzes the transfer of acetyl groups from polyphenolic peracetates to certain enzyme proteins, resulting in the modulation of the catalytic activity. This enzyme, called Transacetylase, was found to be ubiquitous in the tissues of several animal species and a variety of cells.

Malaria is a major killer of children in the tropical world and remains a significant scientific challenge. V.S. Chauhan's paper highlights the importance and urgency of developing malarial vaccine programs. Since glycolysis is the primary source of ATP for malarial parasite during the intraerythrocytic stage, glycolytic enzymes present themselves as potential targets for inhibitors. P. Balaram sheds light on *Plasmodium falciparum* triosephosphate isomerase, a central enzyme in glycolytic pathway. K. Chibale's paper describes the synthesis and antimalarial screening of a series of novel β-amino alcohol derivatives, which show improved antiplasmodial activity.

Organic Synthesis

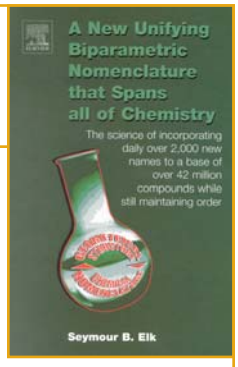
Among important challenges now facing synthetic organic chemists is the need to design and produce chemically well-defined molecules that are useful in medicine, agriculture, and biology. In his paper, D. Basavaiah describes how he has successfully employed the Baylis-Hillman reaction, an atom economical carbon-carbon bond forming reaction between the α-position of an activated alkene and a carbon electrophile, for the synthesis of an interesting class of heterocyclic molecules of biological importance.

In another paper, E. van der Eycken describes the Diels-Alder reactions of polymer-bound 2(1*H*)-pyrazinones with acetylenes, which offers an efficient solid-phase methodology for the separation of the resulting products (i.e., pyridines and pyridones) using the concept of traceless linking. Upon reaction, pyridines are released into solution phase, whereas pyridones stay on the solid support and can be cleaved from the resin, affording the final compounds in moderate to high purities. He compares the pros and cons of microwave-assisted protocol with the conventional thermal method.

H.B. Kagan's paper focuses on the use of Me_3SiCN. He describes the asymmetric reduction of ketones by trimethoxysilane in the presence of catalytic amounts of monolithium salt of (*R*)-BINOL. He also used this catalyst and related compounds in the trimethylsilylcyanation of various aromatic aldehydes to synthesize chiral cyanohydrins. E.J. Thomas' paper describes the results of using allyl metal reagents for the control of remote stereocenters, with applications in the synthesis of complex natural products (e.g., epothilone B and pamamycin 607).

The papers contained in this issue of *PAC* offer encouraging evidence that natural products research is vigorous and rich with future promise.

www.iupac.org/publications/pac/2005/7701



A New Unifying Biparametric Nomenclature that Spans All of Chemistry

by Seymour B. Elk
Elsevier, 2004, ISBN 0-444-51685-9

reviewed by Kevin Thurlow

I read the title of this book with some trepidation—what could it mean? The subtitle is "The science of incorporating over 2 000 new names to a base of over 42 million compounds while still maintaining order." The author, Seymour B. Elk, is concerned that there are different forms of nomenclature for "inorganic chemistry," "organic chemistry," and "polymer chemistry," etc. Elk makes the entirely reasonable point that as new chemicals are discovered, the boundaries between these different areas become somewhat blurred, and there are communication difficulties among chemists.

Therefore, Elk proposes an unified scheme, where the name is based entirely on the geometric structure. The author has a background in mathematics and computers, as well as chemistry, and his proposed system reflects this. He points out obvious faults in IUPAC nomenclature (e.g., "fluorine" and "fluorene" sound the same, but are entirely different; and "polyethylene" is used instead of "polymethylene"). He also draws attention to IUPAC's use of alphabetical order to set priorities. He says that using size would give I > Br > Cl > F, or using reactivity would give F > Cl > Br > I. This works fine for simple examples of course.

The claimed advantages of his system include the following: one set of rules that can easily be expanded if new forms of structure are discovered; recognition that chemistry is three-dimensional; removal of traditional prefixes and suffixes; creation of "single, unified, systemic formulations for addending modules at specified locations to an evolving skeletal base" (which avoids consulting long tables of parent names); elimination of oxidation number; new ways of dealing with tautomers and aromatic compounds; and improved systems for boranes and polymers. In brief, the idea is to have one system to cover all chemical names. This is a laudable ideal, but is it possible or even desirable in everyday circumstances?

The system espoused is a line system, like Wiswesser and SMILES, and also under development in the InChI project. As such, it really relies on computers for creation and understanding of "names." (The author does not like to "name" chemicals, he "nomenclates" them!) He is certainly not fond of IUPAC, but his knowledge is a little hazy as he says that 'butan-1-ol' is a British name and '1-butanol' is IUPAC. He reasonably says that multiple primes and Greek letters are a nuisance, but then uses α and ß and ℵ (Hebrew "aleph") himself. He gives (page 32) the "IUPAC" name 3(2-propynyl),5-methenyl-oct-1,2-diene,6-yne and its equivalent in his system, which is:

$$H1C3(C1\underline{C}1)_2C1C3C1\underline{C}1H:^{9}[(2C)_2H:^{5}(1H)];^{13}[2C1H:^{3}(1H)]$$

The '$\underline{C}$' requires some juggling of the keyboard, and means a non-terminal 'CH_2' group. ('$\underline{C}$' would be a non-terminal CH group.) He carries the rule for selecting longest chain to extremes, including the terminal hydrogen atoms. The example above shows a drawback to his system. The "IUPAC" name has errors, but you can still work out what it means. Any error in the second "name" would be difficult to detect and correct.

I doubt that any one system of nomenclature can meet universal approval. Sometimes, you want structural diagrams, or CAS numbers, or IUPAC names, or INNs for drugs, or ISO pesticide names, or INCI cosmetic names, or hazard warning labels, or abbreviations.... The list is endless. You use whatever is best for the given audience and the given situation. Any nomenclature system has failings. In the system proposed in this book, for example, you cannot easily speak the name, and a small typing error would cause complete confusion.

Unfortunately, this book has a large number of typographical errors. "Flouro" instead of "fluoro" repeatedly. The layout is also confusing. It is not always clear which "names" refer to which diagrams, and there are frequent, lengthy footnotes, up to half a page long. The author has a tendency to circumlocution, which may irritate some readers.

To summarize, it is an interesting system that Elk proposes, which has good and bad points, like all systems of nomenclature. It appears to succeed in producing a naming system for everything, but the "names" produced are incredibly complicated, and not, in my view, beneficial for communication.

Kevin Thurlow <kjt@lgc.co.uk> from LGC, Ltd. Chemical Nomenclature Advisory Service in Teddington, Middlesex, UK, is also a member of the Advisory Committee of the IUPAC Chemical Nomenclature and Structure Representation Division.

http://books.elsevier.com/elsevier/?isbn=0444516859

Chemistry and You

The European Chemical Industry Council (Cefic) launched an educational Web site—chemistryandyou.org—to raise awareness and interest in chemistry. The site—designed to be attractive to young people, while meeting the needs of secondary schools—is intended to show the overwhelming benefits chemistry brings to our daily lives. Although not designed for chemists per se, the site may be useful to those chemists who crave for their friends and family to understand how interesting, and indeed relevant, chemistry is.

The site—available in French, English, Dutch, German, Italian, and Spanish—is one way that Cefic is helping to maintain the chemical sector's long-term ability to innovate. According to Cefic, this ability begins in the classroom and rests on sustained investment in education and research.

"Chemistry is all around us—in our mobile phones, in our homes, in our cars—and yet people are often not even aware of it," said Cefic Director General Alain Perroy. "To young people, chemistry may seem like a world of abstract symbols and equations, yet it is in reality a world of very concrete objects that make our lives safer, more comfortable, and more pleasurable."

Whoever we are, wherever we live, chemistry is present in everything we do, improving our lifestyle and the world about us. While that might be difficult to explain in a few words, this site invites visitors to follow a day in the life of five different people. With Sarah, Thomas, Igor, Mee, and Barbara, one can explore how everyone has specific needs that relate to chemistry. As the site illustrates, from New York to Sydney we all expect the same things around the house, in the supermarket, and in the car. The site's emphasis is on showing, rather than telling (so, did I say too much?) how science and technology affect everything, from the simplest gadgets to the most sophisticated satellite technology.

In the first six months after its launch, the site received more than 50 000 visits. Launched in November 2003 during European Science and Technology Week, the site was marketed, with the help of a promotional poster, to 30 000 secondary schools across Europe.

For more information on the European Chemical Industry Council, visit <www.cefic.org>.

www.chemistryandyou.org

Conference Call

Organic Synthesis

by Tamejiro Hiyama

Organic synthesis has long played a central role in the chemical sciences. Thus, it is stands to reason that the series of **International Conferences on Organic Synthesis**, initiated and sponsored by IUPAC, continues to thrive. The 15th Conference (ICOS-15) was held 1–6 August 2004 in Nagoya, Japan.

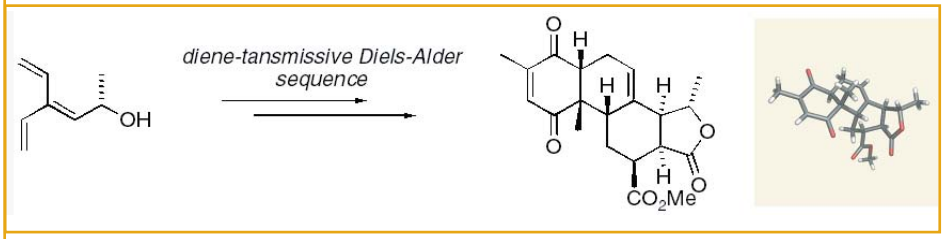
Given the widely held view that chemists in Japan are leaders in organic synthesis, the decision was made to hold ICOS-15 in Nagoya. In light of its distinct leadership in organic synthesis, it is surprising that ICOS had not been held in Japan since 1982 (ICOS-4). Professor Minoru Isobe (Nagoya University) and Professor Hisashi Yamamoto (now at the University of Chicago) enthusiastically took up the baton as the conference co-chairs. Nagoya was chosen as the venue because it is a research center that is close to Tokyo and Osaka/Kyoto.

The organizers provided a superb combination of chemistry, efficiency, and hospitality for near 1000 participants. A major change for ICOS-15, compared with ICOS-4, was the marked increase in participants from East Asia, which reflects the rapid growth in this field over the last two decades in Taiwan, China, Korea, and Singapore. These countries, combined with Japan and East Asia, now comprise the third center of chemical research activity in the world after North America and Europe.

Another feature of ICOS-15 was that all plenary, invited, and award lectures were presented in the main hall, enabling all of the participants to enjoy the full range of cutting edge developments in chemistry. In addition, all of the poster presenters (totaling 466) were allowed to orally summarize their presentations before the session to help attendants decide which of the posters they should visit. Of the posters, three excellent presentations by **Toshifumi Dohi** (Osaka University), **Eun Joo Kang** (Seoul National University), and **Natalie A. Miller** (Australian National University) were awarded the IUPAC Poster Prize.

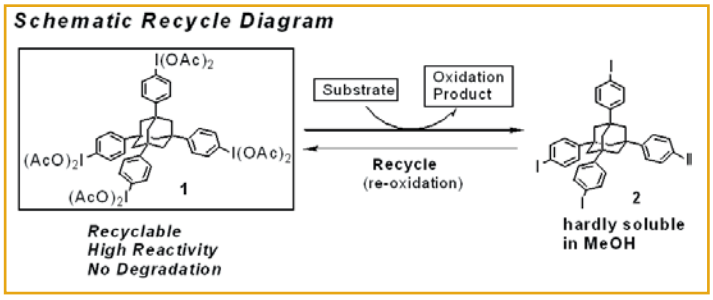
IUPAC Poster Prize Winners Toshifumi Dohi (top left), Eun Joo Kang (right), and Natalie A. Miller.

The scientific program embraced all aspects of modern synthetic organic chemistry. There were 10 plenary lectures, the Thieme/IUPAC award lecture, 2 Nagoya medal lectures, and 20 invited lectures.



(Left) The synthesis of chiral [3]- and [4]dendralenes has been achieved. Diene-transmissive Diels-Alder reactions of these compounds allow the rapid assembly of enantiomerically pure polycyclic compounds. (IUPAC poster prize winner Natalie A. Miller)

(Right) A novel non-polymer-supported hypervalent iodine(III) reagent 1 has been developed that has high recyclability as well as high reactivity, stability. This reagent has several advantages overcoming several drawbacks of conventional polymer-supported hypervalent iodine(III) reagents. (IUPAC poster prize winner Toshifumi Dohi)



Following is a list of the plenary speakers and their lecture subjects:

- E.M. Carreira (ETH) on asymmetric catalysis
- J.L. Wood (Yale) on synthesis of polycyclic target molecules
- P.B. Dervan (Caltech) on regulation of gene expression
- A. Fürstner (Max-Planck) on catalysis-based total synthesis
- Ryoji Noyori (RIKEN) on molecular catalysis
- L. E. Overman (UCI) on alkaloid total synthesis
- C.-C. Liao (Tsing Hua) on masked o-benzoquinone strategy
- S.V. Ley (Cambridge) on methods for azadirachtin total synthesis
- Y. Langlois (Paris Sud) on cytotoxic natural products synthesis
- E.N. Jacobsen (Harvard) on asymmetric metal catalysis

The Thieme/IUPAC prize was awarded to **John Hartwig** (Yale) who lectured on transition metal-catalyzed substitution reactions. The Nagoya Silver Medal was given to Keiji Maruoka (Kyoto) who gave a talk on practical asymmetric synthesis with chiral phase transfer catalysts. The Nagoya Gold Medal was presented to J.F. Stoddard (UCLA), who discussed the nature of the mechanical bond.

Topics of ICOS-15 focused on automated synthesis, bioorganic chemistry, combinatorial chemistry, green chemistry, Lewis acid catalysis, new catalysis, new material, oxidation catalysis, polymer synthesis, process chemistry, reduction catalysis, self-assembled molecule, synthesis of natural products, and medicinal drugs and agrochemicals. A selection of plenary and invited lectures will be published in *Pure and Applied Chemistry*, for which Tamejiro Hiyama is acting as conference editor.

The next conference, ICOS-16, will be held in Merida, Yucatan, México, from 11–15 June 2006. Dr. Eusebio Juaristi, Instituto Politecnico Nacional, México, is the chairman of the organizing committee.

Tamejiro Hiyama <thiyama@NPC05.kuic.kyoto-u.ac.jp > is a professor of organic materials in the Department of Material Chemistry at Kyoto University Katsura, Japan. Since 2004, he has been the editor in chief of *Chemistry Letters*.

Vanadium Chemistry

by Tamas Kiss

The **4th International Symposium on Chemistry and Biological Chemistry of Vanadium** was held 3–5 September 2004 in Szeged, Hungary. The symposium followed the 7th European Biological Inorganic Chemistry (EUROBIC) conference (Gearmich Partenkirchen, Germany) and provided a forum for the presentation and discussion of recent results in the following areas:

- biological aspects of vanadium chemistry
- inorganic chemistry of vanadium
- vanadium chemistry in catalysis and organic synthesis

The conference attracted over 110 participants from 25 countries and 4 continents. There were 5 plenary lectures (Hirao, Pecoraro, Yamamoto, Tracey, and Sakurai), 14 invited lectures, 9 lectures, and 57 posters presented during the program. The plenary and section lectures represented the wide scope of vanadium chemistry.

Fifteen lectures dealt with the biological importance of vanadium and its role in halogenoperoxidases and in forming insulin-mimetic compounds. Eleven lectures presented new results concerning the versatile inorganic chemistry of vanadium. Five papers discusssed vanadium compounds as catalysts. The distribution of the 57 posters presentations among the three main areas was very similar.

V. Pecoraro, R. Vewer, J. Littlechild, M. Sivak, and G. Santoni presented results of using synthetic, structural, biological, and computational methods to understand the mechanism of vanadium haloperoxidases. H. Sakurai, D.C. Crans, C. Orvig, D. Rehder, Y. Shechter, and M. Makinen reported new developments of insulin enhancing vanadium complexes as potential pharmaceuticals. Various aspects of the bioinorganic chemistry of vanadium were discussed in lectures by H. Michibata (vanadium accumulating Ascidians), T. Hubergtse (Amavadine), M. A. Alves (vanadium toxicity), and B. Vertessy (enzyme regulation).

Various aspects of the inorganic chemistry of vanadium were also discussed in the following lectures by A. Tracey, K. Hegetschweiler, J. Horzicek, L. Pettersson, J. Costa Pessoa, and K. Majlesi (equilibrium

Vanadis, Norse Goddess of Love and Beauty, the deity after whom vanadium was named, and after whom the new award is named.

and structure), J. Hartung, T. Kabanos, A. Salifoglou (synthesis), T. Hirao, V. Conte (redox chemistry), and A. Keramidas, J. Krzystek (spectroscopy).

Recent results in the catalytic behavior of various vanadium complexes were reported in a fascinating plenary lecture by H. Yamamoto and section lectures by C. Lorber and E. Rosenthal. Also of note was the awarding of the first-ever Vanadis Award to Debbie C. Crans (University of Colorado, USA).

The entire program and abstracts of the symposium, list of participants, and photographs of the event can be accessed at **<www.staff.u-szeged.hu/~vanadium>**. A selection of the plenary and invited lectures will be published in *Pure and Applied Chemistry*.

The V5 Symposium is planned for fall 2006 in San Francisco, California, USA.

Tamas Kiss <tkiss@chem.u-szeged.hu> is a professor in the Department of Inorganic and Analytical Chemistry at University of Szeged in Hungary. He served as the chairman of the 4th International Symposium on Chemistry and Biological Chemistry of Vanadium.

Chemical Thermodynamics

by John H. Dymond and Haike Yan

From 17–21 August 2004 in Beijing, China, the **18th IUPAC Conference on Chemical Thermodynamics** (ICCT) was held concurrently with the 12th National Conference on Chemical Thermodynamics and Thermal Analysis of China. Conference organizers included Haike Yan, conference chair; Zhiwu Yu, conference co-chair; and Xibai Qiu, conference secretary. The conference attracted 395 participants from 40 countries (144 from China, 84 from Europe, 49 from Japan, and 40 from North America). Eighty-two percent of the delegates were from academia (including 56 students), 15 percent from industry, and three percent from other sectors.

During the opening ceremony, there was a presentation of the first Doctorate Awards to be given by the International Association of Chemical Thermodynamics. The awards, sponsored by Elsevier, were given to Lin Chen, from Tsinghua University, Beijing; Dirk Wandschneider, from the University of Rostock, Germany; and Weiguo Xu, from Liaoning University, China. They each received a certificate and USD 500, and presented their papers at the conference.

The conference began with the Rossini Lecture, which was presented by Jean-Pierre E. Grolier on "Advanced Experimental Techniques in Polymer Thermodynamics." The conference program consisted of eight symposia, and three workshops. In symposium one, on Electrolyte and Non-electrolyte Solution Thermodynamics, Emmerich Wilhelm gave the plenary lecture on "The Fascinating World of Non-electrolytes, Pure and Mixed." The symposium also featured invited lectures by Eckhard Vogel, Fumio Hirata, and Takayoshi Kimura. Symposium two, on New Materials, featured a plenary lecture by C. Richard Catlow on "Computational Approaches to the Catalytic Activation of Carbon-Hydrogen Bonds," and invited lectures by Mary Anne White and Vladimir Durov. The plenary lecture in the third symposium, Phase Equilibrium, Supercritical Fluids, and Separation Technologies, was given by Pablo Debenedetti on "Thermodynamics of Supercooled and Glassy Water." Cornelis Peters and Ding-Yu Peng gave invited lectures. Symposium four on Biological, Medical, Pharmaceutical, Agricultural, and Food Thermodynamics featured a plenary lecture by Stephan Grzesiek on "Biomolecular Interactions in Solutions." Lee Hansen and Ichiro Hatta were the invited lecturers.

Symposium five was on Colloid and Interface Science. Bernard Cabane presented the plenary lecture on "Solid-Liquid Separation," and there were invited lectures from Gerd Olofsson, Watson Loh, and Xueqin An. The title of symposium six was Non-equilibrium Thermodynamics, Statistical Thermodynamics, and Molecular Simulation. The plenary lecture on "Non-equilibrium Pattern Formation" was presented by Qi Ouyang. An invited lecture was given by Zhen-Gang Wang. Symposium seven considered Thermochemistry and Molecular Energetics, with

Michio Sorai, the plenary lecturer, speaking on "Entropy Diagnosis for Phase Transitions Occurring in Functional Materials." Juliana Boerio-Goates gave the invited lecture. Symposium eight was on Industrial Thermodynamics and Data Bases, with a plenary lecture by Michael Fenkel on "Global Communications and Expert Systems in Thermodynamics: Connecting Property Measurement and Chemical Process Design." Invited lectures were given by Pertti Koukkari and Zhoulan Yin.

The conference featured three workshops: Workshop on Thermodynamic Frontiers and Education, with invited lecturer Kazuya Saito; The Ionic Liquids Workshop, with invited lecturers Joan Brennecke and Andreas Heintz; Workshop on New Experimental Techniques, including Nanotechnology, with invited lecturers Joon Won Park and Junko Morikawa. In addition, there were 189 oral presentations, spread over the symposia and workshops, and 283 poster presentations.

The Rossini lecture and the plenary lectures will be published in *Pure and Applied Chemistry*. Selected papers from individual symposia will be published in a variety of other journals.

The plenary and invited lectures demonstrated how chemical thermodynamics is making important and unparalleled contributions to innovative and rapidly developing, interdisciplinary fields such as life sciences, new materials, medicine and pharmacy, agriculture, and green chemistry. These issues are particularly important for those who are in developing or economically disadvantaged. A great benefit of the conference was the opportunity it provided for face-to-face discussion and communication with scientists from developed countries. This should lead to further research and improved education.

Thermodynamics will continue to be an important area of research for many years to come, with a wide range of applications from chemical engineering to the bio-sciences. We look forward to the presentation and discussion of the results of further advances in chemical thermodynamics at the next ICCT, which will take place in Boulder, Colorado, USA, in 2006.

John H. Dymond <johnd@chem.gla.ac.uk> is secretary of IACT and a research fellow at the University of Glasgow, Scotland, UK. Haike Yan is a member of the board of directors of IACT and a professor at the Institute of Chemistry, Academica Sinica, Beijing.

Phosphorus Chemistry

by Pascal Metivier

The **16th International Conference on Phosphorus Chemistry** was held 4–9 July 2004 in Birmingham, England, UK. This tri-annual conference provides a forum for the scientific community to discuss the latest results in the field as well as potential future developments.

The conference, which attracted 480 delegates from 35 countries, offered 156 oral presentations and 240 posters. An important part of the conference has been devoted to the application side of phosphorus chemistry, which has encouraged strong industry participation. This conference was sponsored by Rhodia, one of the major phosphorus chemical manufacturers.

The major trends that can be drawn from this conference are the following:

- Phosphorus chemistry is one field where innovative and "non classical" type structures can be obtained. Most of these structures present very specific electronic properties, which opens new horizons in terms of potential applications.
- Research into polymers containing phosphorus moiety is an important emerging area, with potential implications for surface science and biochemistry.
- There is a clear shift in phosphorus chemistry toward catalysis and surface science. In turn, there is diminishing interest in research and development for some of the more classical applications such as agrochemicals or flame-retardants.
- Biological and medicinal chemistry remains one of the key fields for phosphorus chemistry, with the continuing development of oligonucleotides and their use as antisense drugs and the use of phosphorous for antiviral applications and treating bone related diseases.

Full abstracts of oral and poster presentations, as well as photos, are available at the conference Web site <www.icpc2004.com>.

The next conference will be held in Xiamen, China, in 2007. Professor Yufen Zhao will be the conference chairman.

Pascal Metivier <pascal.metivier@eu.rhodia.com> is the director of research and development for Phosphorus and Performance Derivatives at Rhodia. He served as the chairman of ICPC 2004.

Heterocyclic Chemistry

by Irina P. Beletskaya

The **XXI European Colloquium on Heterocyclic Chemistry** (ECHC) was held 12–15 September 2004 in Sopron, Hungary. The conference, which was organized by the Chemical Research Center of Hungarian Academy of Sciences and the Hungarian Chemical Society, drew over 300 participants, including 100 young chemists from 24 countries. The program included 12 invited lectures and 180 posters, of which 12 were selected for oral presentation. The conference chairman Gyorgy Hajos and co-chairman Peter Matyus helped create a highly organized event with a very creative and friendly atmosphere.

The chemistry of heterocyclic compounds comprises a very broad field as is clearly seen from this partial list of invited lectures:

- F. Diederich (Switzerland), "Heterocycles in the design of nonpeptidic enzyme inhibitors"
- I.P. Beletskaya (Russia), "Transition metal catalysis in heterocyclic chemistry"
- J. Alvarez-Builla (Spain), "Pd-reactions in charged heterocyclic species"
- G. Keglevich (Hungary), "P-Heterocyclic chemistry"
- K.R. Seddon (Ireland), "Heterocyclic cations for ionic liquids"
- J.A. Gladysz (Germany), "Design of molecular devises ("rotors", "gyroscopes") using alkene and alkyne metathesis reactions"
- I.E. Marco (Belgium), "Tandem pericyclic reactions of 2-pyrone derivatives"
- J.M. Bakke (Norway), "Synthesis of nitropyridines using N_2O_5/SO_2"
- N. Haider (Austria), "Cycloaddition routes to condensed carbazoles"
- P.J. Dunn (Pfizer), "The history of the discovery of Viagra and other PDE 5 inhibitors"
- K. Hideg (Hungary), "The chemistry and biology of heterocyclic nitroxide radicals"
- S. Florio (Italy), "Utilization of oxiranyllithiums in various interesting asymmetric syntheses"

The conference demonstrated that innovative methods of modern chemistry (new synthetic methodologies, new reaction media, novel catalytic methods, metal-catalyzed and metal-mediated processes, new physical methods of activation [microwave, for instance]) are widely used in the chemistry of heterocyclic compounds. The potential of this chemistry for the synthesis of new and useful compounds is truly inexhaustible.

The next Heterocyclic Colloquium will be held in Italy in 2006.

Irina P. Beletskaya <beletska@org.chem.msu.su> is a professor in the Department of Chemistry at Moscow State University. She served as IUPAC representative at the ECHC and is also a former president of the Organic and Biomolecular Chemistry Division of IUPAC.

Soil Science

by Qiaoyun Huang

The **4th International Symposium on Interactions of Soil Minerals with Organic Components and Microorganisms** (ISMOM2004) was held 20–23 September 2004 at the Huazhong Agricultural University in Wuhan, China. The conference was sponsored by the International Union of Soil Sciences (IUSS) and IUPAC. The meeting attracted 135 delegates from 21 countries. The theme of ISMOM2004 was the "Environmental Significance of Mineral-Organic Component-Microorganism Interactions in Terrestrial Systems." The conference program was divided into the following six sessions:

- Transformation and Dynamics of Pollutants in Soil Environments
- Chemical, Biological and Biochemical Processes in the Rhizosphere
- Bioavailability of Metals, Nonmetals and Xenobiotics Immobilized on Soil Components
- Distribution and Activity of Biomolecules in Terrestrial Systems
- Interactions between Soil Microbial Biomass and Organic Matter/Nutrient Transformations
- Impact of Interactions among Soil Mineral Colloids, Organic Matter and Biota on Risk Assessment and Restoration of Terrestrial Ecosystems

All sessions consisted of oral and poster presentations. There were 2 plenary lectures, 9 invited speakers, 36 oral presentations and 45 posters. Nicola Senesi, from the University of Bari, Italy, presented an IUPAC lecture on "Metal-Humic Substance Complexes in Soil." Pan Ming Huang from the University of Saskatchewan, Canada, gave a plenary lecture on

"Physical-Chemical-Biological Interfacial Interactions in Soil Environments."

The symposium served as a forum for interactions among soil scientists, chemists, geochemists, biologists, microbiologists, mineralogists, ecologists, and environmental scientists. Papers presented at the symposium covered mechanisms of transformations, dynamics and bioavailability of heavy metals, radionuclides, biomolecules and nutrients immobilized on soil minerals, humic substances, mineral-humic complexes, and microorganisms and their impact on plant, animal, and human health.

A selection of the plenary and invited lectures will be published in a special book by Springer-Verlag. Papers from volunteered oral and poster speakers will be published in a special issue of the international journal *Geoderma*.

The 5th ISMOM conference is planned for Chile in 2008.

Qiaoyun Huang <qyhuang@mail.hzau.edu.cn> is a professor of soil biochemistry at Huazhong Agricultural University in Wuhan, China. Dr. Huang served as the conference chairman for ISMOM 2004.

Chemical Engineering

by A.J. Núñez Sellés

The **5th International Congress on Chemistry and Chemical Engineering** was held in Havana, Cuba, 18–22 October 2004, under the sponsorship of the Cuban Chemical Society, Academy of Sciences of Cuba, and IUPAC. The event drew 700 participants (400 Cuban chemists) from 32 countries. The congress comprised the II International Symposium on Biochemistry and Molecular Biology, IV International Workshop on Natural Products Chemistry, and sessions on Chemical Education, History of Chemistry, Chemical Engineering, and Environmental, Organic, Inorganic, and Analytical Chemistry.

Opening remarks were given by Alberto J. Núñez Sellés, president of the Organizing Committee; Ernest Eliel, IUPAC representative (USA); Paulo C. Vieira, president of the Federación Latinoamericana de Asociaciones Químicas, Charles Casey, president of the American Chemical Society; William Byers, president of the American Institute of Chemical Engineers, and Irma Castro Méndez, scientific secretary of the organizing committee.

Outstanding chemists from many different countries delivered more than 800 presentations, including plenary and session lectures. Ernest Eliel delivered a welcoming lecture on the "History of Stereochemistry, 1850–2004." Later, the University of Havana presented Eliel with the title of *Doctor Honoris Causa,* honoring his distinguished career in chemistry (he received a chemistry degree from the University of Havana in 1946) and his contributions to chemistry development in Cuba. Vicente Vérez Bencomo (Cuba) discussed how chemists worked with other disciplines during the research, development, production, and introduction into the Cuban health system of the first synthetic vaccine produced in Cuba against *H. influenzae* B. The auditorium honored both presentations with a standing ovation.

Ramón Pomés Hernández (Cuba) presented a very interesting lecture about the contributions of chemistry to the development of tourism in Cuba. Adamo Fini (Italy) presented his results about the solubility and polymorphism phenomena of pharmaceutical salts from diclofenac. Fini received an Honorary Membership in the Cuban Chemical Society for his distinguished career in chemistry and cooperation with the Cuban chemical community. V. Turk (Slovenia) discussed the function, structure, and regulation of cysteine-proteinases. Nazario Martin (Spain) presented an interesting approach to photosynthesis mimics through fullerene chemistry.

C. Hidalgo (Chile) focused his lecture on the redox signaling cascades in calcium release channels (CRC), with an interesting approach regarding oxidative stress and CRC. C.P. Casey (USA) presented his views on the challenges for chemists in this century. W. Byers (USA) summarized the American Institute of Chemical Engineers response to the changing nature of chemical engineering. L. Echegoyen (USA) deliv-

ered a highly actualized lecture about nanocarbon structures from fullerenes to nano-onions. P. Kalck (France) presented the most recent advances in the use of water-soluble complexes in homogeneous and heterogeneous catalysis.

Session lectures were presented by chemists from the Canada, USA, UK, Germany, France, Spain, Portugal, Mexico, Brazil, Argentina, Colombia, Russia, and Cuba on a wide range of topics, including, enzyme technology, natural products chemistry, organic synthesis, catalysis, and chemical education, vaccine DNA technology, molecular medicine, protease inhibitors, medicinal plants, organometallics, gene therapy, bioinformatics, and waste treatment. The scientific program also included approximately 600 posters and 100 oral presentations.

Honorary Member Awards were given to Adamo Fini of Italy (left) and Zafra Lerman of the USA.

The Cuban Chemical Society acknowledged the significant contributions of the Colegio de Químicos de Puerto Rico and the American Chemical Society to the Cuban chemical community. In addition, Zafra Lerman (USA) was recognized as an Honorary Member of the Cuban Chemical Society for her contributions to strengthening cooperation between Cuban and U.S. chemical communities.

The next congress is scheduled for October 2006.

Prof. A.J. Núñez Sellés <alberto@cqf.co.cu> has been the president of the Cuban Chemical Society since 1996. He is a titular member of the Academy of Sciences of Cuba (1996–2002) and a numerary member of the Iberoamerican Academy of Pharmacy, Spain. He has also been the director of the Center of Pharmaceutical Chemistry, in Havana, Cuba, since 1990.

Thermodynamics

6–8 April 2005, Sesimbra, Portugal

Thermodynamics 2005 will be the 19th meeting in a series of thermodynamics conferences that are held approximately every two years. The meeting will be held 6–8 April 2005 in Sesimbra, Portugal—the first time the meeting will be outside the United Kingdom. The scope of the meeting will include classical thermodynamics and statistical mechanics. The chairman of the conference is J.P. Martin Trusler (Imperial College London, UK) and the local organizers are Eduardo Filipe and José Nuno Canongia Lopes (Instituto Superior Técnico, Lisbon, Portugal).

The conference will feature the 2005 Lennard-Jones Lecture, sponsored by the Royal Society of Chemistry and presented by Gerhard Schneider. In addition, the Christopher Wormald Prize will be awarded to a research student nominated by members of the community. The winner will receive a cash prize and be given the opportunity to present the research work at the conference. The conference will feature the following topics:

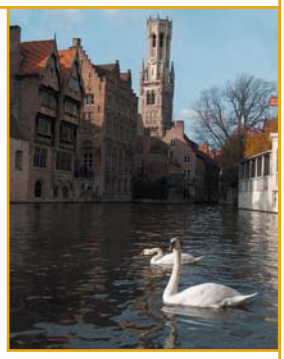
- statistical thermodynamics and molecular simulation
- statistical mechanics of soft matter and complex fluids
- thermodynamic modelling and equations of state
- phase diagrams and supercritical fluids
- thermodynamics of oil, gas and industrial fluids
- mixtures and solutions
- experimental thermodynamics

www.thermodynamics2005.web.pt

Polymer Blends and Eurofillers

9–12 May 2005, Bruges, Belgium

The **8th European Symposium on Polymer Blends—Eurofillers 2005** will be held 9-12 May 2005 in Bruges, Belgium.



"Materials Design, Performance and Problem Solving" is the general theme of the symposium, which aims to stimulate discussion between specialities of complementary fields, including physicists, chemists and engineers, with expertise in both organic and inorganic materials. Design and synthesis of base materials is the very first step of innovation in materials and processes, followed by the search for synergy of appropriate combinations of those materials under different forms and shapes such as films, coatings, foams, packaging, and scaffolds. These have broad a range of applications including, and not limited to, electronics, energy, life sciences, technology, and the environment. Congress topics include the following

Polymer Blends

- innovations in generation and control of phase morphology, including theoretical approach and numerical simulation
- reactive processing: reactive compatibilization, dynamic crosslinking, polymer chemistry in the melt
- interfaces and interphases: control, characterization and modelling
- structure-mechanical performance relationships
- specific polymer blends (including recycling) and their applications

Fillers and Filled Polymers

- preparation and characterization of (nano)fillers of all shapes and functions
- formulations of (nano)fillers with polymers: nanocomposites, natural fiber composites, organic-inorganic hybrid materials
- adhesion between (nano)fillers and polymers
- structure-property relationships of (nano)composites, including confined crystallization issues
- industrial applications of filled polymers in the automotive, electronic, biomedical and packaging areas

The program offers two plenary lectures and 12 keynote lectures and contributed oral presentations, which will be selected from abstracts submitted.

See Mark Your Calendar on page 43 for contact information

www.polymerblends-eurofillers2005.com

Polymer Systems

20–24 June 2005, St. Petersburg, Russia

The Institute of Macromolecular Compounds of the Russian Academy of Sciences continues its series of St. Petersburg meetings on macromolecules. The **5th International Symposium on Molecular Mobility and Order in Polymer Systems** will be held in St. Petersburg, Russia, 20–24 June 2005.

The main objective of this IUPAC-sponsored Symposium is to discuss the modern problems of physics and chemistry in polymer systems with "soft" order preserving a pronounced molecular mobility. As during the 3rd Symposium, the focus will be on dynamic properties. Equilibrium problems will also be discussed. Experimental data as well as the results of theories and simulation approaches will be presented.

The symposium topics are as follows:

- macromolecules in solutions, melts and networks oriented and stretched in strong external fields
- liquid crystalline polymers
- copolymers and polymer blends
- polymer layers and micelles
- polymer complexes and membranes
- polymer networks of different topologies, branched and star polymers, dendrimers

The symposium program will include plenary lectures, 20 invited lectures, several 15-minute oral communications, and poster sections.

See Mark Your Calendar on page 43 for contact information

www.macro.ru

Organic Solids

10–15 July 2005
Cargese, Corsica, France

Organic materials and polymers for electronics and optoelectronics represent a rapidly growing field of research with large impact for knowledge, technology and the economy, as well as for the environment. The conference **Electrical and Related Properties of Organic Solids 2005** will be held 10–15 July 2005 in Cargese, Corsica, France.

The conference (ERPOS 2005) is the 10th following the tradition of the ERPOS conferences held since 1974. For this new edition, approximately 100 participants will be presented with 2 plenary lectures, 10 invited presentations, 3 poster sessions, 2 round tables and 20 special lectures. The meeting will provide an interdisciplinary forum for scientists working in the fields of molecular materials, low dimensional systems, molecular switchable solids, bio-polymers, environmentally friendly chemicals and "green" functional materials for electronics, electrical properties of organic and macromolecular systems, linear and nonlinear optical properties of organic and polymeric structures, data storage, electroluminescent and photovoltaic devices.

Our objectives are to achieve international cooperation of researchers both in academia and industry and to stimulate growth in the field of organic materials for electronics and photonics. A particular attention will be paid to the attendance of young researchers who will receive will receive registration discouts.

The conference will be held in the Institut d'Etudes Scientifiques de Cargèse <www.iesc.univ-corse.fr>, which is a modern conference venue, located in a small traditional village on the coast of the mediterranean island of Corsica. The conference fee is €250 including lunch, banquet, and excursions. There is a 10% reduction for IUPAC members.

See Mark Your Calendar on page 43 for contact information.

http://sciences.univ-angers.fr/erpos/

Heterocyclic Chemistry

31 July–5 August 2005
Palermo, Italy

The International Congresses of Heterocyclic Chemistry are major scientific events that have been organized in different cities in America, Europe and Asia since 1967. They attract attendees from all over the world from both industry and academia. And they are fascinating because they cover the entire range of heterocyclic chemistry—from theory to practical applications.

The **20th International Congress of Heterocyclic Chemistry** will continue the same tradition, offering a scientific program dealing with the latest developments in new methods in heterocyclic chemistry, biologically active heterocycles (both pharmaceuticals and agrochemicals), heterocyclic natural products and analogues, and heterocycles in synthesis, presented by leading international experts. Oral contributions will be encouraged to allow established colleagues as well as young researchers to discuss their latest results and achievements. There is also the potential to present contributed papers in three poster sessions.

Beside the scientific aspects of the program, the attendees will have the chance to appreciate one of the most fascinating spots of the Mediterranean region. Palermo, capital of Sicily, is a lively and colorful town, where millenarian history and contemporary life converge to make the city one of the most intriguing tourist destinations in the world.

The deadline for submission of contributed papers is **1 April 2005.**

See Mark Your Calendar on page 44 for contact information

www.20ichc.palermo.it

Plasma Chemistry

7–12 August 2005
Toronto, Ontario, Canada

The **International Symposium on Plasma Chemistry** (ISPC) is a bi-annual international conference with topics encompassing the entire spectrum of plasma chemistry and plasma processing science. The 2005 symposium will be held 7–12 August 2005 in Toronto, Ontario, Canada. It will include a plasma equipment exhibition and will be preceded by an industrial workshop (7 August 2005) and two IUPAC summer schools—one on low pressure and one on high pressure plasma processing of materials (4–6 August 2005).

The symposium will be organized around plenary lectures, invited and contributed oral presentations, poster sessions, and special and oral sessions. All areas of plasma processing will be covered—from thermal to non-equilibrium plasmas, as well as from fundamentals to applications and engineering.

Contributions are solicited in application areas such as biomaterials, environmental, waste treatment, protective coatings, dielectric barrier discharges, plasma coating, cutting/welding, microelectronics, and all other areas of modern plasma application.

An exhibit will be held during the conference. Companies interested in participating in the exhibit should consult the conference Web site.

In the area of professional recognition, three Best Paper Awards will be selected and presented to young scientists on the basis of the scientific relevance of their contribution. In addition, publisher Wiley-VCH will offer the "Plasma Processes and Polymers Award" to the best oral presentation, poster, or paper by a young researcher on behalf of the *Journal of Plasma Processes and Polymers*.

The Plasma Chemistry Award recognizes lifetime achievements in the area of plasma chemistry and plasma processing. The Board of Directors of the International Plasma Chemistry Society will select the winner of that award. Nominations should be submitted to Board Chairman K. Tachibana <tatibana@kuee.kyoto-u.ac.jp> of Kyoto University .

See Mark Your Calendar on page 44 for contact information

www.ispc17.org

Novel Aromatic Compounds

14–18 August 2005
St. John's, Newfoundland/Labrador, Canada

In the spirit of previous **International Symposia on Novel Aromatic Compounds**, topics for ISNA-11 will span a diverse range of disciplines that involve not only the preparation and study of aromatic compounds, but also more general themes concerning aromaticity. The technical program will feature plenary talks lectures, short invited lectures, and several poster sessions. Leading scientists will discuss aspects concerning the synthesis of aromatic compounds with unique properties, experimental and theoretical characterization of such molecules, as well as their incorporation into devices. Participants in ISNA will draw from all major areas of modern organic, biological, and materials chemistry, fostering healthy discussion and debate of a range of topics. The participation of young scientists (undergraduate and graduate students) and post-doctoral fellows is highly encouraged, and reduced registration fees will apply. The conference social program will include a welcome mixer and conference banquet, and the program for accompanying persons will offer a number of possible excursions. Registration and accommodation information, as well as relevant deadlines, can be found on the conference website.

ISNA-11 will be held 14–18 August 2005 at the Fairmont Hotel, Newfoundland. Situated in the heart of St. John's, this scenic venue provides breathtaking views of the harbor, Signal Hill, and the historic city center. The city of St. John's is located on the Avalon Peninsula in the maritime province of Newfoundland and Labrador. It is a vibrant city in a unique location and one of the oldest in North America. Cradled in a harbor carved from granite on Canada's eastern shore, St. John's and the surrounding area abound with spectacular ocean scenery, wonderful urban parks, charming streetscapes, and historical sites. It is a perfect setting for combining scientific discussion and personal enjoyment.

See Mark Your Calendar on page 44 for contact information

www.chem.ualberta.ca/~isna11/

Analytical Chemistry

12–18 September 2005
Kiev, Ukraine

The International **Congress on Analytical Chemistry and Chemical Analysis**, (AC&CA-05), is to be held 12–18 September 2005 in Kiev, Ukraine. The congress is part of a series of Ukrainian conferences on analytical chemistry established in the 1950s by the Ukrainian Chemical Society. It is the first international congress on analytical science in Ukraine since Ukraine gained its independence. The congress is sponsored by IUPAC and organized by the Ukrainian Chemical Society and the Scientific Council of Analytical Chemistry of the National Academy of Sciences of Ukraine in collaboration with the Division of Analytical Chemistry of the Federation of European Chemical Societies. The congress is being held during the centenary of Anatoly Babko—the founder of modern analytical chemistry in Ukraine. Leading experts from research, development, and industry have been invited to deliver the main lectures. However, anyone with an original contribution to offer on the subject is invited to participate as well.

All main scientific topics of analytical and bioanalytical sciences will be covered by the congress program; including methods and objects of the analysis, separation and pre-concentration, sensors and multisensor systems, pharmaceutical analysis, lab-on-a-chip and miniaturization, analytical techniques for detection of potential terrorist objects, sample preparation and analysis intensification, history and teaching methodology. AC&CA-05 will also include a special symposium—the Russian-German-Ukrainian conference in analytical chemistry (ARGUS-9). The congress has two main tasks: to survey the status of Ukrainian analytical science, and to bring together top scientists and analytical engineers.

The deadline for abstracts and early registration is **1 May 2005**.

See Mark Your Calendar on page 44 for contact information

www.achem.univ.kiev.ua/conference/babko

Mark Your Calendar

Upcoming IUPAC-sponsored events
See also www.iupac.org/symposia
for links to specific event Web site

2005

17–22 April 2005 • Nuclear Analytical Methods • Rio de Janeiro, Brazil
8th International Conference on Nuclear Analytical Methods in the Life Sciences
Prof. Dr. Elisabete De Nadai, Universidad de São Paulo, Centro de Energia Nuclear na Agricultura, Laboratório de Radioisótopos, Caixa Postal 96, CEP 13400-970 Piracicaba, São Paulo, Brazil, Tel.: +55 19 34294655, Fax: +55 19 34294654, E-mail: lis@cena.usp.br

21–22 April 2005 • Clinical Laboratory • Barcelona, Spain
Third European Symposium on Clinical Laboratory and In Vitro Diagnostic Industry
Dr. Josep Lluis Bedini, Hospital Clínic, Laboratori Core, Barcelona, E-08036 Catalonia, Spain, Tel.: +34 93 227 98 69, Fax: +34 93 227 93 76, E-mail: jlbedini@clinic.ub.es

9–12 May 2005 • Polymer Blends • Bruges, Belgium
Joint Meeting of the 8th European Symposium on Polymer Blends and Eurofillers 2005
Prof. Philippe Dubois, Service des Matériaux Polymères et Composites, Université de Mons-Hainaut, Place du Parc, 20, B-7000 Mons, Belgium, Tel.: +32 65 373480, Fax: +32 65 373484, E-mail: philippe.dubois@umh.ac.be

4–9 June 2005 • Polymers and Biopolymers • Réduit, Mauritius
8th UNESCO School and IUPAC Conference on Macromolecules: "*Polymers for Africa*"
Dr. Dhanjay Jhurry, Department of Chemistry, University of Mauritius, Réduit, Mauritius, Tel.: +230 454 1041 - ext 1472, Fax: +230 465 6928, E-mail: djhurry@uom.ac.mu

20–24 June 2005 • Polymer Systems • St. Petersburg, Russia
5th International Symposium on Molecular Mobility and Order in Polymer Systems
Prof. A.A. Darinskii, Institute of Macromolecular Compounds, Russia Academy of Sciences, Bolshoi pr. 31, St. Petersburg, 199004, Russia, Tel.: +7 812 218 8750, Fax: +7 812 218 6869, E-mail: adar@imc.macro.ru

26–30 June 2005 • Polymeric Materials • Prague, Czech Republic
23rd Discussion Conference PMM Current and Future Trends in Polymeric Materials
Prof. Miroslav Raab (Chairman), c/o P.M.M. Secretariat, Institute of Macromolecular Chemistry AS CR, Heyrovského nám. 2 CZ - 162 06 Praha 6, Czech Republic, Tel.: + 420 296 809 281, Fax: +420 809 296 410, E-mail: sympo@imc.cas.cz

10–14 July 2005 • Polymer Gels • Prague, Czech Republic
68th Prague Meeting on Macromolecules and 44th Microsymposium on "*Polymer Gels and Networks*"
Prof. Michal Ilavsky, Academy of the Sciences, Insitute of Macromolecular Chemistry, Heyrovského nám. 2 CZ-162 06 Prague 6, Czech Republic, Tel.: +420 296 809 281, Fax: +420 809 296 410, E-mail: ilavsky@kmf.troja.mff.cuni.cz

10–15 July 2005 • Electrical and Related Properties of Organic Solids (ERPOS 10) • Cargese, Corsica, France
10th International ERPOS Conference - Electrical and Related Properties of Organic Solids and Polymers
Dr. Jean-Michael Nunzi, Laboratorie POMA, UMR-CNRS 6136, Universite d'Angers 2, Boulevard Lavoisier, F-49045 Angers cedex 01, France, Tel.: +33 0 2 4173 5364, Fax: +33 0 2 4173 5216, E-mail: jean-michel.nunzi@univ-angers.fr

17–21 July 2005 • Organometallic Chemistry • Geneva, Switzerland
13th International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS-13),
Prof. E. Peter Kündig, Department of Organic Chemistry, University of Geneva, 30 Quai Ernest Ansermet, CH 1211 Geneva 4, Switzerland, Tel.: +41 22 379 6526, Fax: +41 22 328 7396, E-mail: Peter.Kundig@chiorg.unige.ch

17–22 July 2005 • Carotenoids • Edinburgh, Scotland
14th International Symposium on Carotenoids
Prof. Andrew J. Young, School of Biological and Earth Sciences, John Moores University, Byrom St. Liverpool L3 3AF, UK, Tel.: +44 151 231 2173 / 3575, Fax: + 44 151 207 3224, E-mail: a.j.young@livjm.ac.uk

31 July–5 August 2005 • Heterocyclic Chemistry • Palermo, Italy
20th International Congress of Heterocyclic Chemistry
Prof. Girolamo Cirrincione, Dipartimento Farmacochimico Toss. E Biol., Università degli Studi di Palermo, Via Archirafi 32, I- 90123 Palermo, Italy, Tel.: +39 0916161606, Fax: +39 0916169999, E-mail: gcirrinc@unipa.it

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7–12 August 2005 • Plasma Chemistry • Toronto, Ontario, Canada
17th International Symposium on Plasma Chemistry
Prof. Javad Mostaghimi, Faculty of Applied Science and Engineering, University of Toronto, 40 St. George Street, Room 8260, Toronto ON M5S 1A4, Canada, Tel.: +1 416 978 5604, Fax: 1 416 978 7753, E-mail: mostag@me.utoronto.ca

13–21 August 2005 • IUPAC 43rd General Assembly • Beijing, China
IUPAC Secretariat, Tel.: +1 919 485 8700, Fax: +1 919 485 8706, E-mail: secretariat@iupac.org

14–19 August 2005 • IUPAC 40th Congress—Innovation in Chemistry • Beijing, China
Prof. Xibai Qiu, IUPAC-2005 Secretariat, c/o Chinese Chemical Society, PO Box 2709, Beijing 100080, China, Tel.: +86 (10) 62568157, Fax: +86 (10) 62568157, E-mail: qiuxb@iccas.ac.cn

14–18 August 2005 • Novel Aromatic Compounds • St. John's, Newfoundland, Canada
11th International Symposium on Novel Aromatic Compounds (ISNA-11)
Dr. Graham Bodwell, Department of Chemistry, Memorial University of Newfoundland, St. John's NL, Canada, Tel.: +1-709-737-8406, Fax: +1-709-737-3702, E-mail: gbodwell@mun.ca

21–25 August 2005 • Solution Chemistry • Portoroz, Slovenia
International Conference on Solution Chemistry
Prof. Vojko Vlachy, Faculty of Chemistry and Chemical Technology, University of Ljubljana, Aškerceva 5, POB 537, SL 1001 Ljubljana, Slovenia, E-mail: vojko.vlachy@uni-lj.si

30 August–3 September 2005 • Learning Science • Barcelona, Spain
European Science Education Research Association—"Contributions of Research to Enhancing Students' Interest in Learning Science"
Dr. Roser Pinto, CRECIM Centre de Recerca per a l'Educacio Cientifica i Matematica, Campus de la UAB-Edifici G5, E-08193 Bellaterra, Barcelona, Spain, Tel.: +34 93 5813206, Fax: +34 93 5811169, E-mail: roser.pinto@uab.es

4–9 September 2005 • Analytical Spectroscopy • Antwerp, Belgium
Colloquium Spectroscopicum Internationale XXXIV
Prof. Rene Van Grieken, Department of Chemistry, University of Antwerp, B-2610 Antwerp, Belgium, Tel.: +32 3 820 2362, Fax: +32 3 820 2376, E-mail: rene.vangrieken@ua.ac.be

5–9 September 2005 • Nanostructured Advanced Materials • Stellenbosch, South Africa
3rd IUPAC Workshop on New Directions in Chemistry—Workshop on Nanostructured Advanced Materials (WAM III)
Prof. R.D. Sanderson, University of Stellenbosch, Department of Chemistry & Polymer Science, Private Bag X1, Matieland 7602, South Africa, E-mail: rds@sun.ac.za

10–13 September 2005 • Macromolecule-Metal Complexes • Tirrenia (Pisa), Italy
11th IUPAC International Symposium on Macromolecule-Metal Complexes (MMC-11)
Prof. Francesco Ciardelli, Chemistry and Industrial Chemistry Department, University of Pisa, via Risorgimento, 35, I-56126 Pisa, Italy, Tel.: +39 0502219229, Fax: +39 0502219320, E-mail: fciard@dcci.unipi.it

11–15 September 2005 • Boron Chemistry • Sendai, Japan
12th International Meeting on Boron Chemistry
Prof. Yoshinori Yamamoto, Department of Chemistry, Graduate School of Science, Tohoku University, Sendai, Japan 980-8578, Tel.: +81 22 217 6581, Fax: +81 22 217 6784, E-mail: yoshi@yamamoto1.chem.tohoku.ac.jp

12–18 September 2005 • Analytical Chemistry • Kiev, Ukraine
International Congress on Analytical Chemistry and Chemical Analysis (AC&CA-05)
Prof. Vladimir Zaitsev, Chemistry Department, Kiev National University, 60 Vladimirskaya, Kiev 01033, Ukraine, Tel.: +380 44-2393345, Fax: +380 44-2393345, E-mail: zaitsev@univ.kiev.ua

17–21 October 2005 • Radiochemistry • Beijing, China
Third Asia-Pacific Symposium on Radiochemistry (APSORC '05)
Prof. Z. F. Chai, Institute of High Energy Physics, Chinese Academy of Sciences, Yu Quan Rd. 19B, P.O. Box 918 Beijing 100039, China, Tel.: +86 10 8823 3191, Fax: +86 10 8823 3191, E-mail: apsorc2005@ihep.ac.cn

Mark Your Calendar

2 0 0 6

10–13 January 2006 • Green Chemistry • Delhi, India
Second International Symposium on Green/Sustainable Chemistry
Prof. M. Kidwai, Department of Chemistry, University of Delhi, Delhi-110007, India, Fax: +91 11 27666235, E-mail: kidwai_chemistry@yahoo.co.uk

11–15 June 2006 • Organic Synthesis • Merida, Yucatan, Mexico
16th International Conference on Organic Synthesis (ICOS 16)
Dr. Eusebio Juaristi, Instituto Politecnico Nacional, Departamento de Quimica, Avenida IPN #2508, Esquina Ticoman, Mexico City, DF, 07360, Mexico, Tel: +52 55 50613722, Fax: +52 55 57477113, E-mail: juaristi@relaq.mx

6–11 August 2006 • Pesticide Chemistry • Kobe, Japan
11th International Congress of Pesticide Chemistry
Dr. Hisashi Miyagawa, Division Applied Life Sciences, Graduate School of Agriculture, Kyoto University, Kyoto 606-8502, Japan, Tel.: +81 75 753 6118, Fax: +81 75 753 6123, E-mail: miyagawa@kais.kyoto-u.ac.jp

7–22 September 2006 • High Temperature Materials • Vienna, Austria
12th International Conference on High Temperature Materials Chemistry (HTMC XII)
Prof. Dr. Adolf Mikula, Wahringstr. 42, A-1090 Vienna, Austria, Tel.: +43 4277 52606, Fax: +43 4277 52679, E-mail: Adolf.Mikula@univie.ac.at

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22–27 July 2007 • Novel Aromatic Compounds • Tsuna-Gun, Japan
12th International Symposium on Novel Aromatic Compounds (ISNA-12)
Prof. Yoshito Tobe, Division of Frontier Materials Science, Osaka University, Toyonaka, Osaka University, Japan, Tel.: +81 6 6850 6225, Fax: +81 6 6850 6229, E-mail: tobe@chem.es.osaka-u.ac.jp

2–6 August 2007 • Organometallic Chemistry • Nara, Japan
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Prof. Kazuhiko Takai, Department of Applied Chemistry, Okayama University, Faculty of Engineering, Tsushimanaka 3-1-1, Okayama 700-8530, Japan, Tel.: +81 86 251 8097, Fax: +81 86 251 8094, E-mail: ktakai@cc.okayama-u.ac.jp

THANK YOU . . .

The tear-off page attached to this back cover was first published in *CI* in Jan 2004. The present update includes the periodic table with the latest named element—Rg—and the compilation of data with the latest—2002—CODATA Internationally recommended values of the fundamental physical constants.

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